# Tankerhoosen River Watershed Management Plan

# Friends of the Hockanum River Linear Park of Vernon, Inc.

In Association with:

Town of Vernon North Central Conservation District Rivers Alliance of Connecticut Hockanum River Watershed Association Belding Wildlife Management Area

March 2009



78 Interstate Drive West Springfield, MA 01089



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# **Executive Summary**

# E.1 The Tankerhoosen – A Key Inland Watershed

The Tankerhoosen River watershed is an approximately 12.9 square-mile subregional basin within the larger Hockanum River and Connecticut River watersheds in north-central Connecticut. Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester.



The Tankerhoosen River has long been recognized as an important natural resource and a key inland watershed

The upper Tankerhoosen River is a cold water stream supporting self-sustaining native trout populations that rank among the best of their kind in the state.

critical to the health of Long Island Sound. The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut — the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high-quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The importance of protecting the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed.

## E.2 Potential Threats to Water Quality

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental



Protection's (DEP) most recent list of water bodies not meeting water quality standards.

# E.3 The Need for a Comprehensive Watershed Plan

The need for local decision-makers to consider the environmental consequences of development proposals that would impact the Tankerhoosen River has been expressed by the watershed towns, local advocacy groups including the Friends of the Hockanum River Linear Park and the Hockanum River Watershed Association, The Nature Conservancy, and the DEP.

An informal partnership was formed in 2005 to build upon the successful communitybased river monitoring and assessment program of the Connecticut River Watch Program and the Hockanum River Watch Program. Led by the Friends of the Hockanum River Linear Park, this group also included representatives of the Hockanum River Watershed Association, the Belding Wildlife Management Area, the North Central Conservation District, the Town of Vernon, and other local volunteers. Their objective was to address the immediate and long-term threats to water quality and natural resources in the Tankerhoosen River watershed by developing and implementing a comprehensive, scientifically-based watershed management plan.

In 2007, the Friends of the Hockanum River Linear Park retained Fuss & O'Neill, Inc. to develop a management plan for the Tankerhoosen River watershed. The goal of the watershed management plan is to identify recommendations that will help maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries. Funding for the project has been provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, Rivers Alliance of Connecticut, and the Town of Vernon. A Technical Advisory Committee was also formed to guide the development of the plan, including representatives of the previously mentioned groups. This plan reflects the combined efforts of Fuss & O'Neill, the Technical Advisory Committee, stakeholders, and state and local resource agencies.

## E.4 Plan Development Process

The Tankerhoosen River Watershed Management Plan is the culmination of desktop analyses and field assessments performed by the project team under the direction of the Technical Advisory Committee. The plan synthesizes information from earlier studies and reports on the watershed, Geographical Information System (GIS) mapping and analyses, review of land use regulations, and detailed field assessments to document baseline watershed conditions, the potential impacts of future development in the watershed, and recommended actions to protect and restore water quality and natural resources.

The plan has also been developed consistent with EPA's guidance for the development of watershed-based plans, which includes nine key elements that establish the structure of the plan. These nine elements include specific goals, objectives, and strategies to



protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act

Development of the watershed management plan consisted of the following five major tasks:

- 1. Assessment of baseline and potential future watershed conditions,
- 2. Review of land use regulations in the watershed,
- 3. Field inventories of stream corridors and upland areas in the watershed,



The management plan was developed to satisfy EPA's criteria for watershed-based plans.

- 4. Identification of watershed management goals, objectives, and potential management strategies to address watershed issues,
- 5. Development of watershed-wide, targeted, and site-specific watershed management recommendations.

The initial task was to develop an understanding of the current conditions of the Tankerhoosen River watershed. To accomplish this, the project team reviewed existing watershed data, studies, and reports; compiled and analyzed GIS mapping of the watershed and various subwatersheds; and developed pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development.

A comparative subwatershed analysis was also performed to identify the Tankerhoosen River subwatersheds that 1) are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions and 2) are likely to have been impacted and have greater potential for restoration to improve or enhance existing conditions. The results of the baseline assessment were documented in the report, *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.).

The results of the comparative subwatershed analysis were used to target individual subwatersheds for detailed field inventories. Using screening-level assessment procedures developed by the Center for Watershed Protection and EPA, field crews assessed approximately 8.7 miles of stream corridors, potential hotspot land uses, and representative residential neighborhoods, streets, and storm drainage systems. The field inventories identified a number of common issues and problems, as well as potential candidate sites for stormwater retrofits, stream restoration, and other targeted projects.

The project team also reviewed municipal land use regulations and planning documents within the watershed towns, focusing on Vernon and Tolland, which comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest



potential for future development. The land use regulatory review identified a number of recommendations to improve stormwater management, encourage or require the use of Low Impact Development (LID), reduce the amount of impervious cover generated by future development, and better protect watercourses, wetlands, and riparian areas.

The combined results of the watershed field inventories and land use regulatory review are described in the report, *Watershed Field Inventories and Land Use Regulatory Review, Tankerhoosen River Watershed*, dated October 2008 (Fuss & O'Neill, Inc.).

The project team then developed a series of goals, objectives, and potential management strategies for the watershed based upon the results of the watershed inventory and evaluation phases of the project. Potential management strategies were further refined with input from the Technical Advisory Committee, culminating in the plan recommendations that are presented in this document.

## E.5 Watershed Management Goals

The Tankerhoosen River Watershed Management Plan is intended to be an affordable and effective plan that can be implemented by the watershed municipalities, residents, and other stakeholders. The overall goal of the plan is to maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, which is essential to the economic well-being, environmental and public health, recreational opportunities, and quality of life for the residents, local governments, and visitors of the Tankerhoosen River watershed. This can be achieved by:

- Protecting the upper region of the Tankerhoosen River watershed, including high-quality headwater streams that sustain significant natural resources such as the Belding Wild Trout Management Area, from existing pollutant sources and future threats related to new development and redevelopment.
- Restoring and enhancing the water quality and ecological health of impacted portions of the Tankerhoosen River and its tributaries to support designated uses for fish and wildlife habitat and recreational uses.

## E.6 Plan Recommendations

A set of specific objectives and recommended actions were developed to satisfy the management goals for the watershed. The plan recommendations include watershed-wide recommendations that can be implemented throughout the Tankerhoosen River watershed, targeted recommendations that are tailored to issues within specific subwatersheds or areas, and site-specific recommendations to address issues at selected sites that were identified during the watershed field inventories. Recommendations can be viewed as short-term, mid-term, and long-term according to their implementation priority.

• *Short-Term Recommendations* are initial actions to be accomplished within the first one to two years of plan implementation. These actions establish the



framework for implementing subsequent plan recommendations. Such actions include development of local regulations and stormwater design guidance, discharge investigations, education program planning, and field inventories within previously unassessed subwatersheds. Small demonstration restoration projects could be completed during this phase, however construction of larger retrofit practices and stream restoration projects requiring extensive design, engineering, and permitting should be planned for later implementation.

- Mid-Term Recommendations involve continued programmatic and operational measures, delivery of educational and outreach materials, and construction of one or two larger retrofit and/or stream restoration projects over the next two to four years. Progress on land conservation, LID implementation, and discharge investigation follow-up activities should be completed during this period, as well as project monitoring and tracking.
- Long-Term Recommendations consist of continued implementation of any additional projects necessary to meet watershed objectives, as well as an evaluation of progress, accounting of successes and lessons learned, and an update of the watershed management plan. Long-term recommendations are intended to be completed during the next 5- to 10-year timeframe and beyond.

Table ES-1 summarizes the management recommendations for the Tankerhoosen River watershed. The recommendations are organized by implementation priority (short-, mid-, and long-term) and scale/location (watershed, targeted, or site-specific). Successful implementation of this plan will require a cooperative effort and commitment from the key watershed stakeholders, including a recommended watershed coalition consisting of the Friends of the Hockanum River Linear Park and other members of the Technical Advisory Committee, the watershed municipalities and citizens, state and federal agencies, and other groups. The table also identifies the watershed stakeholders who should be involved in implementing the plan recommendations in either a lead or support role.



			Who Should be Involved (L = lead, A = assist)											
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	CTDEP	NRCS	USEPA	Citizens/Volunteers
Objective 1. Build a Foundation for Implementing the Plan														
Form sustainable partnership or coalition	S	W	Α	L			А	А	Α		Α			
Adopt watershed management plan	S	W	L		А									
Identify potential funding sources and submit grant applications	S	W	L		L	А	А	А	А	А	А	А		
Objective 2. Enhance In-Stream and Riparian Habitat														
Conduct fish passage assessments	S	Т	Α		L		А	А						
Revise local stream crossing & stormwater design standards	S	W	L											
Belding Pond Dam removal feasibility evaluation	S	Т			А						А	L		
Conduct aquatic invasive species study	S	S	А		L									
Priority stream restoration projects	M/L	S	А		L							А		
Objective 3. Protect/Restore Riparian Buffers														
Priority riparian buffer restoration projects	M/L	S	А		L	А			А			А		
Adopt stream buffer regulations, pending enabling legislation	Μ	W	L											
Revise riparian buffer recommendations (Tolland)	S	W	L											
Incorporate invasive species management measures	М	Т			L			А	А		Α			
Objective 4. Identify and Eliminate Illicit Discharges														
Targeted illicit discharge investigations	S	Т	L		А		А							
Implement municipal IDDE programs	М	W	L											
Priority stream cleanup efforts	S	S			L			Α						Α
Develop education/outreach materials	S	W			L		Α				Α			
Deliver education/outreach to the public	М	W	L				А							
Objective 5. Residential Management Practices														
Increase watershed stewardship signage in residential areas	М	W	L		А		А	А						А
Encourage disconnection of rooftop runoff	М	W	L		Α		А							
Develop education/outreach materials	S	W			L		А							
Deliver education/outreach to the public	М	W	L				А							
Objective 6. Municipal and Business Management Practices														
Review municipal facility compliance	S	W	L											
Improve municipal stormwater management programs	S/M	W	L											
Implement street sweeping and catch basin cleaning	М	W	L							L				
Develop education/outreach materials	S	W			L		Α							

#### Table ES-1. Watershed Management Plan Recommendations Summary



			Who Should be Involved (L = lead, A = assist)											
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	CTDEP	NRCS	USEPA	Citizens/Volunteers
Deliver education/outreach to the public	М	W	L				А							
Increase watershed stewardship signage in commercial areas	Μ	W	L		Α		Α	Α						А
Objective 7. Implement Water Quality Monitoring Program			•					•						
Develop and implement long-term monitoring program	S	W			L		А	Α			А			А
Field monitoring study of LID effectiveness	Μ	W	Α		L		Α							
Objective 8. Protect Open Space		0		1			1		-	1	1	0		
Priority land acquisitions	S/M	Т	L		А	А			А		А			
Continue to implement municipal open space plans	S	Т	L											
Seek alternative funding sources for open space acquisition	S/M	Т	L		A									
Promote use of open space through trail maps and events	S/M	Т			L			Α	Α					
Develop and implement invasive species management plan	Μ	Т			L			A			Α			A
Objective 9. Promote LID and Sustainable Site Design		1	1	1	1	1	1	1	r —	1	1			
Monitor effectiveness of LID regulations (Tolland)	S/M	W	L											
Revise Inland Wetland regulations for consistency (Tolland)	S	W	L											
Develop and implement new stormwater/LID regulations (Vernon)	S	W	L											
Form advisory committee	S	W	L											
Develop Town stormwater/LID manual and/or guidance	S	W	L											
Update existing zoning, subdivision, wetlands regulations	S	W	L											
Priority stormwater retrofits	M/L	S	A		L		A			A				
Incorporate LID into Town projects	М	W	L											
LID demonstration projects (green roads, public works, schools)	S	S	L		A		A							
Develop education/outreach materials	S	W			L		A				A			
Deliver education/outreach to the public	M	W					A							
Objective 10. Assess Additional Subwatersheds		-	1	1	1	1		1 -		1	1	1		
Perform stream and upland assessments	S	T				L ,	A	A	A					A
Priority Abbreviations: $S = $ short-term, $M = $ mid-term, $L = $ long-term	S	cale/L	ocatio	n Abb	reviatio	ons: W	= wa	tershed	d-wide,	1 = t	argeted	1, 5 = 5	site-spe	ecitic

#### Table ES-1. Watershed Management Plan Recommendations Summary

Priority Abbreviations: S = short-term, M = mid-term, L = long-term Scale/Location Abbreviations: W = watershed-wide, I = targeted, S = site-specific HRLP – Hockanum River Linear Park, NCCD – North Central Conservation District, HRWA – Hockanum River Watershed Association, ConnDOT – Connecticut Department of Transportation, CTDEP – Connecticut Department of Environmental Protection, NRCS – Natural Resource Conservation Service, USGS – United States Geological Survey, USEPA – U.S. Environmental Protection Agency, Belding WMA – Belding Wildlife Management Area



# **1** Introduction

# 1.1 The Call for a Comprehensive Watershed-Based Plan

#### The Tankerhoosen – A Key Inland Watershed

The Tankerhoosen River watershed is an approximately 12.9 square-mile subregional basin within the larger Hockanum River and Connecticut River watersheds in north-central Connecticut. Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester.



The Tankerhoosen River has long been recognized as an important natural resource and a key inland watershed critical to the health of Long Island

The upper Tankerhoosen River is a cold water stream supporting self-sustaining native trout populations that rank among the best of their kind in the state.

Sound. The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut — the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high-quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The importance of protecting the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed.

#### **Potential Threats to Water Quality**

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental



Protection's (DEP) most recent list of water bodies not meeting water quality standards.

#### The Need for a Comprehensive Watershed Plan

The need for local decision-makers to consider the environmental consequences of development proposals that would impact the Tankerhoosen River has been expressed by the watershed towns, local advocacy groups including the Friends of the Hockanum River Linear Park and the Hockanum River Watershed Association, The Nature Conservancy, and the DEP.

An informal partnership was formed in 2005 to build upon the successful communitybased river monitoring and assessment program of the Connecticut River Watch Program and the Hockanum River Watch Program. Led by the Friends of the Hockanum River Linear Park, this group also included representatives of the Hockanum River Watershed Association, the Belding Wildlife Management Area, the North Central Conservation District, the Town of Vernon, and other local volunteers. Their objective was to address the immediate and long-term threats to water quality and natural resources in the Tankerhoosen River watershed by developing and implementing a comprehensive, scientifically-based watershed management plan.

In 2007, the Friends of the Hockanum River Linear Park retained Fuss & O'Neill, Inc. to develop a management plan for the Tankerhoosen River watershed. Funding for the project has been provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, Rivers Alliance of Connecticut, and the Town of Vernon. A Technical Advisory Committee was also formed to guide the development of the plan, including representatives of the previously mentioned groups. This plan is the culmination of efforts between Fuss & O'Neill, the Technical Advisory Committee, stakeholders, and state and local resource agencies.

The goal of the watershed management plan is to identify recommendations that will maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, including protection of high-quality natural resources and restoration or enhancement of the water quality and ecological health of impacted portions of the Tankerhoosen River. This plan also describes a replicable approach to watershed-based planning, which satisfies the guidance set forth by the U.S. Environmental Protection Agency (EPA) in Section 319 of the Clean Water Act for developing watershed-based plans, thus enabling implementation projects under this plan to be considered for Section 319 funds.

### **1.2 Plan Development Process**

The Tankerhoosen River Watershed Management Plan is the culmination of desktop analyses and field assessments performed by the project team under the direction of the Technical Advisory Committee. The plan synthesizes information from earlier studies and reports on the watershed, Geographical Information System (GIS) mapping and analyses, review of land use regulations, and detailed field assessments to document baseline watershed conditions, the potential impacts of future development



in the watershed, and recommended actions to protect and restore water quality and natural resources.

The plan has also been developed consistent with EPA's guidance for the development of watershed-based plans, which includes nine key elements that establish the structure of the plan. These nine elements include specific goals, objectives, and strategies to protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act



The management plan was developed to satisfy EPA's criteria for watershed-based plans.

Development of the watershed management plan consisted of the following five major tasks:

- 1. Assessment of baseline and potential future watershed conditions,
- 2. Review of land use regulations in the watershed,
- 3. Field inventories of stream corridors and upland areas in the watershed,
- 4. Identification of watershed management goals, objectives, and potential management strategies to address watershed issues,
- 5. Development of watershed-wide, targeted, and site-specific watershed management recommendations.

The initial task was to develop an understanding of the current conditions of the Tankerhoosen River watershed. To accomplish this, the project team reviewed existing watershed data, studies, and reports; compiled and analyzed GIS mapping of the watershed and various subwatersheds; and developed pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development.

A comparative subwatershed analysis was also performed to identify the Tankerhoosen River subwatersheds that 1) are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions and 2) are likely to have been impacted and have greater potential for restoration to improve or enhance existing conditions. The results of the baseline assessment were documented in the report, *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.), a copy of which is provided on CD-ROM in Appendix A of this plan.

The results of the comparative subwatershed analysis were used to target individual subwatersheds for detailed field inventories. Using screening-level assessment procedures developed by the Center for Watershed Protection and EPA, field crews assessed approximately 8.7 miles of stream corridors, potential hotspot land uses, and representative residential neighborhoods, streets, and storm drainage systems. The field



inventories identified a number of common issues and problems, as well as potential candidate sites for stormwater retrofits, stream restoration, and other targeted projects.

The project team also reviewed municipal land use regulations and planning documents within the watershed towns, focusing on Vernon and Tolland, which comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest potential for future development. The land use regulatory review identified a number of recommendations to improve stormwater management, encourage or require the use of Low Impact Development (LID), reduce the amount of impervious cover generated by future development, and better protect watercourses, wetlands, and riparian areas.

The combined results of the watershed field inventories and land use regulatory review are described in the report, *Watershed Field Inventories and Land Use Regulatory Review, Tankerhoosen River Watershed*, dated October 2008 (Fuss & O'Neill, Inc.), a copy of which is provided on CD-ROM in Appendix A of this plan.

The project team then developed a series of goals, objectives, and potential management strategies for the watershed based upon the results of the watershed inventory and evaluation phases of the project. Potential management strategies were further refined with input from the Technical Advisory Committee, culminating in the plan recommendations that are presented in this document.



# **2 Baseline Watershed Conditions**

This section describes the current conditions in the Tankerhoosen River watershed. The information is based upon a review of existing watershed data, studies, and reports; preparation and analysis of watershed GIS mapping; and pollutant loading and impervious cover models to evaluate areas in the watershed that are most at-risk from future development. More detailed information on the baseline assessment is available in *Baseline Watershed Assessment, Tankerhoosen River Watershed* (Fuss & O'Neill, Inc., May 28, 2008), a copy of which is provided on CD-ROM in Appendix A of this watershed management plan.

## 2.1 Watershed Description

The Tankerhoosen River watershed is a small but very important 12.85 square-mile sub-regional basin within the Hockanum River watershed (Figure 2-1). Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester (Table 2-1).

Table 2-1. Distribution of Municipalities in the Tankerhoosen River Watershed

Town Name	Town Acreage	Acreage in Watershed	% of Town in Watershed	% of Watershed
Manchester	17,408	461	2.7	5.6
Vernon	11,904	5,572	46.8	67.7
Tolland	25,856	1,547	5.9	18.8
Bolton	9,920	646	6.5	7.9
Totals	65,088	8,226		100.0

A basic profile of the watershed is provided in Table 2-2. Later sections of this document provide more detailed information on these watershed characteristics.

Area	12.85 square miles (8,226 acres)		
Stream Length	approximately 17.2 miles		
Subwatersheds	10 subwatersheds		
Jurisdictions	4 towns		
Water Quality	DEP Impaired Waters List for habitat for fish and other aquatic life		
Current Impervious Cover	9.8%		
Subwatersheds	Clarks Brook		
Selected for Detailed	Gages Brook		
Assessment Based on	Gages Brook South Tributary		
Vulnerability	Lower Tankerhoosen River		
Assessment	Walker Reservoir		
Subwatarshada	Clarks Brook		
Soloctod for Dotailod	Gages Brook		
Assessment Based on	Lower Tankerhoosen River		
Restoration Potential	Middle Tankerhoosen River		
	Tucker Brook		
Major Transportation	Interstates 84 and 384		
Poutos	U.S. Routes 6 and 44		
Roules	State Routes 30 and 31		

Table 2-2. Profile of the Tankerhoosen River Watershed



	Belding Wildlife Management Area
Significant Natural and	Webster-Knapp Preserve
Historic Features	Bolton Notch Pond
	Walker Reservoir
	Talcottville Historic District

#### Table 2-2. Profile of the Tankerhoosen River Watershed

The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustains a significant natural resource of the State of Connecticut — the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the Connecticut Department of Environmental Protection's (DEP) 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards.

The importance of protecting the pristine upper region of the Tankerhoosen is recognized by both local and state agencies. The State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, The Nature Conservancy (TNC) has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed. The need for local decision-makers to give utmost consideration to the environmental consequences of development proposals that would impact the River, has been expressed by TNC and by the DEP.



Figure 2-1. Tankerhoosen River Watershed



# 2.2 Geologic and Historical Perspective

## 2.2.1 Geology

The State of Connecticut is comprised of three distinct geologic units divided longitudinally across the state. These three units are known as the Western Uplands, the Central Valley, and the Eastern Uplands. The Western and Eastern Uplands are comprised of metamorphic rocks — rocks subjected to intense heat and pressure of the Earth's interior — while the Central Valley is a younger unit comprised of sedimentary rocks. The Central Valley began forming about 225 million years ago when the super-continent Pangaea began to break apart. A large rift formed a long, narrow valley through the middle of the state, eventually filling with sediments from the eroding hills to the east and west (presently known as the Eastern and Western Uplands). The sediments were compacted into soft, easily eroded, red and brown sandstones through which the Connecticut Rivers flows.

The Tankerhoosen River watershed is almost entirely within the Eastern Uplands. The westernmost portion of the watershed is located within the Central Valley. The boundary between the Central Valley and the Eastern Uplands is located near the Vernon-Manchester town line and known as the Bolton Range. The Bolton Range was formed as a result of the different rates of erosion of the less resistant sediments of the Central Valley creating an abrupt rise into the resistant rocks of the Eastern Uplands.

Drastic changes in the surficial geology have occurred within Connecticut since the formation of these geologic regions. Above the sandstone of the Central Valley and the metamorphic bedrock of the Eastern Uplands lie extensive glacial deposits, or "glacial till," left as the large glaciers receded. Melting glacier ice formed rivers which sorted glacial till into layers of sand and gravel, or "stratified drift." The Tankerhoosen River flows through hills of glacial till in the steep Eastern Uplands and then drops into the stratified drift of the Central Valley (Bell, 1985).

## 2.2.2 Population and Industry

Beginning about 10,000 years ago, as the last glacial ice retreated from New England, Native American populations settled Connecticut and the areas along the Tankerhoosen River. The river was used by Native Americans as a source of fish and a travel route to the Connecticut River (Hockanum River Watershed Association, 1998). The Podunks of East Hartford and Manchester, the Nipmucks of Ellington and Tolland were among the tribes that farmed corn in the fertile river floodplains of the Tankerhoosen River. In addition to agriculture, the tribes used the land within the watershed for hunting, gathering, and fishing.

European settlers brought a marked change in land use to Connecticut. Land was cleared and agriculture was the primary use through the Revolutionary War era. However, the availability of more fertile lands in western New York, northern Ohio, and Pennsylvania led to the great migration of Connecticut farmers during the 1800s.



Those who stayed worked in the many factories that arose along the rivers and streams, and manufacturing became a major economic force (Gibbons et al., 1992).

The Tankerhoosen River was no exception to the development patterns across Connecticut. From the headwaters at Gages Brook, the elevation drop of the Tankerhoosen River was ideally suited to power a wide variety of mills. During the eighteenth and nineteenth centuries, several mills associated with the textile, cottonwool, energy, and paper industries were built near these waterfalls and in other areas in the watershed. The Talcottville Historical District is located in southwestern portion of the Tankerhoosen River watershed near the confluence with the Hockanum River. One of the first cotton mills in America was built by Peter Dobson in the early 1800's in Talcottville. The mill burned down in 1909, not to be rebuilt. Peter Dobson is also famous for early observations that ice may have played a role in the erosion and transport of rock in the region.

The Vernon Depot, located within the watershed on Church Street, was an active transportation center during the early part of the twentieth century. The Hartford, Providence and Fishkill Railroad ran seven times a day at the Depot, with connections to Rockville. The Keystone Arch on Tunnel Road (also known as the Keystone Tunnel) was constructed circa 1850 to allow trains to traverse Tunnel Road without disrupting street traffic toward Vernon Center. The 108-foot long tunnel is constructed of 30 arches, each of which consists of a center keystone with nine stones forming the curves on either side. The tunnel is considered by historians to be a fine piece of historic architecture and as a monument to the integrity and skilled workmanship of its builders.

Valley Falls was the site of the first industry in Vernon, a saw mill, in 1740. Valley Falls Park hosted a small mill complex for flaxseed oil and cotton between 1850 and 1877. Beginning in the mid-1800s until the mid-1900s the property was converted into farmland for producing corn, hay, oats, butter, and cheese. In 2001, the historic farmhouse and six outbuildings were purchased by the Friends of Valley Falls, Inc. to ensure preservation of the historical complex. Alternate forms of manufacturing power put most of the mills out of business by the late 1950s. Dozens of the mill buildings and their associated dams remain an integral component of the river.

Rapid population growth in the post-war era of the 1950s and 1960s slowed significantly as developable land became scare (see Figure 2-2). Today, the population of the Tankerhoosen River watershed is approximately 16,000, which is more than double the population of the watershed in the 1950s. Commercial and residential development has occurred in the watershed since the 1970s, with a continued decline in industrial uses. Significant commercial development along the major transportation corridors and residential development in the watershed has increased watershed impervious coverage and contributed to degraded water quality in portions of the Tankerhoosen River and its tributaries. Numerous historical impoundments within the watershed also continue to serve as barriers to fish passage along the Tankerhoosen River and its tributaries.



Watershed Population



Source: Connecticut Population Projections, Series 95.1, Office of Policy and Management, September 1995.

#### Figure 2-2. Population Trends in the Tankerhoosen River Watershed

## 2.2.3 Recreation Resources

The Tankerhoosen River provides many opportunities for recreational activities, such as fishing, swimming, and limited boating. Along the river, there are both town and state lands that are preserved for parks, wildlife sanctuaries and rail-trails. Recreational activities in these areas include hiking, biking, cross-country skiing, ice skating, nature observation, and aesthetic enjoyment.

Some of the prominent recreational centers in the watershed include the Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park. Each of these areas provides parking, picnicking, and trails for walking and cross-country skiing. The Belding Wildlife Management Area was the location of the first Class I Trout Management Area in Connecticut. Recreational areas that also have historical significance include the Dobsonville Pond and Talcottville Pond. Additionally, the area associated with the confluence of the Tankerhoosen and Hockanum Rivers includes a privately owned recreational facility and is the starting point for the annual Manchester Canoe and Kayak Race.

## 2.2.4 Watershed Restoration Efforts

The Connecticut River Watch Program (CRWP), a volunteer water quality monitoring, protection, and improvement program for the Connecticut River and its tributaries, is working closely with the Hockanum River Watch Program (HRWA) and North Central Conservation District to develop and support a community-based river monitoring and assessment program in the Tankerhoosen River watershed. The CRWP monitoring



program has included stream walk surveys and rapid bioassessments (cost-effective biological survey techniques) along the Tankerhoosen River, as well as other areas of the larger Hockanum River watershed.

The Connecticut DEP also conducts routine ambient water quality and benthic monitoring at approximately twelve locations along the Hockanum and Tankerhoosen Rivers. The data assist in documenting the chemical and biological quality of surface waters within the watershed and will be used to support the development of a Total Maximum Daily Load (TMDL), which will address sources of water quality impairment in the Hockanum and Tankerhoosen Rivers.

Baystate Environmental Consultants, Inc. (BEC) conducted a feasibility study in 2002 for the dredging of Tankerhoosen Lake and subsequently prepared a Watershed Management Plan for Tankerhoosen Lake in 2004. The plan identified watershed factors that have directly affected or have the potential to affect the water quality and overall health of Tankerhoosen Lake. The project recommended a Town-wide approach for reducing the quantity of pollutants, specifically sediment and nutrients, reaching Tankerhoosen Lake. BEC personnel conducted field observations of the major contributing watercourses and impoundments in the Tankerhoosen Lake watershed to identify point sources of sediment and nutrients as well as nonpoint source pollutants. BEC recommended that the Town of Vernon require the implementation of stormwater best management practices (BMPs) that maximize to the extent practicable, the removal of total suspended solids and nutrients. In addition to the lake dredging project recommended in the feasibility study, BEC also recommended several structural and nonstructural elements, including a sediment trap at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.

## 2.3 Natural Resources

### 2.3.1 Hydrology

The Tankerhoosen River watershed is 12.85 square-miles, with the majority of the watershed (approximately 70 percent) located within the Town of Vernon (Figure 2-1). Gages Brook and its associated southern tributary comprise the headwaters region of the watershed, eventually flowing into Walker Reservoir East. Gages Brook is located in the northwest portion of the Town of Vernon and within the western portion of neighboring Tolland. A few small impoundments are located within the Gages Brook watershed. The brook receives drainage from the I-84 corridor near the Vernon-Tolland town boundary. In Tolland, Gages Brook flows through an industrial park and residential areas.

Walker Reservoir is no longer an active public water supply but rather a recreational resource that attracts hikers, fisherman, and ice skaters. The Tankerhoosen River, which is a moderately sized (16 feet wide) upland stream, originates at the outlet of Walker Reservoir East and bisects the Town of Vernon on the south side of Interstate



84. The river flows southwest for approximately five miles to the Hockanum River in the Talcottville section of Vernon.

Barrows Brook, Rickenback Brook, and several other small tributaries drain the eastern portion of the upper Tankerhoosen River watershed between Walker Reservoir and the confluence with Railroad Brook near Webster Pond. Barrows Brook is the furthest upstream tributary to the Tankerhoosen River and flows through undeveloped, privately owned land. Rickenback Brook flows east to west through a relatively undeveloped portion of Vernon and discharges to the Tankerhoosen River approximately 0.4 miles upstream of the river's confluence with Railroad Brook. Portions of this brook are within the Belding Wildlife Management Area and have been established for catch and release trout fishing (BEC, 2004).

Railroad Brook drains the southern portions of the watershed, beginning at Bolton Notch Pond in Bolton, and flows north through Valley Falls Park and the Belding Wildlife Management Area before joining the Tankerhoosen River. Valley Falls Pond is located along Railroad Brook within the confines of the Valley Falls Park property. Railroad Brook flows through primarily undeveloped land and discharges to the Tankerhoosen River approximately 1.6 miles upstream of Tankerhoosen Lake (BEC, 2004).

Clarks Brook and Tunnel Brook join the Tankerhoosen River in the middle portion of the watershed prior to the river's confluence with the DEP-owned Tankerhoosen Lake, the first of three DEP-owned run-of-river ponds. Clarks Brook originates north of I-84 and drains primarily industrial/commercial and undeveloped land within the Town of Vernon. Clarks Brook discharges to the Tankerhoosen River approximately 0.5 miles upstream of the river's confluence with Tunnel Brook. Tunnel Brook is located in the central portion of Vernon, flowing north to south and crossing the I-84 corridor. The brook empties into the Tankerhoosen River approximately 0.65 miles upstream of the inlet to Tankerhoosen Lake (BEC, 2004).

Dobsonville Pond is located just downstream of Tankerhoosen Lake. Tucker Brook, which drains the southeastern portion of the watershed and a residential section of the Town of Manchester, joins the Tankerhoosen River immediately upstream of Dobsonville Reservoir dam. Further downstream are Talcottville Pond and the confluence with the Hockanum River near the Vernon/Manchester town line.

Overall the Tankerhoosen River is comprised of a large percentage of first and second order (i.e., headwater) streams according to the Strahler Stream Order classification system. Stream hydrology and water quality in headwater streams are important components of ecosystem health because they are a critical food source for the entire river, influence downstream conditions, and support biodiversity.

Ten subwatersheds within the Tankerhoosen River watershed have been delineated for the purposes of this assessment. The subwatershed delineations are based on the CTDEP local basin delineations, modified slightly based on surface water hydrology and grouped accordingly to facilitate assessment and development of watershed management plan recommendations. Figure 2-3 depicts the subwatersheds identified in



this assessment, and Table 2-3 summarizes the basic characteristics of the subwatersheds.

Subwatershed	Acronym	Area (acres)	Area (square miles)
Bolton Notch Pond	BNP	344	0.54
Clarks Brook	CB	647	1.01
Gages Brook	GB	695	1.09
Gages Brook South Tributary	GBST	680	1.06
Lower Tankerhoosen River	LTR	321	0.5
Middle Tankerhoosen River	MTR	1,578	2.46
Railroad Brook	RB	1,208	1.89
Tucker Brook	TB	934	1.46
Upper Tankerhoosen River	UTR	1472	2.3
Walker Reservoir	WR	347	0.54
Tankerhoosen River Watershed		8,226	12.85

The Tankerhoosen River Watershed is located in an area with a temperate and humid climate. Based on historical climate information available from the NOAA National Weather Service weather station in Harford/Bradley International Airport in Windsor Locks, Connecticut, precipitation is generally well-distributed throughout the year with the wettest conditions in August and November and driest in February (worldclimate.com for Hartford/Bradley International Airport, Hartford County). In Windsor Locks, the mean annual precipitation over a 41-year period of record is 44.4 inches, and the 24-hour average temperature ranges from a high of 73.6°F in July to a low of 24.6°F in January.

Generally, the designated 100-year floodplain of the Tankerhoosen River is confined along a narrow corridor (<500 feet wide) surrounding the river. The entire length of the Tankerhoosen River is within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain, with the exception of a small reach near the river's headwaters, between Reservoir Road and Fish and Game Road. The lower reach of Railroad Brook (below Valley Falls Pond including the pond) is also within the 100year floodplain. Walker Reservoir West and East and portions of Gages Brook also lie within the designated 100-year floodplain (BEC, 2004).



Figure 2-3. Tankerhoosen River Subwatersheds

# 2.4 Water Quality

# 2.4.1 Classifications and Impairments

The Federal Clean Water Act (CWA) was developed to protect the nation's surface waters. Through authorization of the CWA, the United States Congress declared as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water wherever attainable". Connecticut Water Quality Standards are established in accordance with Section 22a-426 of the Connecticut General Statutes and Section 303 of the CWA. The Water Quality Standards are used to establish priorities for pollution abatement efforts. Based on the Water Quality Standards, Water Quality Classifications establish designated uses for surface and ground waters and identify the criteria necessary to support these uses. The Water Quality Classification system classifies inland surface waters into four different categories ranging from Class AA to D. Table 2-4 summarizes the Connecticut Surface Water Quality Classifications.

Designated Use	Class AA	Class A	Class B	Class C	Class D
Existing/proposed drinking water supply	•				
Potential drinking water supply	•	•			
Fish and wildlife habitat	•	•	•		
Recreational use	•	•	•	Class C and D waters may be suitable for certain fish and wildlife habitat, certain recreational activities, industrial use, and navigation	
Agricultural and industrial use	•	•	•		

Table 2-4. Connecticut I	Inland Surface W	Vater Quality Classification	S
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Source: DEP Surface Water Quality Standards, December 17, 2002

Figure 2-4 depicts the Water Quality Classifications of surface waters in the Tankerhoosen River watershed. Surface waters throughout the Tankerhoosen River watershed are classified as Class A with the exception of the Tankerhoosen Lake, Dobsonville Pond, and Talcottville Pond which are classified as Class B/A.

The CWA (Federal Clean Water Act) requires states to:

- 1. Adopt Water Quality Standards,
- 2. Assess surface waters to evaluate compliance with Water Quality Standards,
- 3. Identify those waters not currently meeting Water Quality Standards, and
- 4. Develop Total Maximum Daily Load (TMDL) analysis and other management plans to bring water bodies into compliance with Water Quality Standards.



Figure 2-4. Water Quality Classifications



A portion of the Tankerhoosen River does not meet Water Quality Standards for at least one of the designated uses. The impaired segment consists of the lower 1.51 miles of the Tankerhoosen River from Tankerhoosen Lakes to its confluence with the Hockanum River. The impaired uses include habitat for fish, other aquatic life, and wildlife. The causes and sources of impairment in the lower reaches of the Tankerhoosen River have not been identified and are currently listed as "unknown." TMDLs provide the framework to restore impaired waters by establishing the maximum amount of a pollutant that a water body can assimilate without adverse impact to aquatic life, recreation, or other public uses. The 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards includes a priority ranking system for development of a TMDL specific to the contaminants in each impaired segment: high (H), medium (M), low (L), or under study (T). DEP has identified the impaired segment of the Tankerhoosen River as a high priority for development of a TMDL to restore the impairment.

Location Description	Waterbody Segment Length	Impaired Designated Use	Use Support	Cause	TMDL Priority	Potential Source
From mouth at Hockanum River, upstream to Tankerhoosen Lake	1.51 miles	Habitat for Fish, Other Aquatic Life and Wildlife	Ρ	Impairment Unknown	Н	Source Unknown

#### Table 2-5. Tankerhoosen River Watershed Impaired Waters

Source: DEP, 2006

H —high priority for which there is assessment information that suggests that a TMDL may be needed to restore the water quality impairment.

P – partially supporting

# 2.4.2 Tankerhoosen River Watershed Water Quality Monitoring Study

A water quality monitoring study was conducted in October and November 2006 to establish current baseline water quality conditions in the watershed, identify water quality impacts, and begin to develop a water quality database for the watershed (Fuss & O'Neill, 2007). Chemical water quality monitoring and biological assessments were conducted during dry and wet weather conditions. Samples were collected from fourteen locations throughout the watershed on four occasions (Figure 2-4). A variety of parameters were measured including pH, temperature, dissolved oxygen, and conductivity, which all reported values within normal ranges. These results indicate that the water quality of the watershed is generally good. However, some of the measured parameters including turbidity, metals, nitrogen, phosphorus, and bacteria highlighted some of water quality issues in the watershed. A brief discussion of the water quality parameters and identified issues is provided below:

#### **Turbidity**

Based on the wet weather monitoring results, excessive turbidity is a water quality issue in the Tankerhoosen River and its tributaries, particularly Gages Brook (Figure 2-5). Stream channel erosion and stormwater runoff from impervious surfaces and



construction sites are potential sources of the observed turbidity during large precipitation events such as the August 2006 wet weather monitoring event, although it is difficult to attribute the turbidity excursions to a particular source. During the August 2006 wet weather monitoring event, turbidity measurements generally exhibited a declining trend from upstream to downstream within the watershed. Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries.



Figure 2-5. Turbidity – Tankerhoosen River Watershed

#### Metals

The monitoring data suggest a wet weather source of metals to Gages Brook (Figure 2-6 and Figure 2-7). Results from the August 2006 monitoring event indicate a wet weather source of metals close to the I-84 crossing of Gages Brook, as the dissolved copper concentration was consistently below detection limits at the Gages Brook headwaters monitoring location (GB1) and in excess of the chronic aquatic life criterion at several of the downstream Gages Brook locations. The highest wet weather lead concentration was measured in the Gages Brook monitoring location immediately downstream of I-84, which further suggests that highway runoff is a likely source of metals to Gages Brook. Exceedances of the CT WQS for lead were also measured along the Tankerhoosen River at the Fish and Game Road. (TR1) and Bolton Road (TR2) monitoring locations. Elevated dissolved copper and lead concentrations were also measured at the Clarks Brook monitoring location. The data suggest that metals are a potential source of impairment in Gages Brook, Clarks Brook, and the Tankerhoosen River during wet weather. The November 2005 results also indicate dry weather sources of dissolved copper to Gages Brook between the headwaters monitoring location (GB1) and the monitoring location behind the Tolland Agricultural Center (GB2).





Figure 2-6. Dissolved Copper – Tankerhoosen River Watershed



Figure 2-7. Lead – Tankerhoosen River Watershed

#### **Nutrients**

Many of the monitoring locations exceeded the EPA recommended Total Nitrogen criterion for rivers in Ecoregion XIV of 0.71 mg/L (Figure 2-8). Nitrogen concentrations were consistently higher at the Gages Brook monitoring locations than the other monitoring locations in both wet and dry weather.





Figure 2-8. Nitrogen Species – Tankerhoosen River Watershed

Phosphorus concentrations measured during the wet and dry weather events significantly exceeded the CT WQS and EPA criterion at most locations (Figure 2-9). The elevated phosphorus levels are an indicator of potential organic enrichment and algal growth in water bodies along the Tankerhoosen River and its tributaries, which could impair aquatic life support and contact recreation under certain conditions.





Figure 2-9. Phosphorus – Tankerhoosen River Watershed

#### **Indicator Bacteria**

Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries. Dry weather indicator bacteria concentrations were much lower than wet weather. Natural sources of indicator bacteria such as waterfowl or wildlife may have contributed to several dry weather exceedances of the CT WQS for total coliform at the Gages Brook monitoring location behind the Tolland Agricultural Center and at the Tankerhoosen River monitoring location just upstream of Fish and Game Road.

#### **Bioassessments**

The 2006 bioassessment data (RBV and Fuss & O'Neill data collectively) vary considerably by site, but generally indicate very good water quality at most of the monitoring locations, with the exception of the lower Tankerhoosen River near the confluence with the Hockanum River and downstream of Dobsonville Pond. This finding is consistent with previous impairments identified in the lower reaches of the

Tankerhoosen River by the CTDEP. Despite the water quality issues identified in Gages Brook, Clarks Brook, and in certain reaches of the Tankerhoosen River (i.e., heavy metals, turbidity and suspended solids, and potential nutrient enrichment), the 2006 bioassessment data indicate little or no impairment to the benthic communities at the monitored locations.



# 2.5 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Wetlands and buffer zones between watercourses and developed areas help to preserve stream water quality by filtering pollutants, encouraging infiltration of stormwater runoff, and protecting against stream bank erosion.

Wetlands in Connecticut are designated by soil classification. Figure 2-10 depicts the extent and distribution of wetland soils in the Tankerhoosen River watershed based on Natural Resources Conservation Service soil classifications. Figure 2-10 also depicts wetland mapping available from the U.S. Fish & Wildlife Service National Wetlands Inventory. Wetlands soils comprise 11.3% of the overall watershed (approximately 926 acres), while 4% of the watershed area (approximately 320 acres) is mapped as freshwater emergent wetlands or freshwater forested/shrub wetlands. The concentration of wetland soils is generally higher in the undeveloped portions of the watershed. Mapped wetland soils are generally located in riparian and floodplain areas along the Tankerhoosen River and its major tributaries. Table 2-6 summarizes wetland soils coverage by subwatershed.

Subwatershed Name	Wetland Soils Area (ac)	% of Subwatershed
Bolton Notch Pond	20	5.8 %
Clarks Brook	101	15.5 %
Gages Brook	111	15.9 %
Gages Brook South Tributary	34	5.1 %
Lower Tankerhoosen River	7	2.3 %
Middle Tankerhoosen River	188	11.9 %
Railroad Brook	136	11.3 %
Tucker Brook	109	11.7 %
Upper Tankerhoosen River	193	13.1 %
Walker Reservoir	27	7.6 %
Tankerhoosen River Watershed	926	11.3%

#### Table 2-6. Wetland Soils Coverage in the Tankerhoosen River Watershed

At least twenty vernal pools have been identified within the Tankerhoosen watershed by certified scientists (see Figure 2-10). The majority of these were cited by Mr. Ed Pawluk of Connecticut Ecosystems, LLC in a study conducted for the Vernon Conservation Commission. Several of these pools are considered exemplary vernal pools, and as such merit the highest possible level of protection and conservation (Connecticut Ecosystems, LLC, 2005).






In 1993, a comprehensive survey of plant life was conducted in the 1,400-acre watershed from Valley Falls Park in Vernon to Bolton Notch State Park in Bolton (Sexton, 1993). The study was sponsored by the Town of Bolton Conservation Commission and the Town of Vernon Conservation Commission. A total of 345 species representing 82 families were identified. A small band of marble exists a short distance north and south of the cut at Bolton Notch. A plant species unique to this area includes the Yellow Lady's Slipper. Marble is rare east of the Connecticut River and supports additional plants preferring more basic soil including the purple cliffbrake and maidenhair fern (Sexton, 1993).

## 2.6 Fish and Wildlife Resources

Portions of the Tankerhoosen River have abundant habitats supportive of a variety of fish and wildlife. Various waterbodies, wetlands, and upland areas provide habitat to fish, mammals, amphibians, and birds.

Particularly notable is the 282-acre Belding Wildlife Management Area located in the central portion of the Tankerhoosen River watershed. The Belding Wildlife Management Area is a significant natural resource of undeveloped land owned by the State of Connecticut and managed by the DEP. A 1.4-mile section of the Tankerhoosen River within the Belding Wildlife Management Area is managed as a Class 1 Wild Trout Management Area and is one of only two such areas in eastern Connecticut. This section of stream is characterized by natural reproduction sufficient to produce robust populations of native brook trout (up to 8-10 inches) and wild brown trout (up to 10-11 inches) exhibiting above average growth rates (DEP correspondence, 2003).

Areas in the Tankerhoosen River watershed that provide significant habitat are summarized in Table 2-7. These areas provide habitat for some of the most valuable or unique natural resources or ecosystems in their respective communities. Other open space areas are described in the Land Use and Land Cover section of this report.

Town	Areas			
	Vernal Pools on Box Mountain			
	Tancanhoosen LLC Parcel			
	Talcottville Gorge			
Vornon	<ul> <li>Belding Wildlife Management Area</li> </ul>			
venion	Belding Wild Trout Management Area			
	Valley Falls Park			
	<ul> <li>Rambling Ridge Property</li> </ul>			
	Webster-Knapp Preserve			
Tolland	Tolland and Charter Marshes			
Dolton	Freja Park			
BUILUTI	Bolton Notch State Park			

#### Table 2-7. Areas Providing Habitat for Valuable or Unique Natural Resources

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Freja Park is a 21-acre, wooded town-owned area located west of Bolton Notch Pond. Freja Park serves as a gateway for the 1,400-acre Bolton Notch/Valley Falls watershed



area. The town of Bolton originally acquired the property in 1968, but the park suffered from abuse and neglect. Beginning in March 1998, restoration efforts have been underway including numerous Earth Day Clean-up events with the help of volunteers, Boy Scouts, Conservation Commission members. A total of over two tons of litter have been removed from the park.

## 2.6.1 Fisheries

The Tankerhoosen River historically hosted large runs of many anadromous fish species. Development of the river with dams from 1700 to the 1920s created barriers to fish migration, which extirpated the salmon run and severely limited the upstream habitat for shad and river herring. Despite these obstacles, the Tankerhoosen River and its tributaries support a variety of fish species as detailed in Table 2-8.

The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The generally cold water temperatures in the Tankerhoosen are the result of extensive spring water inputs (DEP correspondence, 2008).

As indicated previously, the Belding Wild Trout Management Area in the upper portions of the Tankerhoosen River watershed is a Class 1 Wild Trout Management Area with self-sustaining native trout populations that rank among the best of their kind in the state. Portions of the remainder of the Tankerhoosen River are stocked annually by the DEP Inland Fisheries Division. Valley Falls Park Pond is stocked in the spring and winter with about 4,400 rainbow trout and generates between 7,500-8,000 angler hours of fishing annually. Walker Reservoir, upstream of the Belding Wildlife Management Area, is stocked each spring with over 1,800 adult brown and rainbow trout (DEP correspondence, 2003).

	Bolton Notch Pond	Gages Brook	Lower Tank. River	Middle Tank. River	Upper Tank. River	Railroad Brook
American Eel				Х	Х	Х
Brown Bullhead	Х					Х
Black Crappie	Х				Х	
Blacknose Dace		Х		Х	Х	Х
Brook Trout		Х		Х	Х	Х
Brown Trout			Х	Х	Х	Х
Bluegill	Х		Х	Х	Х	Х
Chain Pickerel	Х		Х	Х		
Common Shiner				Х	Х	Х
Creek Chub				Х	Х	
Fallfish				Х	Х	
Fathead Minnow		Х				
Golden Shiner	Х			Х	Х	
Longnose Dace				Х	Х	
Largemouth Bass		Х	Х	Х	Х	Х
Pumpkinseed	V	V	~	~	~	×
Sunfish	^	^	^	^	^	^
Rainbow Trout				Х	Х	Х
Rockbass			Х			
Smallmouth Bass			Х			
Tessellated Darter			Х	Х	Х	

### Table 2-8. Fish Species



	Bolton Notch Pond	Gages Brook	Lower Tank. River	Middle Tank. River	Upper Tank. River	Railroad Brook
White Sucker		Х		Х	Х	Х
Yellow Perch	Х			Х		Х
					Stocked	
Tiger Trout					in Pond	
					Stocked	
Golden Trout					in Pond	

#### Table 2-8. Fish Species

## 2.6.2 Birds

Bird surveys were conducted in 2004 at the Tancanhoosen LLC property, within Valley Falls Park, and at various Town of Vernon properties, including areas around Walker Reservoir East and on the Connecticut Light & Power line site.

Eighty bird species were detected during the 2004 surveys. Seventy four species were counted during standardized bird counts at 24 count points, and 6 more were detected as incidental observations. The greatest number of species occurred at Walker Reservoir, while the former gravel pit on the Tancanhoosen LLC property contained the most uncommon birds. Prairie warbler, field sparrow, brown thrasher and eastern towhee were detected on the Tancanhoosen LLC property throughout the breeding season. Populations of these species are declining and brown thrasher is on Connecticut's list of Species of Special Concern. These birds are dependent on early successional habitats such as grassland and shrubland. These habitat types have been lost to reforestation and human development. The gravel pit is at an early successional stage with open, grassy habitat and short, scattered pine trees. This site will eventually revert to a forested habitat unless actively managed to maintain early successional habitat. Once the site is reforested, early successional species will disappear from this site (Seymour, 2004).

The Tankerhoosen River watershed also supports a wide range of bird of species. Surveys performed in 2003 and 2004 reported evidence of great blue heron, wood duck, willow flycatcher, hermit thrush, black-throated blue warbler, broad-winged hawk, hairy woodpecker, pileated woodpecker, olive-sided flycatcher, yellow-throated vireo, red-breasted nuthatch, blue-gray gnatcatcher, Nashville warbler, pine warbler, blackpoll warbler, blackburnian warbler, cerulean warbler, worm-eating warbler, and Canada warbler. European starling and house sparrow, two introduced invasive species, were also identified (Seymour, 2004). A complete species list is provided in the *Baseline Watershed Assessment* (Fuss & O'Neill, May 28, 2008).

During 1999, a bird survey was completed to determine the species diversity and the relative abundance of breeding landbirds within Freja Park and Bolton Notch State Park (Comins, 1999). Of the total 55 species were recorded, 51 were likely nesting species and four were probably non-nesting visitors or migrants. An additional fourteen species were not recorded on the survey, but were identified as likely to occur during the nesting season. Another twenty-nine species have reasonable possibility of occurring in the nesting season from time to time or could be attracted to the area.



Two Connecticut State Species of Special Concern were recorded; six species were listed as National Audubon Society Watch List High Conservation Priority species in Connecticut were recorded; an additional six species not listed as watch species were listed by Partners in Flight as High Conservation Priority Species in Connecticut; fourteen species that were uncommon nesters in the Hartford area were recorded (Comins, 1999). See report for additional listing of specific species.

## 2.6.3 Amphibians & Reptiles

Amphibian and reptile surveys were conducted in 2004 within the Tankerhoosen River watershed, including the Belding Wildlife Management Area, Barrows Brook, and Railroad Brook. Some of the species identified included Northern redback salamander, Northern two-lined salamander, Spotted salamander, American toad, Northern spring peeper, Gray treefrog, Wood frog, Green frog, Pickerel frog, Painted turtle, and Garter snake. The most abundant amphibian species detected during this study was the northern redback salamander. A complete list of the identified amphibian and reptile species is provided in the *Baseline Watershed Assessment* (Fuss & O'Neill, May 28, 2008). A previously undocumented vernal pool was discovered between Reservoir Road and Walker Reservoir West. Additional vernal pools were identified on Bolton Road and above Valley Falls Park (Seymour, 2004).

## 2.6.4 Threatened and Endangered Species

The DEP Natural Diversity Data Base (NDDB) maintains information on the location and status of endangered, threatened, and special concern species in Connecticut. Figure 2-11 displays the generalized areas of endangered, threatened, and special concern species in the Tankerhoosen River watershed. The areas represent a buffered zone around known species or community locations. The locations of species and natural community occurrences depicted on the NDDB mapping are based on data collected over the years by the Environmental and Geographic Information Center's Geologic and Natural History Survey, other units of the DEP, conservation groups, and the scientific community. Approximately ten such areas were identified throughout the watershed. Because new information is continually being added to the Natural Diversity Database and existing information updated, the areas are reviewed on an annual basis by the DEP. Areas can be removed or added based upon the results of the review.

Common Name	Scientific Name	Status				
	Flora					
Climbing fern	Lygodium palmatum	Special Concern				
Sphagnum	Sphagnum pulchrum					
Beaked sedge	Carex rostrata					
Leatherleaf	Chamaedaphne calyculata					
	Fauna					
Eastern pearlshell	Margaritifera margaritifera	Special Concern				
Brown thrasher	Toxostoma rufum	Special Concern				
Southern bog lemming	Synaptomys cooperi	Special Concern				
Wood turtle	Clemmys insculpta	Special Concern				
Purple martin	Progne subis	Threatened				



Common Name	Scientific Name	Status			
Eastern box turtle	Terrapene c. carolina	Special Concern			
Habitats					
Medium fen					
Subacidic rocky					
summit/outcrop					

#### Table 2-9. Endangered, Threatened, and Special Concern Species

Source: DEP Natural Diversity Data Base, 2008.

- "Endangered Species" means any native species documented by biological research and inventory to be in danger of extirpation (local extinction) throughout all or a significant portion of its range within Connecticut and to have no more than five occurrences in the state.
- "Threatened Species" means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within Connecticut and to have no more than nine occurrences in the state.
- "Species of Special Concern" means any native plant or any native nonharvested wildlife species documented to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population, or has become locally extinct in Connecticut.

## 2.7 Watershed Modifications

## 2.7.1 Dams, Impoundments, & Water Supply

The historical industrial use of the Tankerhoosen River and its major tributaries has left behind many small dams and impoundments. Most of this infrastructure is no longer used for power generation, and many of these impoundments currently provide aquatic and wildlife habitat and recreational opportunities. Many of the dams in the watershed are also an impediment to fish migration.

According to the DEP Dam Safety Regulations, the hazard classification of a dam is based on the damage potential from failure of the structure. Figure 2-12 shows the location and hazard classification of the identified dams within the watershed. Some of the dams which no longer serve an integral function to industry or public use have fallen into disrepair and pose a potential hazard to downstream properties.

Table 2-10 lists the major drinking water supplies within the Tankerhoosen River watershed that are regulated under the DEP Water Diversion program.

Name	Name of Diversion	MGD	Town
	Vernon Well #1	0.1728	Vernon
Connectiout Water	Vernon Well #2	0.1728	Vernon
Company	Vernon Well #3	0.1440	Vernon
	Vernon Well #4	0.1728	Vernon
	Vernon Well #5	0.4320	Vernon
Manchester Water Department	New Bolton Well Field, Well #1,2,3	Various	Bolton

#### Table 2-10. Major Drinking Water Supplies







Figure 2-12. DEP Regulated Dams – Tankerhoosen River Watershed



The DEP, with Cooperation from the Connecticut Water Company, has identified two preliminary (Level B) Aquifer Protection Areas associated with these wells within the Tankerhoosen River watershed, as shown in Figure 2-13. Aquifer Protection Areas are designated around active well fields in sand and gravel aquifers that serve more than 1,000 people. Level B mapping identifies the general area of aquifer recharge based primarily on topography. The watershed communities are required to establish land use regulations for these areas to limit potential contamination to public groundwater supplies. Private groundwater supply wells are also prevalent throughout areas of the watershed that are not served by public water supplies.

## 2.7.2 Wastewater Discharges

As summarized in Table 2-11, there are number of industrial, commercial, and municipal facilities in the Tankerhoosen River Watershed with surface water discharges regulated under the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the Connecticut DEP. The facilities listed in Table 2-5 have either permitted wastewater or stormwater discharges to surface waters. The majority of these facilities are located in Vernon. There are no municipal wastewater treatment plants located within the Tankerhoosen River watershed.

Town	Facility	Location	Permit Number
	Carpenter's Mobil	447 Hartford Turnpike	GVS000915
	Company 1 Firehouse	724 Hartford Turnpike	GVM000592
	Connecticut Golfland	95 Hartford Turnpike	GPL000108
	First Student	25 Whitney Ferguson Road	GSI001217
	Motiva Enterprises LLC	444 Hartford Turnpike	GGR001404
	Moore's Automotive	1245 Hartford Turnpike	GVM000806
Vernon	Mount Vernon Apartments	1120 Hartford Turnpike	GVS000863
	Oakland Meadows	1158 Hartford Turnpike	GSN001098
	Tighitco, Inc.	101-77 Industrial Park Road	GSI001599
	Vornon Maintonanco	37 Campboll Avonuo	GVS000988
	Vernon Waintenance	37 Campbell Avenue	GSI000074
	VMS Construction Company	120 Bolton Road	GVM000980
Bolton	Transportation Facility	326 Boston Turnpike	GSI001179
Doiton	Hull's Autobody	299-301 Boston Turnpike	GVM000800
	Dari Farms	Gerber Drive	GSN000814
	Mr. Sparkle Car Wash	157 Hartford Turnpike	GVM000646
	Connecticut Light & Power Co.	45 Tolland Stage Road	GVS001027
Tolland	Gerber Scientific Inc.	24 Industrial Park Road West	GSI000914
TUIATIU	Standard Pegister Co	259 Hartford Turnnike	GPP000152
			GPH000345
	CNC Software Inc.	671 Old Post Road	GSN000070
	Belvedere Ridge	601 Old Post Road	GSN001308

### Table 2-11. NPDES Regulated Facilities

Source: DEP, December 2007



Figure 2-13. DEP Aquifer Protection Areas – Tankerhoosen River Watershed



Figure 2-14 depicts sewer service areas in the watershed. Areas outside of the mapped sewer service areas are presumed to be on individual sewage disposal (i.e., septic) systems. Approximately 23% of the overall Tankerhoosen River watershed area is served by municipal sanitary sewers.

Historical and current industrial and commercial development within the Tankerhoosen River watershed poses a potential threat to surface water and groundwater supplies in the watershed. Illegal waste disposal, improper use and disposal of chemicals such as used oil, pesticides, and herbicides, and chemical spills are potential sources of contaminants from industrial and commercial facilities. As summarized in Table 2-12, several hazardous waste generators and other regulated sites are located within the watershed. These facilities are located in both Vernon and Tolland in the central and upper portions of the watershed.

Sito Typo	Number of Sites			
Sile Type	Vernon	Tolland		
Hazardous Waste Generator	5	6		
Air Emissions	1	2		
CERCLA Site	1 (1 on Final NPL)	0		

### Table 2-12. Summary of Regulated Sites

There is one site that is listed as potential hazardous waste site that EPA has evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as "Superfund." This site, Precision Plating Corporation, is located in the Hillside Industrial Park in Vernon and is currently on the Final National Priorities List (NPL). Chromium contaminated groundwater at the site is being remediated under the direction of the DEP.

## 2.8 Land Use and Land Cover

The type and distribution of land use within a watershed have direct impact on nonpoint sources of pollution and water quality. This section describes the land use and land cover patterns in the Tankerhoosen River watershed.

## 2.8.1 Current Conditions

### Land Use

Figure 2-15 depicts general land use patterns in the Tankerhoosen River watershed. The data in Figure 2-15 are parcel-based land use categories for the watershed communities, provided by the Capital Region Council of Governments (CRCOG). The land uses in the watershed include 20 land use categories (Table 2-13). Approximately 60% of the watershed consists of developed land uses, with single-family residential comprising the largest percentage (40%). Highway and other road right-of-ways comprise approximately 9% of the watershed area. Approximately 30% is classified as resource/recreation land use, which includes committed and uncommitted open space. Major portions of the riparian areas adjacent to the Tankerhoosen River and its tributaries are located within resource/recreation areas.



Figure 2-14. Sewer Service Areas – Tankerhoosen River Watershed



Figure 2-15. Current Land Use – Tankerhoosen River Watershed



Areas in the northern portion of the watershed are more commercialized and have a greater retail and industrial use, with commercial, retail, and industrial land uses comprising approximately 4% of the watershed area. The majority of the commercial, industrial, and retail areas are located in headwater regions adjacent to the major transportation corridors of I-84/Route 30 and I-384.

Land Use Type	Acres	Percent of Watershed
Agriculture	103	1%
One Family	3160	38%
Two Family	48	<1 %
Three Family	2	<1 %
Multi Family	39	<1 %
Condominium	165	2%
Group Quarters	12	<1 %
Commercial	110	1%
Retail	88	1%
Mixed Use	3	<1 %
Industrial	183	2%
Government/Non-Profit	102	1%
School	26	<1 %
Cemetery	22	<1 %
Health/Medical	6	<1 %
Resource/Recreation	2398	29%
Undeveloped	851	10%
Right-of-way	770	9%
Water	77	<1 %
Unknown	61	<1 %

#### Table 2-13. Current Land Use – Tankerhoosen River Watershed

In the Tankerhoosen River watershed, several tracts of potentially developable land have been permanently preserved as "committed" open space. Committed open space parcels in the Town of Vernon and the Town of Bolton were identified through available land use mapping and confirmed by members of the Technical Advisory Committee and the Bolton Conservation Commission. Committed open space parcels in Tolland and Manchester were determined through available mapping from each Town's Plan of Conservation and Development (POCD) and from the Connecticut Office of Policy and Management Municipal Plans of Conservation and Development. In general, the committed open space areas include deeded open space that is privately owned, parcels owned by land trusts, land owned by the State of Connecticut as well as parks owned by the Town of Vernon and Town of Bolton, including the Hop River State Park Trail, Valley Falls Park, Freja Park, and Bolton Notch State Park. This land is protected against future development and is generally located in the central and southern portion of the watershed. Figure 2-16 identifies the committed open space land in the watershed.

In addition, several parcels within the watershed are designated for agricultural or forestry use under Public Act 490. While development is not prohibited on this land, this program reduces the tax burden on this land, thereby relieving some of the pressure to develop the land and allows it to continue to serve as open space.



Figure 2-16. Committed Open Space – Tankerhoosen River Watershed



## Zoning

Figure 2-17 depicts the zoning designations in the Tankerhoosen River watershed. The data in Figure 2-17 are also parcel-based and provided by CRCOG. The majority of the Tankerhoosen River watershed is zoned for residential uses. Commercial and industrial zones associated with the I-384 and I-84 corridors are located in the southern and northern portions of the watershed, respectively.

### Land Cover

Figure 2-18 depicts the general land cover in the Tankerhoosen River watershed. Data shown in Figure 2-18 are land cover categories derived from 2002 Landsat satellite imagery with ground resolution of 30 meters. The land cover data in the watershed are summarized into ten categories (Table 2-8). These ten categories are those used in the Connecticut Land Cover Map Series and are described following the table (University of Connecticut Center for Land Use Education and Research).

	1985		2002		Relative	Relative
Land Cover Type	Acres	Percent of Watershed	Acres	Percent of Watershed	Percent Change <sup>1</sup>	Percent Change <sup>2</sup>
Barren	91	1%	162	2%	1%	78%
Coniferous Forest	454	6%	430	5%	-1%	-5%
Deciduous Forest	4581	56%	4085	50%	-6%	-11%
Developed	1793	22%	2201	27%	5%	23%
Forested Wetland	192	2%	175	2%	0	-9%
Non-Forested Wetland	2	< 1 %	19	<1 %	0	912%
Other Grasses and Agriculture	551	7%	603	7%	0	9%
Turf and grass	448	5%	447	5%	0	0%
Utility Right of Way	19	< 1 %	17	<1 %	0	-12%
Water	95	2%	88	1%	1%	-7%

## Table 2-14. Land Cover – Tankerhoosen River Watershed

<sup>1</sup>Calculation = % land cover 2002 - % land cover 1985

 $^{2}$ Calculation = (acres land cover 2002 – acres land cover 1985) / acres land cover 1985

Source: University of Connecticut's Center for Land Use Education and Research (CLEAR)

- Barren Mostly non-agricultural areas free from vegetation, such as sand, sand and gravel operations, bare exposed rock, mines, and quarries. Also includes some urban areas where the composition of construction materials spectrally resembles more natural materials. Also includes some bare soil agricultural fields.
- Coniferous Forest Includes Southern New England mixed softwood forests. May include isolated low density residential areas.
- Deciduous Forest Includes Southern New England mixed hardwood forests. Also includes scrub areas characterized by patches of dense woody vegetation. May include isolated low density residential areas.
- Developed High density built-up areas typically associated with commercial, industrial and residential activities and transportation routes. These areas contain a significant amount of impervious surfaces, roofs, roads, and other concrete and asphalt surfaces.
- Forested Wetland Includes areas depicted as wetland, but with forested cover. Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Non-forested Wetland Includes areas that predominantly are wet throughout most of the year and that have a detectable vegetative cover (therefore not open water). Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Other Grasses and Agriculture Includes non-maintained grassy areas commonly found along transportation routes and other developed areas and also agricultural fields used for both crop production and pasture.



Figure 2-17. Watershed Zoning as Defined by CRCOG – Tankerhoosen River Watershed







- Turf & Grass A compound category of undifferentiated maintained grasses associated mostly with developed areas. This class contains cultivated lawns typical of residential neighborhoods, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas. Also includes some agricultural fields due to similar spectral reflectance properties.
- Utility Includes utility rights-of-way. This category was manually digitized on-screen from rights-of-way visible in the Landsat satellite imagery. The class was digitized within the deciduous and coniferous categories only.
- Water Open water bodies and watercourses with relatively deep water.

#### **Forest Cover**

Forested areas are the predominant land cover type in the Tankerhoosen River watershed. Approximately 55% of the watershed consists of deciduous and coniferous forests, primarily in the central and southern portions of the watershed. Table 2-15 compares the total acres and percent forest cover by subwatershed. The percent forest cover in each subwatershed ranges from approximately 31% in the Walker Reservoir subwatershed to approximately 86% in the Railroad Brook subwatershed. Based on a literature threshold values documented in several studies (CLEAR, 2007), watershed forest cover of 65% or greater is the minimum needed for a healthy aquatic invertebrate community. Only two of the ten subwatersheds, Railroad Brook and the Upper Tankerhoosen River, exceed the threshold value of 65%. Based on a recommendation of the American Forests organization, 40% forest cover is a reasonable threshold goal for urban areas. All but two subwatersheds, Clarks Brook (34.8 %) and Walker Reservoir (31.3 %), both of which are located in the northern and most developed portion of the watershed, meet this goal.

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in each Subwatershed	Developable Forest Cover in Subwatershed (acres)	Forest Cover that is Developable
Bolton Notch Pond	171	49.60%	41	24.00%
Clarks Brook	226	34.80%	70	30.90%
Gages Brook	314	45.20%	134	42.60%
Gages Brook South Tributary	395	58.10%	171	43.30%
Lower Tankerhoosen River	149	46.60%	82	54.90%
Middle Tankerhoosen River	625	39.60%	122	19.60%
Railroad Brook	1043	86.30%	346	33.20%
Tucker Brook	374	40.00%	119	31.80%
Upper Tankerhoosen River	1110	75.40%	278	25.00%
Walker Reservoir	109	31.30%	54	49.20%
Tankerhoosen River Watershed	4515	54.90%	1416	31.40%

#### Table 2-15. Forest Cover – Tankerhoosen River Watershed

Table 2-15 also includes a comparison of the amount of forest cover in each subwatershed that could potentially be developed in the future (i.e., "developable"). Refer to Section 2.5.2 for a discussion of the determination of "developable" areas and watershed buildout scenario. The percent of forest cover that is developable for each subwatershed ranges from approximately 20% in the Middle Tankerhoosen River subwatershed and up to approximately 55% in the Lower Tankerhoosen River subwatershed. These results suggest that future development within the watershed has



the potential to significantly reduce forest cover and, in some subwatersheds, to below recommended thresholds.

#### **Riparian Vegetation**

Riparian, or streamside, corridors are critical areas important to stream stability, pollutant removal, and wildlife habitat. These areas are also sometimes called "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers (CLEAR 2007). A stream walk survey of the Tankerhoosen River conducted in 1999 revealed that riparian buffers of 100 feet are common between the river and developed areas. However, some areas along the lower reaches of the Tankerhoosen River were identified as having stream buffers of less than 25 feet, according to the results of a 2000 stream walk survey of the Tankerhoosen River.

In order to assess the status and of the riparian corridors in the Tankerhoosen River watershed, the acreage of forest cover within the riparian area (defined as a 200-foot buffer on both sides of streams and a 200-foot buffer from waterbody shorelines) was calculated for each of the ten subwatersheds based on the 2002 Center for Land Use Education and Research (CLEAR) forest land cover classes (coniferous and deciduous forest). The results are provided in Table 2-16.

Subwatershed Name	Forest Cover in 200-foot Riparian Corridor (acres)	Percent of 200-foot Riparian Corridor that is Forested
Bolton Notch Pond	19	34.90%
Clarks Brook	42	46.30%
Gages Brook	85	61.40%
Gages Brook South Tributary	93	62.30%
Lower Tankerhoosen River	31	35.80%
Middle Tankerhoosen River	99	41.80%
Railroad Brook	167	87.20%
Tucker Brook	92	51.80%
Upper Tankerhoosen River	216	80.70%
Walker Reservoir	21	23.10%
Tankerhoosen River Watershed	866	58.30%

### Table 2-16. Forest Cover in Riparian Corridors

Forest cover within the 200-foot riparian corridor for the overall Tankerhoosen River Watershed is nearly 60%, although the amounts vary considerably by subwatershed. Railroad Brook (87.2%) and the Upper Tankerhoosen River (80.7%) subwatersheds have the highest percentage of forest cover within the 200-foot riparian corridor. Walker Reservoir (23.1%) and Bolton Notch Pond (34.9%) have the lowest percentage of forest cover within the 200-foot riparian corridor. These results indicate that large portions of the watershed streams and waterbodies are well-protected by intact riparian forest cover, although several subwatersheds have significantly lower riparian forest cover.



## **Developed Areas**

Developed areas are also a dominant land cover type in the Tankerhoosen River watershed. Approximately 27% of the watershed consists of commercial, industrial, residential, and transportation land cover types (i.e. "developed" category) that follow the major transportation corridors, regional retail and commercial areas, and population centers. Approximately 7% of the watershed consists of other grass and agriculture, although only a small portion of this (approximately 1%) consists of land in active agricultural use.

A comparison of watershed land cover data between 1985 and 2002 (Table 2-14) shows a moderate increase in watershed development during this period (5% increase in developed cover types) and a corresponding loss of coniferous (1% decrease) and deciduous forest (6% decrease).

### **Impervious Cover**

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology (Center for Watershed Protection, 2003; Schueler et al., 1992; Schueler, 1994; Schueler, 1995; Booth and Reinelt, 1993, Arnold and Gibbons, 1996; Brant, 1999; Shaver and Maxted, 1996). Research has also demonstrated similar effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases (NRDC, 1999). Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. Figure 2-19 illustrates this effect. These research findings have been integrated into a general watershed planning model known as the impervious cover model (ICM) (CWP, 2003). The ICM has also been confirmed locally in Connecticut by the DEP, which has determined a statewide impervious cover threshold of 12 percent for aquatic life impairment (Belucci, DEP, 2007).

A GIS-based impervious cover analysis was performed for the Hockanum River watershed and including the Tankerhoosen River watershed by staff from the Department of Natural Resources Management and Engineering at the University of Connecticut (Civco, 2005). The satellite-derived land cover data described previously were used in the analysis. This technique, known as "direct impervious surface modeling", extracted impervious surface data directly from 2002 Landsat imagery to estimate the amount of impervious surface within each pixel. The DEP GIS basin layer was used to calculate the percent of imperviousness by basin. Figure 2-19 graphically summarizes the results of this analysis.





The overall imperviousness of the Tankerhoosen River watershed is estimated at approximately 9.7%. This level of impervious cover is slightly below the CTDEP aquatic life impairment threshold of approximately 12%, where ecological stress and stream impacts become apparent. As shown in Figure 2-20 and summarized in Table 2-17, impervious cover in much of the central and southern portions of the watershed (Upper Tankerhoosen River and Railroad Brook watersheds) is less than 5%, consistent with the high percentage of forest cover and conservation land in these areas. The headwater tributaries of the Tankerhoosen River, specifically Gages Brook, are estimated to have approximately 11.5% impervious cover, while localized subwatershed areas around Bolton Notch Pond, Walker Reservoir, and Dobsonville Pond have impervious cover near or above 20%.

Subwatershed	Percent Impervious Cover
Bolton Notch Pond	16.60%
Clarks Brook	17.20%
Gages Brook	11.50%
Gages Brook South Tributary	11.30%
Lower Tankerhoosen River	15.80%
Middle Tankerhoosen River	12.90%
Railroad Brook	1.70%
Tucker Brook	8.10%
Upper Tankerhoosen River	4.50%
Walker Reservoir	19.90%
Tankerhoosen River Watershed	9.70%

#### Table 2-17. Percent Impervious Cover - Tankerhoosen River Watershed



Figure 2-20. Current Impervious Cover – Tankerhoosen River Watershed



The results of this analysis provide an initial diagnosis of potential stream and receiving water quality within the watershed study area. The analysis method and ICM are based on several assumptions and caveats, which limits its application to screening-level evaluations. Some of the assumptions of the ICM include:

- Requires accurate estimates of percent impervious cover, which is defined as the total amount of impervious cover over a subwatershed area. The resolution of the land cover data used in the evaluation is relatively coarse, although sufficient for a screening-level analysis.
- Predicts potential rather than actual stream quality.
- Does not predict the precise score of an individual stream quality indicator but rather predicts the average behavior of a group of indicators over a range of impervious cover.
- The 10 percent and 25 percent thresholds are approximate transitions rather than sharp breakpoints.
- The ICM has not been validated for lakes, reservoirs, aquifers, and estuaries.
- Does not currently predict the impact of watershed best management practices (treatment or non-structural controls).
- Does not consider the geographic distribution of the impervious cover relative to the streams and receiving waters. Effective impervious cover (impervious cover that is hydraulically connected to the drainage system) has been recommended as a better metric, although determining effective impervious cover requires extensive and often subjective judgment as to whether it is connected or not.

Impervious cover is a more robust and reliable indicator of overall stream quality beyond the 10 percent threshold. The influence of impervious cover on stream quality is relatively weak compared to other potential watershed factors such as percent forest cover, riparian community, historical land use, soils, agriculture, etc. for impervious cover less than 10 percent.

## 2.8.2 Future Conditions

A watershed buildout analysis was also conducted as part of this assessment to assist in the identification of subwatersheds with the highest restoration potential as well as the greatest vulnerability. The purpose of the analysis is to estimate the future land use and impervious cover conditions of the watershed as a result of maximum development allowed by the current zoning within the watershed.

### Land Use

Watershed lands that could be developed in the future (i.e., "developable" land) were subdivided into two categories, based on the CRCOG parcel-based land use data:

• *New Development* - areas that are currently undeveloped and could become new developments in the future. Land designated as "new development" includes those parcels that are designated as "undeveloped" and "resource/recreation" in the CROCG land use data and not identified as committed open space.



 Redevelopment - areas that are currently underdeveloped and could be redeveloped with a higher intensity land use in the future. Land designated for "redevelopment" were limited to single-family residential parcels in the CRCOG land use data that could be subdivided and/or redeveloped in the future.

Areas having the following physical and/or regulatory constraints were also removed from consideration for future development or redevelopment: water bodies, wetland soils, and soils whose slope characteristics defined by NRCS exceed 15% (i.e., steep slope soils). Resulting fragments of land smaller than ¼-acre in size for new development and 3 acres in size for redevelopment were also removed from the analysis. Table 2-18 and Figure 2-21 summarize the amount of developable land by subwatershed, including the new development and redevelopment categories.

Subwatershed	New Development (acres)	New Development Percent in Subwatershed	Redevelopmen t (acres)	Redevelopment Percent in Subwatershed
Bolton Notch Pond	49	14.30%	11	3.20%
Clarks Brook	57	8.80%	52	8.10%
Gages Brook	129	18.50%	72	10.30%
Gages Brook South Trib.	123	18.10%	102	15.00%
Lower Tankerhoosen R.	91	28.50%	17	5.40%
Middle Tankerhoosen R.	127	8.00%	141	8.90%
Railroad Brook	212	17.60%	172	14.30%
Tucker Brook	122	13.10%	89	9.50%
Upper Tankerhoosen R.	238	16.10%	150	10.20%
Walker Reservoir	108	31.30%	13	3.80%
Total	1257	15.30%	820	10.00%

#### Table 2-18. Developable Land – Tankerhoosen River Watershed

The future land use buildout scenario was estimated by assigning new land uses to developable areas, while maintaining the existing land uses for developed and unbuildable land (wetland soils, steep slope soils, etc.). The developable areas were assigned a future land use based on maximum degree of development allowed by the existing zoning category. Table 2-19 presents the future land use category assigned to each developable parcel based on the zoning category. This analysis assumes development of Act 490 parcels consistent with the underlying zoning and does not account for future zone changes or future land development regulatory changes.

Zoning Category	Future Land Use
1-3 Unit Residential, High Density	Condominium
1-3 Unit Residential, Medium Density	Three Family
1-3 Unit Residential, Medium-Low Density	Two Family
1-3 Unit Residential, Low Density	One Family
Cluster/Open Space Residential	One-Family
Industrial	Industrial
Multi-Family	Multi-Family
Planned Area Development Including Residential	Mixed Use
Planned Industrial	Industrial
Planned Residential	Multi-Family
Town Center	Mixed Use
Town Scale Commercial	Commercial

#### Table 2-19. Assigned Future Land Use Category







The results of the buildout analysis are summarized in Table 2-20, which compares acreage of existing and future land use in the watershed. The most significant potential land use change is in the residential land use categories, which is predicted to increase by approximately 15% watershed-wide. The area of resource/recreation and undeveloped land is predicted to decrease by approximately 15% watershed-wide, while commercial and industrial land are predicted to increase by approximately 3%.

Land Use Type	Acresexisting	Percent of Basin <sub>Existing</sub>	Acres <sub>Future</sub>	Percent of Basin <sub>Future</sub>	Relative Percent Change
Agriculture	103	1%	89	1%	0
One Family	3160	38%	3415	42%	4%
Two Family	48	<1 %	811	10%	10%
Three Family	2	<1 %	3	<1 %	0
Multi Family	39	<1 %	60	1%	1%
Condominium	165	2%	177	2%	0
Group Quarters	12	<1 %	12	<1 %	0
Commercial	110	1%	206	3%	2%
Retail	88	1%	88	1%	0
Mixed Use	3	<1 %	33	<1 %	0
Industrial	183	2%	270	3%	1%
Government/Non-Profit	102	1%	102	1%	0
School	26	<1 %	26	<1 %	0
Cemetery	22	<1 %	14	<1 %	0
Health/Medical	6	<1 %	6	<1 %	0
Resource/Recreation	2398	29%	1787	22%	-7%
Undeveloped	851	10%	233	3%	-7%
Right-of-way	770	9%	770	9%	0
Water	77	<1 %	77	<1 %	0
Unknown	61	<1 %	46	<1 %	0

### Table 2-20. Landuse Buildout Analysis Results

### **Impervious Cover**

The watershed buildout analysis was used in conjunction with the existing conditions impervious cover analysis to estimate future impervious cover in the Tankerhoosen River subwatersheds. To complete this analysis, impervious cover was included as a parameter in the pollutant load model described in Section 2.6.

Land use data for both existing and buildout conditions were then entered into the model to determine the change in impervious cover for each subwatershed. The predicted change in impervious cover was then added to the existing impervious cover estimates to estimate future impervious cover.

Table 2-21 presents estimates of existing and future impervious cover by subwatershed. The shaded cells in the table highlight the subwatersheds in which future impervious cover is predicted to approach or exceed either the "sensitive" (10% to 12%) or "impacted" (25%) threshold values as described by the Impervious Cover Model.



Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change <sup>1</sup>
Bolton Notch Pond	16.60%	18.90%	2.30%
Clarks Brook	17.20%	20.60%	3.40%
Gages Brook	11.50%	14.20%	2.70%
Gages Brook South Tributary	11.30%	13.50%	2.20%
Lower Tankerhoosen River	15.80%	23.00%	7.20%
Middle Tankerhoosen River	12.90%	15.50%	2.60%
Railroad Brook	1.70%	3.40%	1.70%
Tucker Brook	8.10%	10.30%	2.20%
Upper Tankerhoosen River	4.50%	4.70%	0.20%
Walker Reservoir	19.90%	29.13%	9.20%
Total	9.87%	12.47%	2.60%

#### Table 2-21. Percent Impervious Cover – Existing and Future Conditions

1. Percent change =  $(IC^{Future} - IC^{Existing}) \times 100$ 

It is significant to note that, based on this analysis, the overall impervious cover in the Tankerhoosen River watershed is predicted to increase from less than 10% to greater than 12%, which is considered impacted. The largest change in impervious cover is predicted in the Walker Reservoir subwatershed, where imperviousness could increase from approximately 20%, or "impacted," to approximately 29%, or "non-supporting." Additionally, the impervious cover in Gages Brook and the associated Gages Brook South Tributary subwatersheds, both of which are important headwater streams, is predicted to cross the state-wide 12% sensitive threshold value.

Another useful metric was developed by Goetz et al. (2003) for the Chesapeake Bay region, which combines subwatershed impervious cover and tree cover within the 100-foot stream buffer. Each of the subwatersheds within the Tankerhoosen River Basin was analyzed with regard to the combined impervious cover/riparian zone metric, which is summarized in Table 2-22 by Goetz et al. (2003).

		•
Stream Health	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer
Excellent	< = 6%	>=65%
Good	6-10%	60-65%
Fair	10-25%	40-60%
Deer	> 2E0/	<109/

#### Table 2-22. Impervious Cover/Riparian Zone Metric

Natural vegetation was determined using the CLEAR land cover data and included the deciduous forest, coniferous forest, forested wetland, and non-forested wetland categories. The Table 2-23 presents the results from the combined impervious cover/riparian zone metric.



	Exis	ting	Future		
Subwatershed	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	
Bolton Notch Pond	16.6%	40.4%	18.9%	39.8%	
Clarks Brook	17.2%	51.9%	20.6%	38.0%	
Gages Brook	11.5%	<b>59</b> .5%	14.2%	50.1%	
Gages Brook South Tributary	11.3%	69.6%	13.5%	40.2%	
Lower Tankerhoosen River	15.8%	42.7%	23.0%	26.0%	
Middle Tankerhoosen River	12.9%	49.7%	15.5%	41.8%	
Railroad Brook	1.7%	89.4%	3.4%	73.7%	
Tucker Brook	8.1%	65.5%	10.3%	49.6%	
Upper Tankerhoosen River	4.5%	84.6%	4.7%	76.3%	
Walker Reservoir	19.9%	41.2%	29.1%	31.8%	

#### Table 2-23. Impervious Cover/Riparian Zone Metric – Existing and Future Conditions

Overall, most of the Tankerhoosen River subwatersheds are currently categorized as "fair" to "good" based on the riparian zone metric published by Goetz et al. (2003), while several of the key headwater streams, including Railroad Brook and the Upper Tankerhoosen River, fall into the highest category. Comparison between the existing and future ratings indicates that four of the ten subwatersheds (Clarks Brook, Gages Brook South Tributary, Lower Tankerhoosen River, and Tucker Brook) are predicted to experience a decline in stream health as a result of future development and, in particular, development within the riparian corridor.

## 2.9 Pollutant Loading

A pollutant loading model was developed using the land use/land cover data described in Section 2-5. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing and future conditions and not to predict future water quality. This section summarizes the methods and results of the analysis, which are presented in greater detail in the *Baseline Watershed Assessment, Tankerhoosen River Watershed*, dated May 28, 2008 (Fuss & O'Neill, Inc.).

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads for sediment and nutrients based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.



Data obtained as part of the Land Use/Land Cover analysis presented in Section 2.5.2 were used to generate model inputs. Several other model parameters were specified for each pollutant and subwatershed, including:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use.
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model was applied to each subwatershed to estimate pollutant loads for each subwatershed under existing land use and future land use scenarios, as described in Section 2-5. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. Table 2-24 presents the results of this analysis. Results are shown in terms of increase in pollutant loading rate (the mass of pollutant to be discharged from each acre of land in a watershed) and percent increase in pollutant load (based on the total pollutant discharge from each of the watersheds).

	Lo (Lo m	ading ad Incr ass [lb	Rate Inc ease pe or ton]/a	crease er Acre, ac-yr)	Load Increase (%) (Total for Each Watershed)				
Watershed	Ν	N P BOD Sediment				Р	BOD	Sediment	
Bolton Notch Pond (318 ac)	0.66	0.1	2.7	0.012	9.6%	8.0%	10.9%	7.7%	
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%	
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%	
Gages Brook South Trib. (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%	
Lower Tankerhoosen R. (306 ac)	1.31	0.1	6.3	0.022	20.0%	8.9%	27.6%	14.7%	
Middle Tankerhoosen R. (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%	
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%	
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%	
Upper Tankerhoosen R. (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%	
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%	
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%	

Table 2-24. Projected Pollutant Loading Rate and Load Increases

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

 Gages Brook. The existing conditions pollutant load model indicates that this subwatershed is characterized by both relatively high total pollutant loads and pollutant loading rates, with approximately 70% urban land use, the largest amount of industrial land use, and the second-highest commercial land use composition in the entire watershed. The buildout condition of this watershed is projected to result in a 19% increase in urban land use with a corresponding decrease in forest; and the new urban land is likely to consist of new residential



and industrial development. As such, relatively large loads and loading rate increases may occur.

- Lower Tankerhoosen River. The existing conditions pollutant load model for this subwatershed predicts relatively small loads (since the watershed area is small) and moderate loading rates. Under a buildout scenario, this subwatershed is projected to result in more than a 20% increase in nitrogen and BOD loads. The resulting loading rates for these parameters are projected to be the second highest of the Tankerhoosen River subwatersheds.
- *Railroad Brook.* The projected buildout pollutant loadings in this subwatershed for nitrogen and BOD are anticipated to increase by approximately 57% and 70%, respectively. Significant increases are also anticipated in phosphorus and sediment loads. Currently, the Railroad Brook sub watershed is heavily forested, with comparatively little development. Several large tracts of land within this subwatershed are potentially available for future development, especially in Bolton and South Vernon, which makes this watershed vulnerable to potentially significant pollutant load increases.
- *Walker Reservoir.* The existing conditions pollutant loading model suggests that this subwatershed has some of the highest levels of pollutant loads within the overall Tankerhoosen River watershed. Potential land use changes in this subwatershed include significant areas of new residential and mixed-use development, much of which is located adjacent to Walker Reservoir. These changes are predicted to result in the greatest increases in pollutant loading rates for all of the parameters evaluated.

## 2.10 Comparative Subwatershed Analysis

A Comparative Subwatershed Analysis was performed for the Tankerhoosen River subwatersheds to identify the subwatersheds with the greatest vulnerability and restoration potential. Subwatershed "metrics" were used to conduct this analysis. Metrics are numeric values that characterize the relative vulnerability and restoration potential of a subwatershed. The metrics used are presented in Table 2-25. The results of this analysis will be used to prioritize field assessment efforts in future phases of this study and to guide plan recommendations.

The analysis involves a screening level evaluation of selected subwatershed metrics that are derived by analyzing available GIS layers and other subwatershed data sources. The basic approach used to conduct the Comparative Subwatershed Analysis consisted of:

- 1. Delineation of subwatershed boundaries and review of available metric data.
- 2. Selection and calculation of metrics that best describe subwatershed vulnerability and restoration potential. (The metrics used to rank subwatershed vulnerability were selected separately from the metrics used to rank subwatershed restoration potential.)
- 3. Developing weighting and scoring rules to assign points to each metric.



4. Computing aggregate scores and developing initial subwatershed rankings.

Subwatersheds with higher aggregate "vulnerability" scores are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions. Subwatersheds with higher aggregate "restoration potential" scores are more likely to have been impacted and have greater potential for restoration to improve upon existing conditions. This approach enables watershed planners to allocate limited resources on subwatershed where restoration and conservation efforts have the greatest chances of success.

The following sections describe the metrics used and the rationale for their selection, how the various metrics were calculated, and the results of the evaluation. Available GIS and other data were used to compute the value of each metric.

Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points
1. Impervious Cover Change	% increase in impervious cover in subwatershed	Increase in IC is high, suggesting greater development potential and stream impacts	Award 1 pt for each 1% increase in impervious cover
2. Impervious Cover Threshold	Comparison of current and future IC relative to ICM threshold	Predicted IC crosses "impacted" (12%) threshold, development could result in significant stream impacts	Award 5 pts for each exceedance of the 12% threshold
3. Stream Order	% of subwatershed consisting of 1 <sup>st</sup> or 2 <sup>nd</sup> order streams	Subwatershed consists of more lower order streams, vulnerability of headwater streams for habitat and water quality protection	Award 6 pts if 100% of streams are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 4 pts if 50% are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 2 pts if 33% are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 0 pts if 0% are 1 <sup>st</sup> and 2 <sup>nd</sup> order
4. Pollutant Loading	% increase in pollutant loading in subwatershed	Increase in pollutant loading is high, suggesting water quality impacts from future development	Award 1 pt for each pollutant loading parameter > 10% and 3 pts for each parameter >20%
5. Industrial/ Commercial Land	% of subwatershed as industrial or commercial land	Industrial/commercial land is high, greater potential for water quality impacts from pollutant hot spot	Award 1 pt for each 2% of subwatershed classified as industrial or commercial/retail
6. Forest Cover	% of subwatershed with developable forest cover	Area of developable forest cover is high, potential for significant future reductions in forested land	Award 1 pt for each 5% of subwatershed with developable forest cover
7. Stream Corridor Forest Cover	% of stream corridor that is forested	<b>Corridor forest cover is high</b> , potential for significant future reductions in forested riparian areas if public ownership of corridor is low	Add 1 pt for each 10% increase in forest cover
8. Public Ownership of Stream Corridor	% of stream corridor that is publicly owned	Public ownership is low (see metric 7)	Add 1 pt for each 10% reduction of stream corridor in public ownership
9. Road Crossings	number of road crossings / square mile	Number of road crossings is high, greater potential for direct stormwater discharges from roadways	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13- 15 = 7pt; >15 = 10 pts
10. Developed	% of subwatershed	Area served by septic is high,	Award 1 pt for each 5% of

### Table 2-25. Summary of Subwatershed Vulnerability Metrics



Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points
Areas with Septic	served by septic	indicating potential for pollutant loadings from failing septic systems	subwatershed area served by septic
11. Drinking Water Resources	Acreage of developable land within a public drinking water supply area	Area of developable land is high, greater potential for impacts to sensitive surface and groundwater drinking water supplies	Award 3 pts for each subwatershed within an aquifer protection area

#### Table 2-25. Summary of Subwatershed Vulnerability Metrics

## 2.10.1 Priority Subwatersheds for Conservation

The results of the subwatershed vulnerability analysis are summarized in Table 2-26.

Subwatershed	Impervious Cover Change	Impervious Cover Threshold	Stream Order	Pollutant Loading	Industrial/ Commercial Land	Developable Forest Cover	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Drinking Water Resources	Total
Bolton Notch Pond	2	10	6	1	7	2	3	3	0	5	0	41
Clarks Brook	3	10	6	4	7	2	5	5	1	4	0	47
Gages Brook	3	5	6	6	11	4	6	6	3	5	0	55
Gages Brook South Tributary	2	5	6	4	1	5	6	5	3	5	0	42
Lower Tankerhoosen River	7	10	0	7	2	5	4	5	7	5	0	53
Middle Tankerhoosen River	3	10	2	2	2	2	4	5	3	3	3	38
Railroad Brook	2	0	6	12	0	6	9	0	5	1	0	40
Tucker Brook	2	0	6	2	0	3	5	6	3	2	0	28
Upper Tankerhoosen River	0	0	4	2	0	4	8	3	3	3	0	27
Walker Reservoir	9	10	4	4	2	3	2	5	10	6	0	56

### Table 2-26. Results of Subwatershed Vulnerability Analysis

As shown in Table 2-27, the following subwatersheds are considered most vulnerable to future development impacts and should be given highest priority for conservation efforts to maintain existing resource conditions:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Walker Reservoir.



Subwatershed Metric	How Metric is Measured	Indicates Higher Restoration Potential When	Metric Points			
1. Existing Impervious Cover	% impervious cover in subwatershed	Current impervious cover is low, suggesting range of possible sites for storage retrofits and stream repairs	<10% = 10 pts; 10 to 15% = 5 pts; >15% = 1 pt			
2. Publicly- owned land	% of subwatershed that is publicly owned	Public land ownership is high, providing range of potential sites for restoration practices	Award 1 pt for each 2.5% of subwatershed in public ownership			
3. Industrial Land	% of subwatershed that is industrial land	Industrial land is high, suggesting potential for source controls, discharge prevention, and on-site retrofits	Award 1 pt for each 2% of subwatershed classified as industrial			
4. Forest Cover	% forest cover in subwatershed	Forest cover is low, suggesting potential for upland and riparian reforestation	<35% = 7pts; 36 to 50% = 5 pts; 50 to 70% = 3 pts; >70% = 1pt			
5. Wetland Cover	% of subwatershed that is wetlands	Wetland cover is high, suggesting potential for wetland and riparian restoration	Award 1 pt for each 2% of subwatershed area			
6.Development Potential	% of developable land in subwatershed	No more development is expected; stable conditions increase feasibility of stream repairs and storage retrofits	30 to 35% = 1pts; 25 to 30% = 4 pts; 20 to 25% = 7 pts; 15 to 25% = 10pt			
7. Stream Density	stream miles / square mile	Stream density is high, suggesting greater feasibility of corridor practices	Award 1 pt for each 10% increase in stream density from watershed average of 1.3 stream miles / square mile			
8. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is low, suggesting feasibility of riparian reforestation and stream repairs	Add 1 pt for each 10% reduction in forest cover			
9. Public Ownership of Corridor	% of stream corridor that is publicly owned	Public corridor ownership is high, suggesting greater feasibility of corridor practices	Add 1 pt for each 10% of stream corridor in public ownership			
10. Road Crossings	number of road crossings / square mile	Number of road crossings is high, suggesting greater potential for stream repairs, culvert modifications	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts			
11. Developed Areas with Septic	% of subwatershed that is served by septic	Area served by septic is high, suggesting greater potential for septic system upgrades	Award 1 pt for each 5% of subwatershed area served by septic			
12. Water Quality Impairments	number of water quality impairments / square mile	Number of water quality impairments is high, suggesting regulatory need to focus on WQ improvements	Award 3 pts for each water quality impairment identified			

## Table 2-27. Summary of Subwatershed Restoration Potential Metrics

The results of the subwatershed restoration potential analysis are summarized in Table 2-28.



Subwatershed	Existing Impervious Cover	Publicly-owned Land	Industrial Land	Forest Cover	Wetland Cover	Development Potential	Stream Density	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Water Ouality Impairments	Total
Bolton Notch Pond	1	1	1	5	3	10	0	6	6	0	5	0	38
Clarks Brook	1	10	5	7	8	10	0	4	11	1	4	0	60
Gages Brook	5	12	6	5	8	4	10	3	12	3	5	6	79
Gages Brook South Tributary	5	3	0	3	3	1	14	2	9	3	5	9	57
Lower Tankerhoosen River	1	6	1	5	1	1	15	5	11	7	5	6	64
Middle Tankerhoosen River	5	6	1	5	6	10	5	5	10	5	3	0	61
Railroad Brook	10	0	0	1	6	1	9	0	0	5	1	0	34
Tucker Brook	10	10	0	5	6	7	11	4	11	1	2	0	66
Upper Tankerhoosen River	10	3	0	1	7	4	12	1	6	3	3	3	52
Walker Reservoir	1	10	1	7	4	1	0	7	9	10	6	0	55

#### Table 2-28. Results of Subwatershed Restoration Potential Analysis

As shown in Table 2-28, the following subwatersheds should be given highest priority for restoration potential to improve upon existing conditions:

- Clarks Brook,
- Gages Brook,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook.

Based on the combined results of the subwatershed vulnerability and restoration potential analyses, the following subwatersheds were recommended for detailed assessment and planning:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



# **3 Watershed Field Inventories**

Field inventories were performed during summer 2008 to further assess existing watershed conditions and potential sources of pollution. The field inventories are screening level tools for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. The field inventories included selected stream corridors and upland areas within priority subwatersheds, which were identified from the Comparative Subwatershed Analysis. Field inventories were performed within the priority subwatersheds identified in Section 2.7.1.

This section of the watershed management plan provides a summary of the methods and results of the field inventories. More detailed information on the field inventory methods and findings is available in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), a copy of which is provided on CD-ROM as Appendix A of this watershed management plan.

The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (CWP, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (CWP, 2005). The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to the streams. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land.

During the field inventories, crews assessed approximately 8.7 miles of stream corridors, six potential hotspot locations, five representative residential neighborhoods, and a number of streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses. Field inventory nomenclature used throughout this report is summarized in Table 3-1. Copies of completed field assessment forms are provided as attachments to the *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008). Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are available on CD.

Clarks Brook	СВ
Lower Tankerhoosen River	LTR
Middle Tankerhoosen River	MTR
Walker Reservoir	WR
Gages Brook	GB
Gages Brook South Tributary	GBST
Tucker Brook	TB

#### Table 3-1. Field Inventory Nomenclature



Reach Level Assessment	RCH
Channel Modification	СМ
Severe Bank Erosion	ER
Impacted Buffer	IB
Stormwater Outfall	OT
Stream Crossing	SC
Trash & Debris	ТВ
Utilities	UT
Hotspot Investigation	HSI
Neighborhood Site Assessment	NSA
Streets and Storm Drains	SSD

#### Table 3-1. Field Inventory Nomenclature

## 3.1 Summary of Findings

A variety of common issues and problems were identified during the field inventories. Some prevalent issues throughout the watershed are described below.

Overall in-stream habitat in the assessed reaches was mixed. Some of the assessed reaches have high quality habitat, with riparian cover, good floodplain connection, varied substrate, and significant stream shading. In other segments, in-stream habitat is marginal to poor due to bank erosion, buffer encroachment, trash and debris, lack of shading, and in-stream sedimentation. However, the majority of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities. Many potential barriers to fish passage were observed throughout the watershed, including perched culverts, culverts with



Arch-type railroad crossing (SC-02) may prevent fish passage and is suffering from downstream scour evidenced by the large pool shown in the photograph.

very shallow flow, and natural and manmade dams. Therefore, the impact of potential fish barriers and the feasibility of fish barrier removal efforts should be investigated further.

 Stream buffer encroachments are prevalent along stream corridors in or near areas of residential and commercial development. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Education, signage,



Stream segment GB-05B showing limited vegetative buffer and a small footbridge crossing the stream.


stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.

 Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm drainage



Trash and debris along Reach CB-02.

system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

 Numerous outfalls were observed from virtually all of the land uses encountered during the stream assessments. Many appear to be associated with sources having low potential for water quality impacts (i.e., residential foundation drains), while others were of unknown origin and should be the

focus of future investigation. Illicit discharge investigations are recommended in targeted areas and land uses.

 Invasive species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed. Invasive species management should be incorporated into stream corridor restoration activities.



- Parking lots associated with apartment complexes, institutional land uses (schools), and commuter lots are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other smallscale LID approaches.
- The field assessments identified very little evidence of storm drain stenciling or watershed stewardship signage, with the exception of a residential subdivision in the Tucker Brook subwatershed.
- Most of the developed areas surveyed have inadequate stormwater quality controls. Many of the residential developments were constructed prior to the



advent of modern stormwater quality regulations and design requirements. Therefore, most of the development observed in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond detention basins for peak flow control. In most cases, the stormwater management controls that were observed at newer developments were not being maintained.

- No Low Impact Development (LID) design practices were observed in the watershed. With the recent shift toward LID site design and stormwater management requirements, as demonstrated by the Town of Tolland's new LID regulations and design manual, the watershed is an ideal candidate to showcase LID practices for both new development and retrofit applications. Local LID demonstration sites are a valuable tool for public education and promoting the widespread use of such practices. Incorporating LID into town projects, including roadway projects, can also serve as a proactive model for private development.
- Stormwater runoff from Interstate 84, other state roads such as Route 30 and 31, and local roads typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies. Opportunities exist for stormwater retrofits at roadway stormwater outfalls
- Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Access to many of these areas is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility.



Stream segment GB-05B showing area of stream bank erosion.

- Very few active construction sites were observed in the watershed. However, a large amount of developable land exists in the watershed, and future construction activity is a major potential source of polluted runoff. Approaches for stronger soil erosion and sedimentation controls include regulating building envelopes, encouraging property owners to minimize clearing for other purposes, and requiring drainage review for activities that disturb less than <sup>1</sup>/<sub>2</sub> acre.
- Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds (Railroad Brook, Bolton Notch Pond, and Upper Tankerhoosen River) were not assessed as they were determined to be less vulnerable to future development impacts. A schedule



should be established for assessing the remaining stream segments and subwatersheds.

## 3.2 Stream Corridor Assessment

Stream corridors within the Tankerhoosen River watershed were assessed during June 3 through 6, 2008, and on July 2 and 10, 2008. Field crews consisted of staff from Fuss & O'Neill, the North Central Conservation District, and volunteers with Friends of the Hockanum River Linear Park of Vernon. Stream corridors were assessed along selected reaches within priority subwatersheds using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005).

The stream assessment method used in this study is a continuous stream walk method that identifies and evaluates the following impact conditions for each reach:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, culverts, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified;
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

The stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Collected information was entered into a database and used to quantify the overall condition of stream corridors in the watershed, compare subwatersheds within the watershed to each other, and prioritize areas for restoration, stormwater retrofit, land preservation, and other stewardship opportunities.

Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from downstream to upstream when in series and west to east upstream from confluences. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally less than one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach. Impact conditions within each reach were numbered sequentially with an abbreviation



followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02.

Forty-one stream reaches were evaluated in the Tankerhoosen River watershed using this stream assessment protocol. Table 3-2 summarizes the number of impact conditions identified and reach level assessments that were performed within each subwatershed.

Subwatershed	RCH	СМ	ER	IB	OT	SC	TD	UT
Clarks Brook	5		2		10	8	2	
Lower Tankerhoosen River	1				1	1		
Middle Tankerhoosen River	5		1		14	5	7	
Walker Reservoir	5				6	6		
Gages Brook	12	1	8	5	21	12	3	1
Gages Brook South Trib.	7	1	1	1	3	8		
Tucker Brook	6		2	4	9	9	3	

#### Table 3-2. Number of Reach Level Assessments Performed and Impact Conditions Identified

Reach level assessment scores were assigned by field crews based upon the overall stream, buffer, and floodplain conditions. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 relating to poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points.

Streams were assessed relative to a base condition, which for this study, is the highest scoring stream reach in the Tankerhoosen River watershed (153 points). All other assessed stream reaches were assigned a numerical score and categorized relative to the base score of 153 points (Table 3-3). Reaches scoring greater than 90% of the base condition (138 points) are considered "excellent", between 75% and 90% of the base condition are categorized as "good", between 55% and 75% of the base condition are categorized as "fair", between 35% and 55% of the base condition are categorized as "poor", and less than 35% of the base condition are categorized as "very poor". Table 3-4 summarizes stream reach assessment scores and classifications for the assessed stream reaches.

Category	Percentile	Point Threshold
Excellent	90%	≥138
Good	75%	≥115
Fair	55%	≥84
Poor	35%	≥54
Very Poor	<35%	<54

#### Table 3-3. Stream Reach Classifications



Excelle	nt	Good		Fair		Poor		Very F	oor
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
MTR-08	153	GBST-02	127	GB-09	114	TB-04B	83	GB-05B	53
GB-10	146	GB-02	120	GBST-03	111	MTR-01	82	WR-01	35
GBST-04A	146	GBST-09B	120	LTR-03	111	GB-04	80		
GBST-01	145	TB-02	119	GB-07	105	WR-02	80		
MTR-07	139	GBST-04B	117	CB-03	104	WR-04	76		
CB-04	138	TB-01	116	GB-01	102	GB-03B	72		
		GB-08	115	GB-03A	97	GBST-09A	59		
				MTR-09	94				
				GB-05A	93				
				CB-02	93				
				TB-03	92				
				TB-04A	92				
				WR-03	91				
				GB-06	88				
				MTR-02	87				
				CB-01	85				
				WR-05	84				
Note: TB04C	and CB-0	)5 were not sco	ored durin	ig the reach le	evel asses	ssment			

#### Table 3-4. Stream Reach Assessment Scores and Classifications

As depicted in Figure 3-1, MTR-08 is the highest rated stream reach due to good riparian cover and bed material. WR-03 is considered fair due to the presence of invasive species within the riparian corridor. TB-04B and GB-05B are poor and very poor, respectively, because of poor channel characteristics, outfalls, stream crossings, trash and debris and lack of stream buffer and bank erosion in the case of GB-05B.



Figure 3-1. Examples of Stream Reaches in Various Classification Categories

Additional details regarding the assessed stream reaches are provided in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), a copy of which is provided on CD-ROM in Appendix A of this plan.



## 3.3 Upland Assessments

Fuss and O'Neill conducted upland assessments in the Tankerhoosen watershed in July 2008. The field observations assist in identifying pollution prevention and potential restoration opportunities at hotspot land uses and residential neighborhoods in the watershed. Factors that were considered when determining which hotspots and neighborhood areas to prioritize for assessment include:

- Stream condition (assessed during stream corridor inventory),
- Site proximity to the stream,
- Land use type and development density,
- Land ownership,
- Restoration potential.

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a "windshield survey" evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the Tankerhoosen watershed are: hotspots, residential neighborhoods, and streets and storm drains. Field data forms that were completed during the assessments are provided in *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008).

### 3.3.1 Hotspot Investigations

Hotspot site investigations were conducted for six representative sites with a high potential to contribute polluted stormwater runoff to the storm drain system and receiving streams. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transport-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.

The hotspots examined in the field were located within the Lower Tankerhoosen River, Walker Reservoir, Clarks Brook, and Gages Brook subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including three industrial sites, one commercial site, one transportation-related site, and one state/municipal site. Sites are identified by the watershed abbreviation, followed by "HSI" and a numeric identifier. Table 3-5 summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.



Site ID (Watershed)	Land Use Category	Description of Site Operations
GB-HSI-01 (Gages Brook)	Industrial	Industrial Park - Gerber Technologies Office Building
GB-HSI-02 (Gages Brook)	Industrial	Dari Farms Ice Cream Distribution Center
WR-HIS-01 (Walker Reservoir)	Transportation	ConnDOT Commuter Lot
CB-HIS-01 (Clarks Brook)	Commercial	Superior Energy - Propane
CB-HIS-02 (Clarks Brook)	Industrial	Sand, gravel, construction storage/processing facility
LTR-HIS-01 (Lower Tankerhoosen River)	State/Municipal	ConnDOT Maintenance and Service Center

#### Table 3-5. Hotspot Site Investigation Summary

#### Gerber Technologies Office Building

The Gerber Technologies office building is located in the Tolland Industrial on Industrial Park Road West adjacent to Gages Brook. The office building has landscaped areas around the building with shrubs and turf lawn. The site is characterized by a large amount of impervious cover, consisting of building roof areas and parking lots. Approximately 100 vehicles were parked in the employee parking lots at the time of the inspection. Stormwater runoff from the site appears to discharge to the stormwater basin located near the southern limit of the site. The stormwater basin is a wet pond design containing a permanent pool of water and is approximately 70 feet wide by 140 feet long. The basin contained accumulated sediment captured from the site runoff. The basin outfall discharges to Gages Brook via a riprap spillway.

The stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal.



Stormwater basin at the Gerber Technologies facility on Industrial Park Road West. Sediment has built up near the center of the basin (A) and its overflow spillway is overgrown with vegetation (B).



#### Dari Farms Ice Cream Distribution Facility

The Dari Farms distribution facility is also located in the Tolland Industrial Park on Research Way/Gerber Drive near the divide between the Gages Brook and Gages Brook South Tributary subwatersheds. The facility is estimated to be less than 5 years old, as evidenced by the facility's modern pollution prevention site design elements including a covered fueling station, no visible outdoor storage of materials, and well maintained landscaping on the grounds. Possible pollution sources to the storm drainage



The Dari Farms Ice Cream Distribution Facility has a covered fueling station and landscaped grounds (shown in the foreground).

system are the runoff from the large impervious areas on the site (the roof and parking areas) and potential vehicle fluids from truck fueling activities and employee vehicles. It could not be determined whether stormwater is managed on-site, by the downgradient stormwater basin near the Gerber Technologies facility, or both. The site did not appear to incorporate Low Impact Development (LID) design features such as vegetated swales or parking lot bioretention. New commercial and industrial facilities with significant impervious area, such as this one, are potential candidates for on-site LID and stormwater treatment practices to reduce runoff volume and pollutant loads.

#### **ConnDOT Commuter Parking Lot**

The hotspot investigation included the Connecticut Department of Transportation commuter parking lot at exit 67 of Interstate-84, which is located in the Walker Reservoir subwatershed.

Approximately 150 vehicles were parked at the lot during the site visit, which occurred on a weekday during mid-day. The site is contains significant impervious cover and high-intensity vehicle usage and is therefore a source of automobile-related stormwater pollutants including hydrocarbons, sediment, and metals. The entire parking lot drains to a double catch basin located on the southeastern side of the lot. The catch basin discharges through a short



The southeastern side of the Interstate 86 Exit 67 commuter parking lot showing the edge of the lot on the left side of the photograph and the wetland corridor on the right side. The center of the photograph shows the easily accessible and open area for a potential stormwater retrofit.

wetland corridor and subsequently to the stream segment located upstream of Reservoir Road and Walker Reservoir East. An easily accessible grass strip exists between the paved lot and the adjacent wetland and stream corridor. This site is a potential stormwater retrofit candidate (bioretention or water quality swale) to encourage infiltration and provide additional treatment for the parking lot runoff.



#### **Superior Energy**

Superior Energy is a propane gas and related equipment distributor located on Hartford Turnpike (Route 30) in Vernon. The site is located within the Clarks Brook subwatershed near the headwaters of Clarks Brook. The property consists of a retail store, a paved parking lot for delivery trucks, and outdoor storage of propane tanks. It is unknown if vehicle maintenance or fueling occurs on-site. The site appears to have been modified in the past through grading/filling based on an inspection of the existing site drainage and discussions with facility personnel. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.

#### Sand & Gravel Facility

The facility is located on Člark Road at the western end of Industrial Park Road and near the western limit of the Clarks Brook subwatershed. Facility operations appear to include storage and processing of sand, gravel and other construction materials. The site contains one building, which is assumed to be an office and/or maintenance area. The majority of the site consists of an unpaved yard used for the storage of sand and gravel piles and equipment to process the materials and load transport vehicles. The site contains numerous potential sources of sediment and other pollutants associated with the sand and gravel stockpiles, heavy equipment and vehicles, waste construction materials stored outdoors, and pipes and debris in the yard. Sand and gravel operations such as this should employ stormwater pollution prevention practices and source controls as required by the DEP *General Permit for Stormwater Discharges Associated with Industrial Activity*, in addition to stormwater treatment practices to reduce sediment and hydrocarbon loadings in site stormwater runoff.

#### **DOT Maintenance Service Center**

The State of Connecticut operates a Department of **Transportation Maintenance** Service Center for District #1 located on Campbell Avenue in Vernon, which is located in the Lower Tankerhoosen River subwatershed. The facility has an office building, garages for vehicle storage and maintenance, a small parking lot, outdoor storage of sand, salt, gravel and mulch, and an uncovered outdoor fueling station. Vehicle maintenance activities and outdoor vehicle fueling are



outdoor vehicle fueling are *ConnDOT District #1 Maintenance Service Center, Campbell Avenue* potential sources of stormwater pollution, in addition to the outdoor stockpile storage.



A rolloff dumpster was observed to be overflowing and uncovered at the time of the windshield survey. Municipal and state-operated highway maintenance facilities such as this should employ source controls, pollution prevention, and stormwater treatment practices as necessary in accordance with the DEP *General Permit for Stormwater Discharges Associated with Industrial Activity*.

## 3.3.2 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods and future residential development in the watershed is an important consideration for this study, since approximately 40 percent of the Tankerhoosen River watershed consists of residential land use and future buildout of the watershed could result in conversion of an additional 10 percent of the watershed to residential land use. Neighborhood source assessments were conducted on July 16, 2008 to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that contribute to stormwater quality were assessed by considering the following source areas for "average" neighborhoods throughout the subwatershed:

- Yards and Lawns
- Driveways, Sidewalks, and Curbs
- Rooftops
- Common Areas

Neighborhoods were selected for assessment based on their proximity to stream corridors and their overall potential to contribute pollutants to the stream. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments and condos). One field sheet was completed for each neighborhood assessed. The selected neighborhoods are located in the Tucker Brook, Lower Tankerhoosen River, Clarks Brook, Walker Reservoir, and Gages Brook subwatersheds, as summarized in Table 3-6.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on easily observable features such as lawn care practices, drainage patterns, oil stains, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.



Neighborhood/ Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Mount Vernon Apartments	Walker Reservoir	Multi-family	Moderate	Moderate
Campbell Avenue	Lower Tankerhoosen River	High-density, single-family	Moderate	Low
Valley View Drive/Andrew Way	Gages Brook	Medium-density, single-family	None	Low
High Manor Mobile Home Park	Clarks Brook	High-density, single-family	Moderate	Moderate
Meadowbrook Drive	Tucker Brook	Medium-density, single-family with open space areas	None	Low

Table 3-6. Neighborhood Source Assessments Conducted in the
Tankerhoosen River Watershed

#### Mount Vernon Apartments

The Mount Vernon apartments are a 33-acre multi-family housing complex situated between Hartford Turnpike (Route 30) and Interstate 84 in the Walker Reservoir subwatershed. The apartments are served by outdoor surface parking lots in front of each building. Site imperviousness is estimated at approximately 50 percent. Runoff downspouts are connected directly to the site stormwater drainage system, and parking areas are served by traditional curb and gutter drainage. The complex is generally well-maintained, with generally clean gutters, catch basins, and parking areas. Some oil staining was observed on the pavement within individual parking stalls

The overall pollution severity is rated as moderate due to the large amount of directly connected impervious area and potential pollutant sources from parking areas. This site is a potential retrofit candidate to reduce stormwater runoff from the site, including disconnecting downspouts from the storm drainage system and redirecting them to pervious grass areas, rain barrels/cisterns, and rain gardens. Multi-family parking lots, such as the parking lots at this complex, may also be good candidates for stormwater retrofits. The following photograph depicts an existing landscaped area adjacent to the parking lot that could potentially function as a bioretention/rain garden.



The Mount Vernon apartment complex buildings showing clean and well-maintained parking areas and landscaping (A) and a landscaped area that has the potential to be used as a rain garden (B).



#### Campbell Avenue

The Campbell Avenue residential development is a 13-acre neighborhood of single family homes on approximately 1/4 acre lots. The neighborhood is located off of Dobson Avenue and is situated between Interstate 84 and the ConnDOT Maintenance Service Center to the north and Dobsonville Pond to the south. The age of the neighborhood is estimated as approximately 50 years. Almost none of the homes have a garage, and nearly all have impervious driveways connected to the street curb and gutter drainage system. No on-site or centralized stormwater management practices were observed, other than curb and gutter drainage. Most of the homes have downspouts that are directed to pervious lawn areas near the house. Landscaping practices were minimal. This type of older, high density single family residential neighborhood has limited potential for stormwater retrofits due to limited land area.

#### Valley View Drive/Andrew Way

The Valley View Drive/Andrew Way neighborhood is approximately 55 acres in size and located near the headwaters of Gages Brook. The neighborhood is approximately 25 years old and consists of single family homes occupying approximately 1-acre lots. Most of the homes have garages and a high percentage of the lots are covered by lawn (60%) and landscaped areas (20%). The subdivision is served by traditional curb and gutter drainage. No centralized stormwater management measures were observed. Approximately three quarters of



A typical lot in the Valley View Drive/Andrew Way neighborhood.

the roof downspouts are connected to adjacent pervious areas. Overall, the neighborhood was rated as having low pollution potential and limited potential for stormwater retrofits.

#### High Manor Mobile Home Park

High Manor Mobile Home Park is an approximately 28-acre neighborhood located in the Clarks Brook subwatershed, situated between Route 30 and Interstate 84. The park is believed to have been developed in the 1970s. The average lot in the neighborhood has approximately 40 percent impervious cover, including the home and driveway, 40 percent grass cover, and 20 percent landscaped area. Approximately 90 percent of the homes have roof downspouts that discharge to lawns. The streets have traditional curb and gutter drainage, and storm drain inlets were observed to be clean. No centralized



A street view of the High Manor Mobile Home Park showing turf lawns with some mature trees on the properties.

stormwater management measures were observed.



#### Meadowbrook Drive

The Meadowbrook Drive neighborhood is an approximately 100-acre residential neighborhood in the northeast corner of Manchester. The neighborhood is situated in the central portion of the Tucker Brook subwatershed, and Tucker Brook flows partially through and along the north and west sides of the development. The subdivision is estimated as approximately 10 years old, and the average lot size for the single family homes in the subdivision is approximately <sup>1</sup>/<sub>2</sub> acre. All of the homes have garages. The driveway, sidewalks and curb areas are clean and dry. A majority of the homes have roof downspouts that discharge to pervious lawn areas. The street storm drains are stenciled. An approximately 1-acre wet stormwater basin near the corner of Yale and Chatham Drives receives runoff from the subdivision storm drainage system. The basin outlet discharges to Tucker Brook. At the time of the inspection the stormwater basin outlet was observed to be overgrown with vegetation, and stream bank erosion was observed at the outfall to the stream. The basin appears to be in need of regular maintenance. Buffer encroachment, stream crossings, residential drain outfalls, and yard waste dumping were common in residential areas along the stream corridors in this subdivision.



Typical conditions in the Meadowbrook Drive neighborhood showing landscaping, lot sizes, and general cleanliness.

## 3.3.3 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be assessed to determine if existing maintenance practice could reduce pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted on July 16, 2008. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. Findings of the street and storm drain assessment are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as Table 3-7.



Location	Storm	Drains	Streets
Campbell Avenue			
Mount Vernon Apartments			
Valley View Drive/Andrew Way			
High Manor Mobile Home Park			
Gerber Technologies			
Clark Road Industrial Park			[No photo]

## Table 3-7. Streets and Storm Drain Assessment Photographs



Most of the streets were clean, free of sediment and debris, and in good condition. The one exception is Industrial Park Road in the Clark Road Industrial Park where roads were observed to be in poor condition (cracked, broken, and sediment accumulation). Storm drains along Industrial Park Road were also partially obstructed with sediment, leaves, trash, and one of the catch basins had standing water above the elevation of the stream water surface, indicating blockage of the outlet pipe. Many of the inspected catch basins had varying degrees of sediment accumulation and nearly all could benefit from increased clean-out and street sweeping. With the exception of the Meadowbrook Drive subdivision in the Tucker Brook subwatershed, none of the storm drains observed during the field assessments was stenciled.



## 4 Land Use Regulatory Review

## 4.1 Introduction

Municipal land use regulations control patterns of new development and redevelopment and can play a significant role in protecting water quality and other natural resources in a watershed. These commonly include local plans of conservation and development, zoning regulations, subdivision regulations, inland wetland regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by town within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors.

A key element in the development of a Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to strengthen existing land use controls and better protect natural resources within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl.

An opportunity exists for the watershed towns to develop revised and/or new regulatory mechanisms to satisfy Phase II stormwater requirements, while also protecting water quality and other natural resources in the Tankerhoosen River watershed consistent with the objectives of this plan.

This section summarizes the following information:

- Existing municipal land use planning entities and regulations for each of the watershed communities based on information obtained from a land use questionnaire conducted by the North Central Conservation District in 2005 as part of the *Hockanum River State of the Watershed Report* (Fuss & O'Neill, 2005). The information was updated where necessary to reflect current conditions.
- Existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the local land use regulations. The regulatory review was performed for the towns of Tolland and Vernon because they comprise the majority of the land area in the Tankerhoosen River watershed



and have the greatest potential for future development. Findings of the regulatory review are described in the report *Watershed Field Inventories and Land Use Regulatory Review* (Fuss & O'Neill, October 2008), as well as a technical memorandum dated June 9, 2008 for the Town of Vernon, a copy of which is provided in Appendix B of this watershed management plan.

## 4.2 Summary of Land Use Planning Entities

The 2005 land use questionnaire provided information from the watershed municipalities on the land use regulations in each town, including information on wetlands and watercourses regulations, zoning regulations, plans of development, open space planning, and stormwater regulations. The following paragraphs summarize information obtained from the questionnaire, which was updated to reflect current conditions as of October 2008.

Local land use regulations are administered by various Town commissions, boards, and agencies. Land use commissions in the Tankerhoosen River watershed communities are summarized in Table 4-1.

Town	Land Use Commissions
	Planning and Zoning Commission (acts as Inland Wetlands and
Manchester	Watercourses Agency)
	Conservation Commission
	<ul> <li>Planning and Zoning Commission</li> </ul>
	<ul> <li>Inland Wetlands Commission</li> </ul>
Vernon	Conservation Commission
	<ul> <li>Design Review Advisory Commission</li> </ul>
	Open Space Task Force
	<ul> <li>Local Historic Properties Commission</li> </ul>
	<ul> <li>Planning and Zoning Commission</li> </ul>
Tolland	<ul> <li>Inland Wetlands and Watercourses Commission</li> </ul>
TUIIATIU	Conservation Commission
	Design Advisory Board
	Planning and Zoning Commission
Bolton	Inland Wetlands Commission
	Conservation Commission
	Open Space Preservation, Acquisition, and Conservation     Committee
	Commutee

#### Table 4-1. Tankerhoosen River Watershed Land Use Commissions

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

Table 4-2 summarizes the current plan of development, subdivision, inland wetlands, zoning, floodplain management, and stormwater regulations for the watershed towns. The table lists the last revision date for the applicable land use regulations.



Regulation	Manchester	Vernon	Tolland	Bolton
Plan of Development	2004	2001	1999	1990
Subdivision Regulations	2005	2007	2008	2004
Wetlands Regulations	2007	2006	2007	2006
Zoning Regulations	2008	2009	2008	2005
Floodplain Management	1994	In Zoning Regs.	None	2005
Stormwater Regulations	Connecticut Stormwater Quality Manual	In Zoning Regs.	2008 (LID)	2004

#### Table 4-2. Municipal Land Use Regulations

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

#### Inland Wetlands & Watercourses

Regulating activity with the potential to affect wetlands and watercourses is an essential component in preserving or improving the water quality and overall health of the Tankerhoosen River. In Connecticut, the Inland Wetlands and Watercourses Act requires that each municipality establish an Inland Wetlands and Watercourses Agency or Commission and local regulations regulating private and municipal work located in or affecting wetlands or watercourses.

Each of the surveyed watershed towns has an inland wetlands agency, and each town has defined an upland review area, or distance from wetlands and watercourses that is subject to review. Three of the four watershed towns indicated that they have identified wetlands or watercourses that are impaired or that require restoration or require special protection. Table 4-3 summarizes the regulating agencies, upland review areas, and identified wetlands and watercourses of special significance for the surveyed watershed towns.

Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance
Manchester	Planning & Zoning Commission	50' wetlands and watercourses	None identified
Vernon	Inland Wetlands & Watercourses Agency	100' wetlands 200' designated watercourses	<ul> <li>Vernal pools on Box Mountain Road</li> <li>Tankerhoosen River</li> <li>Hockanum River</li> <li>Belding Wildlife Management Area</li> </ul>
Tolland	Inland Wetlands & Watercourses Commission	50' wetlands 100' watercourses	Preliminary*
Bolton	Inland Wetlands Commission, Conservation Commission	100' wetlands and watercourses	Yes*

Table 4.0	Indiana d	Matlende	ار مر م		Desidentieses
Table 4-3.	iniand	wettands	and	watercourses	Regulations

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005. \*Information available from the individual towns; amended in 2008.



**Stormwater Management and Soil Erosion and Sediment Control** Development of the landscape with impervious surfaces can alter the hydrology of a watershed and has the potential to adversely affect water quality and aquatic habitat. As a result of development, vegetated and forested land that consists of pervious surfaces is largely replaced by land uses with impervious surfaces. This transformation increases the amount of stormwater runoff from a site, decreases infiltration and groundwater recharge, and alters natural drainage patterns. Natural pollutant removal mechanisms provided by on-site vegetation and soils have less opportunity to remove pollutants from stormwater runoff. During construction, soils are also exposed to rainfall, which increases the potential for erosion and sedimentation. Development can also introduce new sources of pollutants from everyday activities associated with residential, commercial, and industrial land uses.

Stormwater runoff both during construction and following completion of construction for new development and redevelopment projects is regulated at the local and state levels. All of the watershed towns have erosion and sediment control regulations as mandated by the Soil Erosion and Sediment Control Act. Most Connecticut municipalities have adopted regulations requiring that a soil erosion and sediment control plan be submitted with any application for development within the municipality when the disturbed area of such development is more than one-half acre. Projects that disturb greater than 5 acres of land are subject to regulation under the DEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This permit applies to discharges of stormwater and dewatering wastewaters from construction activities including, but not limited to, clearing, grading, and excavation that result in the disturbance of 5 or more acres of total land area on a site. Pursuant to Phase II of the NPDES Stormwater Program, construction activities disturbing between 1 and 5 acres have been delegated by DEP to the municipalities provided that the erosion and sediment control plan is reviewed and receives approval from the town, under the Soil Erosion and Sedimentation Control Act.

Post-construction stormwater quantity and quality are also regulated by the watershed municipalities through municipal planning and zoning and inland wetlands and watercourses regulations. All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems* (MS4 General Permit). The MS4 General Permit regulates the quality of municipal stormwater discharges and requires the creation of a Stormwater Management Plan that addresses the following six minimum control measures:

- 1. Public education and outreach on storm water impacts required throughout the entire municipality;
- 2. Public involvement/participation required throughout the entire municipality;
- 3. Illicit discharge detection and elimination required throughout the entire municipality including mapping all storm water discharges from a pipe or conduit with a diameter of 15 inches or greater (or equivalent cross-sectional area) owned or operated by the municipality;
- 4. Construction site storm water runoff control required throughout the entire municipality;



- 5. Post-construction storm water management in new development and redevelopment; and
- 6. Pollution prevention/good housekeeping for municipal operations.

The DEP *Connecticut Stormwater Quality Manual* provides guidance on the measures necessary to protect the waters of the State of Connecticut from the adverse impacts of post-construction stormwater runoff. It is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management in Connecticut. The manual provides uniform guidance for developers, engineers, and review agencies on the selection, design, and application of stormwater control measures. All of the watershed towns in the Tankerhoosen River watershed have indicated that they use the stormwater manual in reviewing development proposals for stormwater management issues.

In February 2008, the Town of Tolland amended its zoning and subdivision regulations to require that Low Impact Development (LID) techniques be implemented on all development to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and nonpoint sources of stormwater due to land development projects. Tolland also developed a companion LID design manual.

#### **Open Space**

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds.

While approximately 40 percent of the Tankerhoosen River watershed consists of undeveloped land uses, much of this land is not considered open space because it may be privately owned and ultimately developed. Protected open space areas include deeded open space that is privately owned, parcels owned by land trusts, state and federally-owned land, land owned by water companies, and municipal park land. Such land is protected against future development. Each of the watershed towns has prepared an open space plan for their respective communities (Table 4-4).

Town	Open Space Plan
Manchester	2004
Vernon	2005
Tolland	2006
Bolton	2004

#### Table 4-4. Status of Municipal Open Space Plans in the Tankerhoosen River Watershed

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

In addition to the designation of protected open space through donation, purchase of land by a town, conservation or land trusts, or other private and/or public agencies, towns also require that some land be dedicated as open space with the development of



new subdivisions. The subdivision regulations of all of the towns in the Tankerhoosen River watershed require the set aside of a percentage of new subdivisions as open space, and all but Manchester have provisions for fee-in-lieu-of open space. Table 4-5 summarizes responses from the surveyed watershed communities regarding their current open space regulations.

A majority of the surveyed watershed towns also allow "cluster development" and "open space subdivisions" in their subdivision regulations. These are compact forms of development that concentrate density in one portion of the site in exchange for reduced density elsewhere, thereby reducing overall site imperviousness and associated stormwater impacts and potentially avoiding development in sensitive areas of a site.

	Allow Cluster	Allow Open	Subdivision Open Space							
Town	Development	Space Subdivisions	Required	Fee in lieu of						
Manchester	Yes	No	Yes, 6%	No						
Vernon	Yes	No	Yes	Yes						
Tolland	Yes	Yes	Yes, 10%	Yes						
Bolton	Yes	Yes	Yes	Yes						

#### Table 4-5. Open Space Regulations

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005; amended in 2008.

## 4.3 Summary of Existing Regulations

The following policy, regulatory and planning documents were reviewed for the towns of Vernon and Tolland relative to stormwater management and natural resource protection:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development/Open Space Plan.

## 4.3.1 Town of Vernon

The Town of Vernon has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.



This section contains preliminary recommendations for the town of Vernon based on the review of the existing land use regulations and planning documents. The recommendations in this section are a summary of the more detailed regulatory review, which is provided in the technical memorandum dated June 9, 2008 (Appendix B).

#### **Town Design Manual**

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the DEP Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

#### Stormwater Management Standards

Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance. Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included with the memorandum in Appendix B.

#### New or Modified Stormwater Regulations

 Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified –1) a new stand-



alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.

- Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
  - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
  - Which projects and activities will the new ordinance apply to (i.e., applicability)?
  - How will applications be received and reviewed?
  - Who will be responsible for inspections and enforcement?
  - Will additional staff be required to handle the increased workload to review and process applications?

## 4.3.2 Town of Tolland

#### **Zoning and Subdivision Regulations**

The Town of Tolland amended its zoning and subdivision regulations to:

- 1. Incorporate Low Impact Development (LID) principles. The Town also developed a companion LID Design Manual that provides recommendations for site design, road design, and stormwater management.
- 2. Create a natural Resource and Wildlife Protection Overlay Zone around sensitive habitat areas and steep slopes throughout the town.
- 3. Adopt density-based zoning to replace the minimum lot size requirements.

Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.

#### Inland Wetlands and Watercourses Regulations

The Inland Wetlands and Watercourses regulations were amended in 2007, and are in accordance with the Connecticut General Statues. The regulations define an Upland Review Area extending a minimum 50 feet from the edge of a wetlands and/or watercourse and a extending a minimum of one hundred 100 feet from any watercourse, including intermittent watercourses. The width of the Upland Review Area may be doubled in cases where the slopes bordering the wetland and/or watercourse are in excess of 15%, the presence of highly erodible soils, or unique and/or easily damaged wetland ecosystems exist.



Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the DEP *Connecticut Stormwater Quality Manual*, as amended. The Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to promote the use of LID.

The town should also consider incorporating more explicit watercourse buffer recommendations, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations. Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

#### Plan of Conservation and Development

The Tolland Planning & Zoning Commission is in the process of updating the 1999 Plan of Conservation & Development (POCD) in accordance with the Connecticut General Statutes which requires the plan to be updated every ten years. The plan will establish a common vision for the future of the community and determine policies that will help attain that vision. The plan will address a range of themes, including natural resources, open space, utility infrastructure, and community development.

The Town's planning consultant has prepared draft recommendations related to conservation issues as part of the POCD update process. The recommendations address surface and groundwater quality, important habitat areas, drainage issues, green infrastructure, and open space protection. Some of the key recommendations for natural resource protection that also apply within the Tankerhoosen River watershed include (Planimetrics, 2008):

- Future development should occur in a manner and in locations that are environmentally sustainable.
- Impacts from existing development should be minimized through education, incentives, and town leadership.

#### **Open Space and Conservation Plan**

The 2006 Tolland Open Space and Conservation Plan inventoried natural resources throughout the town, including wetlands, rivers and streams, lakes and ponds, vernal pools, water supply watersheds, forest resources, and wildlife resources. In addition to the Open Space and Conservation Plan, the town has also completed or is implementing the following open space preservation activities (Planimetrics, 2008):

- Establishing an Open Space Acquisition Fund.
- Setting up a structured process for open space procurement and management.
- Promoting the use of open space, with trail maps and programmed activities.
- Tapping into a volunteer group for maintenance (Tolland Conservation Corps).



## **5 Watershed Goals and Objectives**

This section presents the overall management goals for the watershed, specific objectives and indicators to measure progress in achieving the objectives, and recommended management strategies. The goals, objectives, and management strategies presented in this section were developed in conjunction with the Technical Advisory Committee based upon the results of the watershed inventory and evaluation phases of the project.

## 5.1 Watershed Management Goals

The watershed management goals for the Tankerhoosen River watershed are summarized below. The first two goals listed below reflect the overall goals for managing the Tankerhoosen River, while the latter two reflect protection/preservation and restoration goals, respectively.

- Develop an affordable and effective watershed management plan that can be implemented by the watershed municipalities, residents, and other stakeholders.
- Maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries, which is essential to the economic wellbeing, environmental and public health, recreational opportunities, and quality of life for the residents, local governments, and visitors of the Tankerhoosen River watershed.
- Protect the upper region of the Tankerhoosen River watershed, including highquality headwater streams that sustain significant natural resources such as the Belding Wild Trout Management Area, from existing pollutant sources and future threats related to new development and redevelopment.
- Restore and enhance the water quality and ecological health of impacted portions of the Tankerhoosen River and its tributaries to support designated uses for fish and wildlife habitat and recreational use.

## 5.2 Watershed Management Objectives and Strategies

Specific objectives and recommended management strategies to achieve the watershed management goals are described below. Additional details of the recommended management strategies, including implementation priority, schedule, costs, funding sources, and implementation responsibilities, are presented in Section 6 of this plan.



#### Objective 1. Establish a sustainable coalition of partners to take a leadership role in implementing the Tankerhoosen River Watershed Management Plan, and encourage intermunicipal coordination in managing water quality and habitat issues in the watershed through this coalition.

#### Management Strategies

- Maintain the existing Technical Advisory Committee but shift its responsibilities from planning to implementation.
- Include representatives from each of the watershed municipalities (Vernon, Tolland, Manchester, and Bolton), the Connecticut Department of Environmental Protection, and possibly new members to fill in missing expertise.
- This group would form the core of a watershed partnership or coalition specifically for implementing the Tankerhoosen River Watershed Management Plan. The coalition would take the lead on implementing specific action items identified in the watershed plan, including:
  - o Identify funding opportunities for grants or other financial assistance,
  - Periodically review and update action items in the plan (at least every 5 years),
  - o Develop annual work plans (i.e., specific "to-do" lists),
  - Host annual public meetings to celebrate accomplishments, recognize participants, review lessons learned, and solicit feedback on plan updates and next steps.
- Encourage adoption of the watershed plan by the watershed municipalities.
- Identify funding sources and prepare and submit grant applications for projects identified in the watershed plan.

# Objective 2. Enhance in-stream and riparian habitat along the river and its tributaries to sustain a diversity of aquatic life.

- Conduct a fish passage assessment to refine the understanding of fish passage barriers throughout the watershed and opportunities for restoring fish passage and aquatic habitat for various parts of the river system.
- Revise local storm drainage design standards and regulations such that new or modified stream crossings are designed consistent with the Connecticut DEP Stream Crossing Guidelines (February 26, 2008).
- Investigate the feasibility of dam removal, including the implications of release
  of contaminated sediments behind the dams. Consider the impacts of dams
  beyond barriers to anadromous fish passage and fragmentation of resident fish
  populations. Dams affect water quality and particularly coldwater habitat.
  Accompany dam removal feasibility studies with assessments of fish passage at
  culverts upstream and downstream of the dams.
- Implement priority stream bank stabilization projects identified during the watershed field inventories.



## Objective 3. Protect existing and restore degraded vegetative and riparian buffers.

#### Management Strategies

- Implement priority buffer reforestation and invasive species management projects identified during the watershed field inventories.
- Pending passage of enabling legislation by the Connecticut state legislature, adopt riparian buffer protection regulations that would establish a contiguous buffer strip on either side of the river such that it remains in a natural, undisturbed state.
- Tolland should consider incorporating more explicit watercourse buffer protection, including minimum buffer widths, similar to the watercourse buffer recommendations in the Town of Vernon Inland Wetlands and Watercourses Regulations.
  - Vernon should adopt LID regulations, which include site design credits or other similar incentives for developers to restore or establish vegetative buffers as part of site development.
  - Partner with the Connecticut Department of Transportation on state roadway projects in the watershed to request Transportation Equity Enhancement funding available for habitat/ecological restoration projects under SAFTEA-LU).
  - o Educate developers, town staff, and the public.

# Objective 4. Improve water quality by identifying and eliminating illicit discharges and encouraging stream cleanups.

- Follow-up with recommended discharge investigations (by the responsible municipality) identified during the watershed field inventories.
- Ensure that illicit discharge detection and elimination (IDDE) efforts of the watershed municipalities (required by the MS4 General Permit) include their respective areas of the Tankerhoosen River watershed.
- Ensure that the watershed municipalities implement IDDE programs as required by the MS4 General Permit, including an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the regulated municipal separate storm sewer system and an IDDE Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.
- Implement priority stream cleanup projects identified during the watershed field inventories.
- Educate town staff and the public.



#### Objective 5. Build awareness of land stewardship and management practices and reduce nonpoint source impacts in residential areas.

Management Strategies

- Increase watershed stewardship signage (watershed, stream, stormwater pollution prevention, and storm drain markings).
- Encourage disconnection of rooftop runoff from the storm drainage system to reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.
- Tailor education efforts to the types of pollution producing behaviors observed in residential neighborhoods throughout the watershed (buffer encroachments, yard waste, piped discharges, septic system maintenance for unsewered areas, etc.).
- Encourage the creation of backyard habitat in residential areas that abut the Tankerhoosen River and its tributaries and recognize efforts of the public.

#### Objective 6. Advance local government and community business awareness of the Tankerhoosen River through pollution prevention education and watershed restoration outreach activities.

- The watershed municipalities should review the current compliance of their municipal facilities in the watershed with pollution prevention best management practices and applicable regulatory programs. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations. Recognize examples of good practices and hold them up as models.
- The watershed municipalities should improve implementation of municipal stormwater management programs during the second term of the MS4 General Permit.
- Create a general brochure and presentation to inform businesses about pollution prevention. Conduct compliance assistance outreach (e.g., visits, group training, and/or printed materials) for specific types of businesses in the watershed (e.g., light industry, offices, commercial retail centers, restaurants).
  - Create educational displays in highly visible, strategic locations throughout the watershed to highlight water quality and habitat amenities, and to reinforce the watershed protection efforts in the watershed.
  - Increase watershed stewardship signage (watershed, stream, stormwater pollution prevention, and storm drain markings).



#### Objective 7. Implement an ongoing water quality and biological monitoring program to assess the effectiveness of implementation efforts and build upon the existing water quality database to guide future decision making.

#### Management Strategies

- Establish a long-term water quality and biological monitoring program building upon previous baseline monitoring and ongoing DEP and volunteer monitoring efforts.
- Conduct a field monitoring study of the effectiveness of new LID practices (pervious pavement, rain gardens, etc.) in the watershed. The study could be used as a demonstration project to highlight a "local, real-world" example of LID stormwater design.

#### Objective 8. Manage, maintain, and promote existing open space and continue to acquire open space that meets resource protection and recreational goals within the watershed.

- Continue efforts to acquire unprotected open space, with priority given to the headwater subwatersheds (Gages Brook, Gages Brook South Tributary, Walker Reservoir, Upper Tankerhoosen River, Railroad Brook, and Bolton Notch Pond), riparian areas, and contiguous unfragmented parcels of open space.
- Implement existing municipal Open Space Plans and update the plans at least once every 5 years. Endorse the remaining priority open space in the watershed as high priority open space conservation areas in the municipal Open Space Plans and Plans of Conservation and Development.
- Seek alternative funding sources and approaches for open space acquisition such as state grants, limited market rate development on a parcel to help fund the acquisition of the remainder of the parcel as open space, transferring development rights from sensitive locations to locations better suited for development.
- Create watershed-wide trail maps and promote the use of existing open space by publicizing trail maps and events on open space parcels.
- Develop an invasive species management plan for the watershed, including prevention and education efforts to preempt arrivals, early detection and citizen monitoring efforts, rapid response measures for successful eradication, and when a species cannot be eradicated, continued control efforts that are necessary to minimize ecological and economic impacts.



#### Objective 9. Mitigate the negative impacts of stormwater runoff on hydrology and water quality through the use of Low Impact Development, sustainable design, and other stateof-the-art stormwater management practices.

#### Management Strategies (Regulatory)

- All municipalities in the watershed are subject to the NPDES Phase II requirements, including adoption of a local regulatory mechanism to control construction and post-construction runoff from new development and redevelopment projects.
- Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town of Tolland should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.
- The Tolland Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations.
- Vernon should develop and implement new or revised stormwater/LID regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects, and 3) address other local drainage and natural resource protection issues identified by the Town.
  - Two potential approaches have been identified 1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
  - Vernon should form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon.
  - Vernon should develop a Town stormwater and LID design manual, incorporating a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater regulations.
- Other amendments to the Vernon Subdivision, Zoning, and Inland Wetlands regulations are recommended to achieve reductions in impervious cover and to promote the use of LID practices (see Vernon Land Use Regulatory Review recommendations, Appendix B).
- Manchester and Bolton should also consider adopting LID design guidance and regulations or similar regulatory mechanism that satisfies the NPDES Phase II requirements and promotes or requires the use of LID design practices.
- All of the watershed communities should consider updating their zoning regulations to require a zoning permit/drainage review for land clearing activities less than ½ acre and minimize land clearing by regulating building envelope or through the use of an LID credit system.



### Management Strategies (Structural)

- Install priority stormwater retrofits (municipal, state, and private outfalls and/or sites) for water quality improvements based on watershed field inventory recommendations.
- Watershed towns should incorporate LID into town projects, including roadway work using emerging LID/Green Roads principles. The Town of Tolland should take a leadership role by incorporating LID into a high-profile demonstration project at a publicly-owned facility. The site should be regularly monitored and actively used for educational purposes.
- Education for developers, town staff, and the public.

## Objective 10. Conduct additional assessment in non-priority subwatersheds.

#### Management Strategies

 Not all of the Tankerhoosen River subwatersheds and/or stream reaches were assessed during the development of this watershed management plan. Therefore, the remaining subwatersheds (Railroad Brook, Bolton Notch Pond, and the Upper Tankerhoosen River) and stream reaches should be assessed over the next two years to identify additional site-specific issues and restoration projects.



## **6 Watershed Management Recommendations**

This section of the plan describes specific recommendations to meet the watershed management goals and objectives outlined in Section 5. The recommendations include watershed-wide recommendations that can be implemented throughout the Tankerhoosen River watershed, targeted recommendations that are tailored to issues within specific subwatersheds or areas, and site-specific recommendations to address issues at selected sites that were identified during the watershed field inventories.

The recommendations presented in this section are classified according to their implementation priority. Recommendations can be viewed as short-term, mid-term, and long-term, as summarized below:

- Short-Term Recommendations are initial actions to be accomplished within the first one to two years of plan implementation. These actions establish the framework for implementing subsequent plan recommendations. Such actions include development of local regulations and stormwater design guidance, discharge investigations, education program planning, and field inventories within previously unassessed subwatersheds. Small demonstration restoration projects could be completed during this phase, however construction of larger retrofit practices and stream restoration projects requiring extensive design, engineering, and permitting should be planned for later implementation.
- Mid-Term Recommendations involve continued programmatic and operational measures, delivery of educational and outreach materials, and construction of one or two larger retrofit and/or stream restoration projects over the next two to four years. Progress on land conservation, LID implementation, and discharge investigation follow-up activities should be completed during this period, as well as project monitoring and tracking.
- Long-Term Recommendations consist of continued implementation of any additional projects necessary to meet watershed objectives, as well as an evaluation of progress, accounting of successes and lessons learned, and an update of the watershed management plan. Long-term recommendations are intended to be completed during the next 5- to 10-year timeframe and beyond.

Table 6-1 summarizes the management recommendations for the Tankerhoosen River watershed based upon the management objectives identified in the previous section. The recommendations are organized by implementation priority (short-, mid-, and long-term), scale and location (watershed, targeted, or site-specific), and the groups who are responsible for implementing the recommendations. The remainder of this section presents detailed plan recommendations, including implementation priority, schedule, anticipated benefits, potential costs, funding sources, implementation responsibilities, and an evaluation framework to measure the progress and of plan implementation.



					Who	Shoul	ed (L =	L = lead, A = assist)						
Key Actions	Priority	Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	CTDEP	NRCS	USEPA	Citizens/Volunteers
Objective 1. Build a Foundation for Implementing the Plan														
Form sustainable partnership or coalition	S	W	А	L			А	А	А		А			
Adopt watershed management plan	S	W	L		А									
Identify potential funding sources and submit grant applications	S	W	L		L	А	А	Α	А	А	Α	Α		
Objective 2. Enhance In-Stream and Riparian Habitat														
Conduct fish passage assessments	S	Т	А		L		А	А						
Revise local stream crossing & stormwater design standards	S	W	L											
Belding Pond Dam removal feasibility evaluation	S	Т			Α						А	L		
Conduct aquatic invasive species study	S	S	А		L									
Priority stream restoration projects		S	Α		L							Α		
Objective 3. Protect/Restore Riparian Buffers														_
Priority riparian buffer restoration projects	M/L	S	А		L	А			Α			Α		
Adopt stream buffer regulations, pending enabling legislation	Μ	W	L											
Revise riparian buffer recommendations (Tolland)		W	L											
Incorporate invasive species management measures		Т			L			Α	А		Α			
Objective 4. Identify and Eliminate Illicit Discharges														
Targeted illicit discharge investigations	S	Т	L		А		А							
Implement municipal IDDE programs	Μ	W	L											
Priority stream cleanup efforts	S	S			L			Α						А
Develop education/outreach materials	S	W			L		А				А			
Deliver education/outreach to the public	Μ	W	L				А							
Objective 5. Residential Management Practices														
Increase watershed stewardship signage in residential areas	Μ	W	L		Α		А	А						Α
Encourage disconnection of rooftop runoff	Μ	W	L		Α		Α							
Develop education/outreach materials	S	W			L		А							
Deliver education/outreach to the public		W	L				А							
Objective 6. Municipal and Business Management Practices														
Review municipal facility compliance	S	W	L											
Improve municipal stormwater management programs	S/M	W	L											
Implement street sweeping and catch basin cleaning	Μ	W	L	1	1		1	1	1	L				

#### Table 6-1. Watershed Management Plan Recommendations Summary



					Who	ed (L =	(L = lead, A = assist)							
Key Actions		Scale/Location	Watershed Towns	Friends of HRLP	Watershed Coalition	Landowners	NCCD	HRWA	Belding WMA	ConnDOT	CTDEP	NRCS	USEPA	Citizens/Volunteers
Develop education/outreach materials	S	W			L		А							
Deliver education/outreach to the public	М	W	L				А							
Increase watershed stewardship signage in commercial areas	М	W	L		Α		А	Α						А
Objective 7. Implement Water Quality Monitoring Program			-									-		
Develop and implement long-term monitoring program	S	W			L		А	А			А			А
Field monitoring study of LID effectiveness		W	Α		L		А							
Objective 8. Protect Open Space														
Priority land acquisitions	S/M	Т	L		А	Α			Α		А			
Continue to implement municipal open space plans	S	Т	L											
Seek alternative funding sources for open space acquisition	S/M	Т	L		А									
Promote use of open space through trail maps and events	S/M	Т			L			А	А					
Develop and implement invasive species management plan		Т			L			Α			А			А
Objective 9. Promote LID and Sustainable Site Design														
Monitor effectiveness of LID regulations (Tolland)	S/M	W	L											
Revise Inland Wetland regulations for consistency (Tolland)	S	W	L											
Develop and implement new stormwater/LID regulations (Vernon)	S	W	L											
Form advisory committee	S	W	L											
Develop Town stormwater/LID manual and/or guidance	S	W	L											
Update existing zoning, subdivision, wetlands regulations	S	W	L											
Priority stormwater retrofits	M/L	S	Α		L		А			А				
Incorporate LID into Town projects	М	W	L											
LID demonstration projects (green roads, public works, schools)	S	S	L		А		А							
Develop education/outreach materials	S	W			L		А				А			
Deliver education/outreach to the public	М	W	L				Α							
Objective 10. Assess Additional Subwatersheds														
Perform stream and upland assessments	S	Т			L		А	Α	Α					А

#### Table 6-1. Watershed Management Plan Recommendations Summary

Priority Abbreviations: S = short-term, M = mid-term, L = long-term HRLP – Hockanum River Linear Park, NCCD – North Central Conservation District, HRWA – Hockanum River Watershed Association, ConnDOT – Connecticut Department of Transportation, CTDEP – Connecticut Department of Environmental Protection, NRCS – Natural Resource Conservation Service, USGS – United States Geological Survey, USEPA – U.S. Environmental Protection Agency, Belding WMA – Belding Wildlife Management Area

## 6.1 Watershed-Wide Recommendations

Watershed-wide recommendations are those recommendations that can be implemented throughout the Tankerhoosen River watershed. These basic measures can be implemented in each of the watershed towns, are applicable in most areas of the watershed, and are intended to address nonpoint source pollution through municipal land use regulations, public education and outreach, open space protection, and watershed monitoring. The benefits of these measures are primarily long-term, cumulative benefits resulting from source control, pollution prevention, and improved stormwater management for new development and redevelopment projects.

# 6.1.1 Build a Foundation for Implementing the Plan

During the planning process, the Technical Advisory Committee provided direction and local knowledge of the watershed in guiding the watershed assessments, determining priorities, and developing the management plan. As the focus of the planning process moves towards implementation, the Technical Advisory Committee, under the leadership of the Friends of the Hockanum River Linear Park, should transition to a watershed partnership or coalition specifically for implementing the Tankerhoosen River Watershed Management Plan. Recommended actions include:

- Maintain the existing Technical Advisory Committee but shift its responsibilities from planning to implementation.
- Include representatives from each of the watershed municipalities (Vernon, Tolland, Manchester, and Bolton), the Connecticut Department of Environmental Protection, and possibly new members to fill in missing expertise.
- Periodically review and update action items in the plan (at least every 5 years).
- Develop annual work plans (i.e., specific "to-do" lists).
- Host annual public meetings to celebrate accomplishments, recognize participants, review lessons learned, and solicit feedback on plan updates and next steps.
- Encourage adoption of the watershed plan by the watershed municipalities. As a group, the watershed partnership or coalition should encourage formal adoption of the watershed plan by the watershed towns and develop basic guidelines and procedures for long-term membership.
- Review and prioritize potential funding sources that have been preliminarily identified in this plan (see Section 6.5.3), and prepare and submit grant applications for projects identified in the watershed plan.



# 6.1.2 Municipal Regulations and Design Guidance

The regulatory review described in Section 4 of this plan identifies areas for improvements in local land use regulations and municipal stormwater design guidance to strengthen stormwater management and resource protection throughout the watershed. More detailed recommendations that were identified for the Town of Vernon are described in the technical memorandum provided in Appendix B. Many of the detailed concepts and recommendations that are described in the Vernon land use regulatory review memorandum are also applicable to the other watershed towns.

### Town of Tolland

- 1. LID/Stormwater Regulations
  - Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town of Tolland should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.
- 2. Inland Wetlands and Watercourses Regulations
  - The Tolland Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to further promote the use of LID. Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the DEP Connecticut Stormwater Quality Manual, as amended.
  - The town should also consider incorporating more explicit watercourse buffer recommendations, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations. Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

### Town of Vernon

- 1. Town Design Manual
  - Vernon should develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the DEP Connecticut Stormwater Quality Manual to take advantage of the existing design guidance,


but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.

- The design manual should include a section that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management.
- The design manual should incorporate or reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.
- 2. Stormwater Management Standards
  - The Town should develop and incorporate into the design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance. Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the DEP *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in the memorandum in Appendix B.
- 3. New or Modified Stormwater Regulations
  - The Town of Vernon should develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified –1) a new stand-alone stormwater ordinance, or 2) addition or amendments to the existing Zoning Regulations. Both approaches are discussed in Appendix B.
  - The Town should form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:



- If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
- Which projects and activities will the new ordinance apply to (i.e., applicability)?
- How will applications be received and reviewed?
- Who will be responsible for inspections and enforcement?
- Will additional staff be required to handle the increased workload to review and process applications?
- 4. Subdivision Regulations
  - Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
  - Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
  - Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
  - Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.
  - Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
  - Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a standalone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
  - Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.



- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.
- 5. Zoning Regulations
  - Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
  - Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
  - Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.

Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

• Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.



- 6. Inland Wetlands and Watercourses Regulations
  - Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.
  - Pending passage of enabling legislation by the Connecticut state legislature, the Town should also adopt riparian buffer protection regulations that would establish requirements (as opposed to recommendations) for a contiguous buffer strip on either side of selected watercourses such that they remain in a natural, undisturbed state.

#### **Other Watershed Towns**

- Manchester and Bolton should also consider adopting LID design guidance and regulations or similar regulatory mechanism that satisfies the NPDES Phase II requirements and promotes or requires the use of LID design practices.
- All of the watershed communities should consider updating their zoning regulations to require a zoning permit/drainage review for land clearing activities less than ½ acre and minimize land clearing by regulating building envelope or through the use of an LID credit system.

## 6.1.3 Illicit Discharge Detection and Elimination

#### Municipal Illicit Discharge Programs

Illicit discharges are non-stormwater flows that discharge into the stormwater drainage system or directly into surface waters. Failing septic systems, wastewater connections to the storm drain system, and illegal dumping are among the types of illicit discharges that can occur in residential and commercial areas. Depending on the source, an illicit discharge may contain a variety of pollutants that can impact both human health and the aquatic environment. A number of potential illicit discharges were identified throughout the watershed during the stream inventories. Identifying and eliminating these discharges is an important means of pollution source control for the watershed.

All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 General Permit). The MS4 General Permit regulates the quality of discharges from municipal storm drainage systems. The program requires the towns to implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the municipal storm drainage system, as well as sanctions to ensure compliance. This includes developing an Illicit Discharge Detection and Elimination (IDDE) Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.



The MS4 General Permit is anticipated to be reissued in 2009, which represents an opportunity for the watershed towns to review their compliance status relative to the MS4 General Permit requirements, including the illicit discharge detection and elimination component.

The following recommendations apply to each of the watershed towns:

- Review the compliance status of the municipal stormwater management programs relative to each of the minimum measures addressed in the existing and proposed MS4 General Permit. Modify the stormwater management plans as necessary.
- Ensure that illicit discharge detection and elimination efforts of the watershed municipalities include their respective areas of the Tankerhoosen River watershed.
- Conduct follow-up illicit discharge investigations at priority outfall locations identified during the watershed inventories (see Site-Specific Recommendations).
- Develop and implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the regulated municipal separate storm sewer system and an IDDE Plan to detect and eliminate existing and future non-stormwater discharges, including illegal dumping.

## 6.1.4 Residential Practices

#### Watershed Stewardship Signage

Stewardship signage can be an effective way of educating the public on the importance of preserving natural resources and common ways in which they may be impacting these resources. The general public is often unaware of the cumulative effects of their every-day activities. Signage can play an important role in making the connection between every-day activities and their sometimes harmful results.

Routine residential practices that can affect water quality and the natural environment include improper disposal of trash, pet waste, yard waste, and hazardous wastes; excessive use of fertilizers and pesticides; depositing fluids and materials in storm drains; and improper management of riparian areas. Educational signage can take the form of kiosks in public areas, storm drain markers or stencils, anti-dumping signs, proper pet waste management signs, and roadside/stream side signage (examples include "adopt a stream/roadway" programs).

The watershed field inventories identified very little evidence of storm drain stenciling or watershed stewardship signage. Stormwater and pollution prevention signage is generally lacking in most residential areas of the watershed. The watershed towns, together with other local stakeholders and volunteers, should consider additional storm drain marking in residential neighborhoods, heavy pedestrian areas served by storm sewers, and municipal facilities (schools, town offices, parks, libraries, etc.).



### **Rooftop Disconnection**

Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm



Rain barrel used to capture and re-use rooftop runoff (Source: CWP, 2007).

drainage system or surface waters directly, and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

Rooftop disconnection (also referred to as "downspout or roof leader disconnection") is a cost-effective on-site option for reducing the volume and cost of stormwater that requires public management. Runoff from residential rooftops is collected by eaves troughs, which are installed along the edge of the roofline. Water collected in the eaves trough is conveyed to ground level by one or more downspouts. Downspouts may then connect directly into the storm sewer system or discharge to driveways, which in turn convey the water to the street and storm drainage system.



Rooftop disconnection has a number of economic and environmental benefits to the municipality and the homeowner. The major benefits include:

Runoff from commercial rooftops can be directed to bioretention planting beds (Source: CWP, 2007).

- Reduces volumes of flows conveyed and resulting loads to watercourses,
- Reduces the volume of flow to the municipal storm drainage system,
- Increases infiltration and groundwater recharge,
- Provides options to "recycle" rainwater.

Rooftop disconnection is ideal in neighborhoods where roof leaders are directly connected to the storm drainage system and in medium density residential areas with lot sizes in the 0.25 to 1.0 acre range (CWP, 2007). However, most residential areas that contribute rooftop runoff to the storm drainage system are potential retrofit candidates for some form of rooftop disconnection.

A variety of alternatives are available for residential and non-residential rooftop disconnections, ranging from simple disconnections to more complex delivery systems. Residential rooftop disconnection options include (Figure 6-1):



- Simple disconnection,
- Rain barrels and rain gardens,
- French drain or dry wells.

Non-residential rooftop disconnection options include (Figure 6-1):

- Simple disconnection,
- Rain gardens,
- Stormwater planters and cisterns,
- Green rooftops.



Figure 6-1. Residential and Commercial Rooftop Disconnection Retrofit Strategies (Source: CWP, 2007)

The Town of Vernon should incorporate rooftop disconnections for new development and redevelopment projects in the recommended stormwater/LID regulatory mechanism and design manual. The manual should require the use of rooftop disconnection and other LID techniques or provide incentives for their use such as an LID credit system. The manual should also include specific criteria regarding the suitability and design of various rooftop disconnection practices.

Individual rooftop retrofits target a small area, requiring the participation of many homeowners and businesses to make a measurable difference across a subwatershed. As a result, a coordinated effort is required for widespread participation in such a program, which typically includes a combination of targeted education, technical assistance, and financial subsidies to homeowners or the business community. Examples of effective local rooftop disconnection programs are presented in *Urban Stormwater Retrofit Practices* (CWP, 2007)

http://www.cwp.org/Resource Library/Center Docs/USRM/ELC USRM3.pdf.



## 6.1.5 Municipal and Business Practices

The municipal/state facilities and businesses that were observed during the field inventories exhibited examples of both good pollution prevention practices and opportunities for improvement. The watershed municipalities and ConnDOT should review the current compliance of their respective facilities (public works/maintenance facilities, parks, schools, public safety facilities, etc.) in the watershed with pollution prevention best management practices and applicable regulatory requirements. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations, many of which are also subject to stormwater pollution prevention and other similar state and federal regulatory programs (oil pollution prevention, hazardous waste, air emissions). Examples of good practices should be recognized and modeled. The proposed watershed coalition should provide guidance (e.g., visits, group training, and/or printed materials) and develop incentives to encourage local businesses to adopt these model practices. Light industry, offices, commercial retail centers, and restaurants in the watershed should be the focus of these efforts.

With the pending reissuance of the DEP MS4 General Permit, the watershed towns have an opportunity to re-evaluate and improve upon the effectiveness of their municipal stormwater management programs during the second term of the MS4 General Permit. This includes the municipal good housekeeping minimum measure contained in the General Permit. The towns should modify their stormwater management plans to include audits of pollution prevention and good housekeeping practices at their respective municipal facilities, as well as re-evaluate their municipal street sweeping, catch basin cleaning, and drainage system maintenance efforts. At a minimum, all streets in the watershed should be swept at least twice per year, with more frequent sweeping of targeted areas, as necessary and as equipment and funding allow. Vacuum-assisted sweeping has been shown to be more effective than conventional mechanical broom sweeping for removing finer particulates.

Educational signage should also be considered in commercial business areas along the major transportation corridors in the watershed, including Interstate 84, Route 30, Route 31, and other heavily-traveled local roads that cross the Tankerhoosen River and its major tributaries. Increased educational signage explaining the linkage between recreational centers in the watershed and the Tankerhoosen River is also recommended within Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park.

## 6.1.6 Education and Outreach

Nearly all source control and pollution prevention measures rely on some form of public education to change public behavior. In some cases, education efforts must be targeted at municipal officials and public works employees (e.g., stormwater ordinances, roadway deicing application, storm drainage system maintenance). The general public, including residents, business owners and operators, plays an important role in almost all of the source control and pollution prevention measures described in this plan.



Often, the public is not aware of the critical role they have in protecting water resources. Public education is an important part of an overall pollution prevention and source control program because it raises awareness of both personal responsibilities and the responsibilities of others relative to environmental protection and teaches people what individual actions they can take to prevent pollution. This increased understanding has the additional benefit of fostering support for watershed management efforts.

Public education programs can consist of a variety of elements including:

- Educational displays, pamphlets, booklets, and utility stuffers;
- Use of the media (newspapers, television, radio);
- Promotional giveaways (hats, t-shirts, bumper stickers, etc.);
- Stormwater educational materials;
- Classroom education.

The choice of outreach materials depends on the resources available and the target audience. A public education and outreach program should be designed to offer a broad discussion of stormwater and water quality issues. For maximum effectiveness, the program should target selected geographic areas or subwatersheds, audiences, and potential sources of pollution. A variety of general educational materials on stormwater and pollution prevention are available from state and federal government agencies, as well as education and industry groups.

The NPDES Phase II stormwater permitting program has generated a plethora of educational materials regarding water quality and nonpoint source pollution. A collection of educational materials is maintained by the U.S. EPA and is accessible to the public via the U.S. EPA's Nonpoint Source Outreach Toolbox (<u>http://www.epa.gov/nps/toolbox/</u>) and NPDES Stormwater Program page (<u>http://cfpub.epa.gov/npdes/home.cfm?program\_id=6</u>). The materials target various audiences including the residences, commercial businesses, and industry. Additional materials can be found at <u>www.asist.net/stormwebs.htm</u> and <u>www.stormwatereducation.com/index\_flash.html</u>.

Through implementation of their municipal stormwater programs, the watershed towns should ensure that their public participation and outreach programs focus on target audiences and areas within the Tankerhoosen River watershed. The following target audiences are recommended for watershed public education and outreach programs:

- Homeowners and renters,
- Public school system,
- Builders and residential contractors,
- Residential and commercial lawn care and landscaping professionals,
- Commercial and retail businesses.



Public education and outreach programs should target one or more of the following activities and sources of pollution:

- Illicit discharges,
- Residential downspout disconnection (rain barrels, dry wells, etc.),
- Lawn care practices,
- Yard waste disposal,
- Backyard riparian buffer practices,
- Low Impact Development for homeowners and contractors,
- Septic system maintenance,
- Construction erosion and sediment control,
- Pet waste management.

Educational displays should also be considered for highly visible, strategic locations throughout the watershed to highlight water quality and habitat amenities, and to reinforce the watershed protection efforts. Potential locations include stormwater and LID retrofit demonstration projects at schools, public parking lots, commuter parking lots, and recreational areas (see Site-Specific Recommendations).

## 6.1.7 Water Quality Monitoring Program

#### Long-Term Monitoring Program

Continued chemical and biological monitoring within the Tankerhoosen River watershed is recommended to refine the understanding of water quality impacts from potential point and non-point pollution sources in the watershed, to continue developing a water quality database for the watershed to guide environmental decisionmaking, and to measure the progress toward meeting water quality goals in the watershed. Additional funding sources should be sought to finance future monitoring efforts.

Recommended modifications to the Tankerhoosen river watershed water quality monitoring program for future monitoring events include:

- Chemical monitoring is recommended along Gages Brook immediately downstream of the industrial park to further evaluate potential dry weather impacts and possible illicit connections/discharges from facilities in the industrial park. The Town of Tolland should designate the industrial park as a focus area for its municipal stormwater management program, including outfall monitoring and illicit discharge detection and elimination efforts.
- Chemical monitoring is recommended along tributaries of the lower Tankerhoosen River (Tucker Brook and Tunnel Brook) that have not been previously monitored to provide information on pollutant contributions from developed areas within the lower Tankerhoosen River watershed.



#### LID Retrofit Demonstration Monitoring

Water quality monitoring (runoff volumes and pollutant concentrations) is recommended in conjunction with the potential LID retrofit demonstration projects that are described in the Targeted and Site-Specific Recommendations sections of this plan. Monitoring of the retrofit site(s) is recommended before and after the installation of the retrofit. Such a monitoring program could help quantify the benefits of innovative LID techniques within the Tankerhoosen River watershed, but would require a significant funding source for a comprehensive and statistically-valid "before and after" study design.

## 6.2 Targeted Recommendations

Targeted recommendations are tailored to address issues within specific subwatersheds or areas, rather than watershed-wide. Targeted recommendations also include actions to address common types of problems that were identified at representative locations throughout the watershed, but where additional studies or evaluations are required to develop site-specific recommendations. Targeted recommendations can have both short- and long-term benefits. Appendix C contains a series of subwatershed maps that depict targeted stream corridor recommendations.

## 6.2.1 Priority Parcels for Open Space Protection

As described earlier in this plan, conservation of open space is critical in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Each of the watershed towns continues to implement open space plans for their respective communities.

There are several common ways that undeveloped land can be preserved and protected as open space. These include outright purchase (fee simple), conservation easements, purchase of development rights, and land donations. Regardless of the mechanism, critical to the success of protecting open space land is having a source of funding that can be readily accessed when windows of opportunity to acquire significant parcels arise.

The open space plans of the watershed towns identify priority parcels for preservation and protection. A key goal of the Town of Vernon's Open Space Plan (Revised October 12, 2005) is to protect the Tankerhoosen River watershed and associated wildlife habitat by creating contiguous greenways within the watershed. Preservation of key parcels in the watershed will help to offset the long-term, cumulative impacts of non-point source pollution. The plan's objective is to expand the large contiguous greenway formed by Valley Falls Park, the Belding Wildlife Management Area, Bolton Lakes, and State of Connecticut preserved land in order to protect the Tankerhoosen River and its tributaries from non-point source pollution, link important wildlife habitats, enhance biodiversity, and create extensive opportunities for outdoor recreation. The open space plans of the other watershed towns also identify protection



of key natural resources and water quality, including the Tankerhoosen River and its watershed, as an important goal.

The watershed towns, working closely with other stakeholders including local land owners, should:

- Continue to implement their municipal Open Space Plans and update the plans at least once every 5 years. Endorse the remaining priority open space in the watershed as high priority open space conservation areas in the municipal Open Space Plans and Plans of Conservation and Development.
- Continue to pursue funding sources and alternative approaches for open space acquisition such as state grants, limited market rate development on a parcel to help fund the acquisition of the remainder of the parcel as open space, and transferring development rights from sensitive locations to locations better suited for development.
- Create watershed-wide trail maps and promote the use of existing open space by publicizing trail maps and events on open space parcels.

Priority should be given to larger properties that meet one or more of the following general criteria:

- Are contiguous with and would extend current greenways and riparian areas along headwater (1<sup>st</sup> or 2<sup>nd</sup> order) streams and other water bodies,
- Provide linkages between existing open space areas and linkages to existing trails,
- Provide important scenic, historic, cultural, or natural resource value,
- Protect groundwater and surface water supply sources,
- Protect other critical environmental resources.

Figure 6-2 identifies priority parcels throughout the watershed that should be targeted for open space protection. Several of these parcels, which are among Vernon's highest priority for open space protection, are also described below.

#### Tancanhoosen LLC Property

This collection of parcels comprises approximately 470 acres of land and is situated in the headwaters of the Tankerhoosen River watershed, between Walker Reservoir and the Belding Wildlife Management Area. The site is located near the Exit 67 interchange of Interstate 84 and has experienced significant development pressure. The parcel encompasses over 1.5 miles of the Tankerhoosen River that harbors a significant wild trout area. The site is characterized mostly by forested upland, and some steeply-sloped forested wetlands along the Tankerhoosen. A forested swamp and marsh area also exists on the site near Walker Reservoir. Preservation of this property would serve to offset continuing non-point source pollution pressures on the Tankerhoosen; contribute significantly to the wildlife corridor (greenway) expansion; and provide recreational value and diverse habitats including wetland aquatic habitats, stream habitats, and upland forest habitats.







The DEP has been actively pursuing purchase of this property, although funding has been delayed due to recent state budget cuts. The property remains a high priority for acquisition by the DEP, which is a key open space recommendation of this watershed management plan.

#### Talcottville Gorge Property

This area, known as Talcottville Gorge, is a largely forested, scenic area bisected by the Tankerhoosen River, generally situated between Talcottville Pond and Dobsonville Pond in the lower Tankerhoosen River watershed. The site encompasses a geologically significant gorge with steeply sloped rock outcroppings, a dam and falls, a small pond; and remains of early 19th century textile mills. The acreage also encompasses parcels on either side of Elm Hill Road, which are comprised of some wetlands and steep slopes and forested land and also bound the Rails to Trails. The nearby village area is designated a local historic district. Due to its diverse natural resource, cultural, and recreational value, this property ranks as the highest priority in the Town of Vernon's Open Space Plan.

## 6.2.2 Invasive Plant Species Management

Invasive terrestrial plant species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed during the field inventories. Management measures for control of invasive plant species should be incorporated into site-specific stream restoration activities. An invasive plant species management plan should be developed for targeted areas or subwatersheds, including the Walker Reservoir, Tucker Brook, and Gages Brook South Tributary subwatersheds. The plan could identify prevention and education efforts to preempt arrivals, early detection and citizen monitoring efforts, response measures for successful eradication, and when a species cannot be eradicated, continued control efforts that are necessary to minimize ecological and economic impacts. Information on invasive plant species planning and management can be obtained from:

- U.S. Fish and Wildlife Service: (<u>http://www.fws.gov/invasives/staffTrainingModule/planning/introduction.h</u> <u>tml</u>),
- The Connecticut Department of Environmental Protection,
- The Nature Conservancy (TNC),
- Connecticut Invasive Plant Working Group (CIPWG).

## 6.2.3 Targeted Stormwater Outfall Retrofits

Stormwater runoff from many of the state and local roads in the watershed typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies. Opportunities exist for stormwater retrofits at roadway stormwater outfalls, particularly at or near roadway stream crossings.



This type of retrofit creates new treatment adjacent to the stream corridor near the terminus of an existing storm drain outfall. Outfall retrofits are designed off-line by splitting flow from the existing storm drain pipe (or ditch) and diverting it to a stormwater treatment area formed by an existing depression, excavation or constructed berm. A flow splitter allows larger storms to remain in the existing pipe (or ditch) and bypass the retrofit. Typical stormwater treatment options at outfall retrofits can include stormwater basins, constructed wetlands (Figure 6-3), and bioretention.



A common strategy for outfall retrofits in the stream corridor (Source: CWP, 2007).



Figure 6-3. Example Constructed Wetland Outfall Retrofit (Source: CWP, 2007)



Table 6-2 lists potential outfall retrofit opportunities that were identified during the watershed field inventories, as well as outfalls where illicit discharge investigations and stabilization measures are recommended (see maps in Appendix C). The feasibility of retrofits at these outfalls should be further evaluated based on consideration of site-specific factors including hydraulic head, available space, soil conditions, and easements.

			R	ecommendation	on	
Watershed	Stream Reach	ID	Stormwater Retrofit	Investigate Illicit Discharge	Stabilize or Repair Outfall	Location
Clarks Brook	CB-04	OT-01		ü		Downstream of Rockledge Road
	GB-03A	OT-01			ü	Outfall of sedimentation basin on Gerber Drive
	GB-04	OT-01	ü			Adjacent to Industrial Park Road West
	GB-04	OT-02		ü		250 ft south of Industrial Park Road East
	GB-04	OT-03	ü		ü	100 ft south of Industrial Park Road East
Gages Brook	GB-04	OT- 04B		ü		Adjacent to Industrial Park Road East
	GB-05B	OT-01			ü	Outfall of detention pond CNC Software
	GB-09	OT-01	ü	ü		Along road adjacent to Industrial Park Road East
	GB-09	OT-02			ü	Along road adjacent to Industrial Park Road East
Gages Brook	GBST- 02	OT-01	ü		ü	I-84 Drainage at 0.6 miles east of Exit 67
Tributary	GBST- 02	OT-02			ü	I-84 Drainage 1,000 ft east of OT-01
Lower Tankerhoosen River	LTR-03	OT-01		ü		I-84 runoff from detention pond near Exit 65
Middle Tankerhoosen River	MTR-09	OT-10		ü		South of Warren Street

#### Table 6-2. Priority Outfall Retrofit Sites



			R	Recommendation				
Watershed	Stream Reach	ID	Stormwater Retrofit	Investigate Illicit Discharge	Stabilize or Repair Outfall	Location		
	TB-04B	OT-01	ü		ü	End of Yale Drive, outfall from detention pond		
Tucker Brook	TB-04C	OT-02		ü		North of Chatham Drive 500 ft east of OT-01		
	TB-04C	OT-04		ü	ü	North of Chatham Drive 350 ft east of OT-02		
Walker Reservoir	WR-05	OT-01		ü		At Mile Hill Road		

#### Table 6-2. Priority Outfall Retrofit Sites

## 6.2.4 Watershed Fish Passage Assessments

#### Upper Tankerhoosen

The upper portion of the Tankerhoosen River and Railroad Brook support a variety of fish species. This portion of the watershed also includes the Belding Wild Trout Management Area, which has some of the highest-quality, self-sustaining native trout populations in the state. A number of existing or potential barriers to fish passage were identified during the stream inventories (Appendix C). However, the Upper Tankerhoosen River and Railroad Brook subwatersheds were not assessed during the field inventories as they were determined to be less vulnerable to future development impacts.

A field inventory is recommended along the upper portions of the Tankerhoosen River to identify potential barriers to fish passage such as culverts, dams, and other obstructions. The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The proposed removal of Belding Pond Dam approximately 1 mile downstream of Walker Reservoir (see Section 6.3.4) could potentially provide for additional passage of resident fish populations upstream to Walker Reservoir and tributaries of the Upper Tankerhoosen River, including Rickenback Brook and Barrows Brook.

#### Lower Tankerhoosen

The three run-of-river impoundments on the Lower Tankerhoosen River restrict fish passage within this portion of the river. Nevertheless, resident populations of brown trout, bass, and other fish species have been documented in the Lower Tankerhoosen. Although there are no diadromous fish (herring, shad) passage plans for these dams, there has been an effort in recent years to provide American eel passage at inland dams when there is a need and an opportunity.

The Lower Tankerhoosen River should be further evaluated for the presence of American eel and other resident fish populations that could potentially benefit from fish passage at these three dams. If justified, the DEP Inland Fisheries Division should



request that any repairs to the dams include provisions for fish passage for resident fish populations.

## 6.2.5 Targeted Illicit Discharge Investigations

Numerous outfalls were observed from virtually all of the land uses encountered during the stream assessments. Many appear to be associated with sources having low potential for water quality impacts (i.e., residential foundation drains), while others were of unknown origin and should be the focus of future investigation. Priority outfalls that were identified for follow-up illicit discharge investigations are depicted on the subwatershed maps in Appendix C and summarized in Table 6-2.

Methods for identifying illicit discharges can vary widely in the level of effort and cost required for implementation. The following field-based methods are typically used to identify illicit discharges:

- Testing of Dry Weather Discharges: Flows from stormwater outfalls during dry weather may indicate an illicit discharge. A combination of visual inspection and chemical analysis of dry weather discharges can aid in identifying potential discharge sources.
- *Visual Inspection:* Examination of piping connections by either physical examination or closed-circuit camera can be used to identify possible illicit connections.
- *Review of Piping Schematics:* Examination of architectural plans and plumbing details can reveal potential sites of improper connections.
- *Smoke Testing:* Injection of a non-toxic vapor (smoke) into the facility plumbing system and following its path of travel can be used to locate connections.
- *Dye Testing:* In this method, appropriate colored dyes are added into the drain water of suspect piping. Appearance of the dyed water in the storm drainage system indicates an illicit discharge. As mentioned in the discussion of septic system discharges, testing for optical brighteners can provide an indication of the presence of domestic wastewater flows.
- *Infrared, Aerial, and Thermal Photography:* Use of aerial, infrared, and thermal photography to locate patterns of stream temperature, land surface moisture, and vegetative growth are emerging techniques to identify potential illicit discharges to stormwater systems.

Other sources of information on performing illicit discharge investigations include:

- New England Interstate Water Pollution Control Commission: <u>http://www.neiwpcc.org/neiwpcc\_docs/iddmanual.pdf</u>
- Center for Watershed Protection: <u>http://www.cwp.org/Resource\_Library/Controlling\_Runoff\_and\_Discharges/</u> <u>idde.htm</u>



The watershed towns are required to develop illicit discharge detection and elimination programs under the NPDES Stormwater Phase II program. The Towns should perform follow-up investigations of the potential illicit discharges that were identified in this watershed study as part of their ongoing municipal stormwater permit program.

## 6.2.6 Additional Subwatershed Field Assessments

Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds were not assessed as they were determined to be less vulnerable to future development impacts. The remaining subwatersheds and stream reaches (Table 6-3) should be assessed over the next two years, pending the availability of funding, to identify additional site-specific issues and potential watershed restoration opportunities.

Subwatershed	Stream Reach	Proposed Schedule	
Lower Tankerhoosen River	All except LTR-03	Summer/Fall 2009	
Middle Tankerhoosen River	MTR-03, MTR-04, MTR-05, MTR- 06, MTR-10, MTR-11, MTR-12	Summer/Fall 2009	
Gages Brook South Tributary	GBST-06, GBST-07, GBST-08	Summer/Fall 2009	
Tucker Brook	TB-05, TB-06, TB-07, TB-08, TB- 09, TB-10, TB-11, TB-12	Summer/Fall 2009	
Railroad Brook	All reaches	Summer/Fall 2010	
Bolton Notch Pond	All reaches	Summer/Fall 2010	
Upper Tankerhoosen River	All reaches	Summer/Fall 2010	

#### Table 6-3. Additional Subwatersheds and Stream Reaches to be Assessed

## 6.3 Site-Specific Recommendations

Site-specific recommendations are tailored to address issues at selected sites that were identified during the watershed field inventories. These recommendations also provide examples of the types of projects that could be implemented at similar sites throughout the watershed. Site-specific recommendations can have both short- and long-term benefits.

## 6.3.1 Stormwater Retrofit Opportunities

Stormwater retrofits are structural practices installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system, and ultimately, the Tankerhoosen River or its tributaries. A total of 10 retrofit sites were identified based on the field inventories and review of previous studies and reports. The majority of the stormwater retrofit opportunities are on publicly-owned land. This list is not intended to be all-inclusive, as only several representative subwatersheds and target areas were included in the field inventories. Rather, the retrofit sites identified in this section should be considered representative of the types of retrofit opportunities that exist throughout the watershed.



The stormwater retrofit options identified in this section generally focus on Low Impact Development techniques such as bioretention practices, porous pavement, water quality swales, stormwater basins, and constructed wetlands. They also include traditional practices such as sediment forebays and deep sump catch basins. Conceptual designs and typical details for the proposed retrofit concepts are provided in Appendix D. While the retrofit concepts presented in this section require additional site-specific evaluation to verify their ultimate feasibility, they illustrate how stormwater retrofits can be applied at these and similar sites throughout the watershed and provide the basis for future implementation projects.

#### **Northeast School**

- The paved driveway and parking area at the Northeast School provides an opportunity for a highly visible parking lot retrofit. Retrofits at schools provide an ideal learning opportunity for children and the community. Similar retrofits could be implemented at other schools throughout the watershed.
- Bioretention on existing traffic island and parking lot median. These
  retrofits could be implemented in the Northeast School parking lot by
  excavating a depression in the existing landscaped areas and planting with plants
  that tolerate wet conditions. Existing curbing separating the parking area from
  the traffic islands could also be removed and replaced with curb stops, allowing
  stormwater to flow into the bioretention areas while protecting the areas from
  vehicular traffic. Adjacent paved walkways could be replaced with porous
  pavers for additional infiltration. Existing driveway catch basins could be
  replaced with outlet structures for the bioretention areas. If soils are not
  suitable for stormwater infiltration, an underdrain could be installed below the
  bioretention areas, which would then serve as stormwater filtration devices
  primarily to treat the water quality volume.
- Install a new stormwater basin. As an alternative to the bioretention concept, a new stormwater basin could be located near the corner of Route 30 and the school driveway adjacent to the athletic field to treat runoff from the driveway and parking lot. A new outlet structure could connect to the existing storm drainage system.

#### Mount Vernon Apartments

• Install a new stormwater basin in the lawn area along the apartment complex driveway. The new basin would receive stormwater from the apartment complex's existing drainage system via a diversion manhole that could be constructed to divert low to moderate flows into the stormwater basin for treatment, but high flows would bypass the basin. Existing catch basins could also be replaced with deep sump, hooded catch basins to remove coarse sediment and floatable material.

#### Fire Station (Route 30)

• Replace the existing stormwater leakoff with a constructed stormwater basin and swale. A small constructed stormwater basin and vegetated swale is recommended to treat runoff from the fire station parking lot. The basin would be located along the south side of the parking lot/access road. Removal of a



portion of the paved area may be necessary to allow room for the basin. The basin would discharge to the existing natural wetland via a short vegetated swale. The swale would be located on the outlet side of the wetland. Other types of stormwater treatment measures may not be feasible for this location since groundwater is likely to be shallow due to its close proximity to natural wetlands.

#### Vernon Historical Society (Route 30)

- Construct a new vegetated swale and pocket wetland. A new vegetated swale could be constructed along the south side of the parking lot. This swale would convey runoff to the west along the edge of the parking lot. On the southwestern corner of the property's upland area, a pocket wetland could be constructed adjacent to Myrtle's Garden, an existing landscaped area. The pocket wetland would provide partial treatment of stormwater flows and could be used as a demonstration project. The pocket wetland would discharge to existing natural wetlands via a short vegetated swale.
- The retrofits for the Vernon Historical Society and Fire Station sites are examples of the types of retrofits that could be applied at other municipal parking lots throughout the watershed.

#### ConnDOT Commuter Lot (Route 6/44 and I-384 Interchange)

• Construct a new vegetated swale and stormwater basin along the east side of the commuter lot. The commuter lot located at the I-384 and Route6/44 interchange near Bolton Notch Pond is elevated significantly, providing a low area on the south and east sides of the lot. This topography creates two areas that offer potential opportunities for stormwater basins. The low area on the east side of the lot is a more feasible location for a new stormwater basin since buried utilities may be present to the south, and existing surface drainage from the commuter lot enters the low area south of the lot. Surface drainage from the parking lot would be conveyed and treated by creating a new water quality swale. The swale would convey runoff to a new sediment forebay and stormwater basin, which would discharge to an existing ditch and culvert.

#### ConnDOT Commuter Lot (I-84, Exit 67)

- Install a long, narrow stormwater basin along the east side of the commuter lot to capture and treat flows from the parking area. An existing catch basin inlet can be eliminated and a short swale provided to convey flow into the basin. The basin would then convey flows north to maximize retention time since the majority of runoff would enter the wetland at its southern end. Curbing along the adjacent edge of the parking lot could be eliminated and replaced with curb stops, and the area between the basin and the parking lot replaced with a vegetated filter strip if overland flow to the wetland could be facilitated at other low points.
- Similar stormwater retrofits could potentially be implemented at other state, municipal, and commercial parking lots throughout the watershed.



#### Gerber Technologies Office Building

- Retrofit an existing stormwater basin with a riprap berm to form a sediment forebay. The existing stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal. A sediment forebay would restrict coarse pollutants to a smaller area in the basin, improving treatment of the stormwater that the basin currently receives and facilitating easier maintenance.
- *Maintain the existing riprap outfall, or replace if necessary.* The existing riprap channel leading from this basin to Gages Brook is becoming blocked with shrubs and trees which may restrict its function during a large precipitation event. Additionally, water was observed flowing through the channel rather than over it. The trees and vegetation should be cleared from this channel and the stumps removed. The existing riprap should then be removed, and either replaced with properly bedded riprap, perhaps of a smaller average diameter stone if appropriate, or replaced with a grass swale to facilitate mowing if discharge velocities allow.

#### Lake Street School

- Convert existing island in turn-around in front of school into demonstration bioretention/rain garden. The traffic island in front of the school is a potentially ideal candidate for conversion to a stormwater bioretention area to treat runoff from the school parking lot. The existing island receives surface runoff from the paved turnaround and parking lot areas, but conveys the runoff via a paved low-flow channel through the island to a downgradient headwall and piped drainage system. The island could be converted to a planted bioretention area, incorporating either an exfiltration design if soils allow or an underdrain discharge to the existing storm drainage system for stormwater filtration. The existing walkway and culvert could be replaced with a small pedestrian bridge to. The existing headwall and culvert could be replaced with an outlet structure to convey higher flows.
- This potential retrofit is an excellent opportunity for a bioretention demonstration project.

#### Tankerhoosen Lake and Tankerhoosen River Road Crossings

 Construct sediment forebay at inlet of Tankerhoosen Lake and associated treatment retrofits at selected road crossings. In a 2004 watershed study of Tankerhoosen Lake, Baystate Environmental Consultants recommended the creation of a sediment trap/forebay at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.



## 6.3.2 Riparian Buffer Restoration Opportunities

Riparian buffers are naturally vegetated areas adjacent to waterways, including streams, ponds, and wetlands. This natural vegetation protects the land adjoining a waterway by preserving the floodplain, keeping native soils intact, and maintaining the streamside land and streambanks. Vegetative buffers help encourage infiltration of rainfall and runoff, and provide absorption for high stream flows, which helps reduce flooding and drought. The vegetative community of riparian



A mature riparian buffer (Source: Delaware Riverkeeper Network).

buffers provides habitat for many species of plants and animals, many of them dependent on riparian habitat features for survival and many of them threatened or endangered species. The buffer area provides a living cushion between upland land use and water, protecting water quality, the hydrologic regime of the waterway and stream structure. The naturally vegetated buffer filters out pollutants, captures sediment, regulates stream water temperature and processes many contaminants through vegetative uptake. Riparian buffers should be kept intact or restored wherever possible (Delaware Riverkeeper Network, undated).

Stream buffer encroachments are prevalent throughout the Tankerhoosen River watershed along stream corridors in or near areas of residential and commercial development. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Historical mill development along the banks of the Tankerhoosen and its tributaries has also resulted in the loss of riparian forest cover and encroachment of the built environment upon the river.

Table 6-4 lists stream reaches with impacted riparian buffers and potential buffer restoration candidates that were identified during the watershed field inventories (see maps in Appendix C). In general, riparian buffers are more effective along smaller, headwater streams. Potential riparian buffer restoration approaches for these areas include:

- Installation of new riparian buffers,
- Widening existing riparian buffers,
- Invasive species removal/management,
- Tree planting/reforestation.



The feasibility of riparian buffer restoration at these sites should be further evaluated based on consideration of site-specific factors including site access, available land area, land ownership, soil conditions, appropriate buffer width, and native plant species.

Watershed	Stream Reach	ID	Location
	GB-03B	IB-01	Along Gerber Drive
	GB-06	IB-01	At footbridge south of Valley View Drive
Gages Brook	GB-07	IB-01	100 feet downstream of Andrew Way
	GB-08	IB-01	50 feet upstream of Andrew Way
	GB-10	IB-01	Begins at house on downstream end of reach to 1,500 feet upstream
Gages Brook South Tributary	GBST-04B	IB-01	Rear of house along Leohr Road
Lower Tankerhoosen River		Not Assessed	400-ft length of Tankerhoosen River adjacent to Talcottville Mill
	TB-01	IB-01	At confluent with Lower Tankerhoosen River
	TB-03	IB-01	50 feet downstream of IB-02
Tucker Brook	TB-03	IB-02	400 feet downstream of IB-03
	TB-03	IB-03	250 feet northwest of Vernon Street
	TB-04C	IB-01	Behind houses at end of Yale Drive
	TB-04C	IB-02	Behind houses along Chatham Drive

Table 6-4.	<b>Priority</b>	Riparian	<b>Buffer</b>	Restoration	Sites

#### Talcottville Mill Riparian Damage

In the fall of 2008, extensive removal of trees and vegetated buffer occurred along an approximately 400-foot segment of the Lower Tankerhoosen River. The vegetation removal, and subsequent installation of stone bank stabilization along both sides of the Tankerhoosen River, was associated with redevelopment activities at the Talcottville Mill property. The work was performed without prior approval from the Town of Vernon, the DEP, or the U.S. Army Corps of Engineers. The Town continues to coordinate with the state and federal resource agencies to determine an appropriate course of action to repair the riparian damage.

Corrective actions to restore the lost streambank vegetation and riparian habitat should balance the goal of full restoration with potential disturbance and further water quality impacts associated with complete removal of the existing stone. A dual approach that utilizes the existing stone bank stabilization and introduces new vegetative plantings may be prudent. The feasibility of such an approach should be further evaluated. Subsequent site redevelopment should also incorporate riparian buffer restoration measures (trees and vegetative plantings) into the master plan for the site.

## 6.3.3 Stream Restoration Opportunities

Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Table 6-5 lists stream reaches with



Streambank erosion along Gages Brook.



moderate to severe bank erosion that were identified during the watershed field inventories (see maps in Appendix C). These reaches are potential streambank restoration candidates. Streambank restoration requires use of a system of treatment techniques that work together to stabilize slopes, reduce erosion, and improve aquatic habitat. Although every site is different and requires detailed design of restoration components that work together, typical restoration techniques include:

• Slope Stabilization Techniques. Of primary concern is preventing an unstable slope from additional failure. It is likely that the slope of an eroded bank is close to the limit of its stability, such that additional loading or

the gravel or sand bar to compensat lost channel capacity and to provide material to build the bench.

saturation of the soil could cause a slide. The slope must first be stabilized before techniques to prevent additional erosion can be implemented. If adequate room is available surrounding the stream, it may be possible to flatten



Ripra

l slope stabilization where flattering the slope is not allowable (Source: NEH-654).

the slope to ensure stability. If site constraints prevent flattening the slope, such as a road, structure, or utilities lying just inland from the bank, it may be necessary to provide structural support for the slope, or buttress the slope while providing adequate flow capacity by widening the channel by a corresponding amount along the inside of the bend. In combination with earthwork, slope stabilization should also include a combination of plantings and toe protection techniques to prevent future destabilization.

• Toe Protection

*Techniques.* The toe of the streambank, or the portion of the bank where the slope transitions into the relatively flat stream channel bottom, is subject to constant erosive forces of flowing water, especially along the outside bank of bends. Protecting the toe is critical to ensure that upper portions of the bank are not further undermined. A variety

of techniques have developed for toe protection, including constructing



Typical toe protection for erosion and scour resistance (Source: NEH-654).

cribs made from logs, gabions (baskets filled with stone), woody debris anchored in place, and placed or dumped riprap protection. Bioengineering



techniques are usually not adequate on this part of the slope since the selected treatment technique must be designed to resist the shear stress and energy of the flowing water during high flow conditions, continue deep enough below the stream bottom to resist scour, and not be susceptible to ice damage.

 Bioengineering Techniques. Although hard armoring and engineered slope stability systems can be used effectively to restore an area of degraded bank, these techniques often lack habitat and riparian ecological value that natural conditions provide. In addition, engineered techniques are not 'self-healing,' in that, when damaged, they may fail and allow the degradation of the bank to resume. Bioengineering techniques can be used to avoid



Bioengineering techniques used for slope stabilization and redirection (Source: NEH-654).

these consequences. Streambank bioengineering includes the use of living plant material to supplement or replace engineered systems. Typically, grasses, forbes, shrubs, and trees are used to hold soil in place, resist erosion of high flow events, provide habitat value, and grow into a natural system that could work in place of engineered systems when those systems eventually fail. Native shrub and tree species that root well from cuttings, such as willow and dogwood, can be planted along the bank, projecting into the stream, or through a riprap layer using a variety of techniques to meet site needs. Native grasses and forbes can be planted in areas subject to ice damage or where trees and shrubs are not preferred.

- *Grade Control Techniques.* Downcutting of a stream can present a significant problem since it may disconnect a stream from its wetland. Treatment techniques are available that create artificial hard points along a downcutting reach. These points set the bottom elevation of the stream channel, limiting its downward movement along the treated reach.
- *Riparian Buffer Improvement.* An important step in preventing degradation of the river corridor is to improve the width and quality of the existing riparian buffer, or providing a buffer where encroachment has removed it. The riparian buffer provides an important protection and ecological system that supports and complements the riverine system.

Access to many of the potential streambank restoration sites is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility including land ownership, erosion severity, upstream and downstream conditions, infrastructure constraints, and construction access to the stream.



Watershed	Stream Reach	ID	Location
	GB-01	ER-01	250 feet upstream of confluence with Gages South Tributary
	GB-01	ER-02	250 feet upstream of confluence with Gages South Tributary
Cogoo Brook	GB-03A	ER-01	Along entire reach
Gages Brook	GB-05B	ER-01	Downstream side of Old Post Road
	GB-06	ER-01	450 ft upstream of Old Post Road
	GB-06	ER-02	900 ft upstream of Old Post Road
	GB-06	ER-03	1,100 ft upstream of Old Post Road
	GB-06	ER-04	1,200 ft upstream of Old Post Road
Gages Brook South Tributary	GBST-09B	ER-01	700 ft downstream of Tolland Farms Road
Middle Tankerhoosen River	MTR-09	ER-01	Adjacent to Warren Avenue
	TB-01	ER-01	100 ft upstream of confluence with Lower Tankerhoosen River
Tucker Brook	TB-03	ER-01	400 ft downstream of Phoenix Street, adjacent to utility Right-of- Way
Clarks Brook	CB-02	ER-01	Adjacent to baseball field on Bolton Road
	CB-03	ER-01	Rear of Industrial Park Road building complex

#### Table 6-5. Priority Stream Restoration Sites

## 6.3.4 Dams and Impoundments

In addition to the recommended fish passage barrier assessments along the upper and lower portions of the Tankerhoosen River (see Section 6.2.4), additional site-specific actions are recommended for several of the dams and impoundments in the watershed.

#### Walker Reservoir Dam

An engineering evaluation of Walker Reservoir Dam was performed in 1998 by Karl Acimovic, P.E. on behalf of the Vernon Parks and Recreation Department. The dam was determined to be in poor to fair overall condition, requiring significant modifications and improvements to prevent overtopping of the embankment adjacent to the spillway and subsequent erosion of the crest of the dam. The dam should be re-evaluated to verify what modifications, if any, were implemented in response to the 1998 study findings and to assess current conditions.

Walker Reservoir feeds the headwaters of the Tankerhoosen River and is believed to function as "sink" for pollutants carried from upstream areas including Gages Brook. Walker Reservoir is suspected to play a key role in protecting the high quality of the upper portions of the Tankerhoosen River, in addition to the spring water inputs that also feed the upper reaches of the Tankerhoosen. The relationship between the water quality of Walker Reservoir and the Tankerhoosen River is unclear given the limited available monitoring data. Additional study of the water quality of Walker Reservoir and its potential impact on the Tankerhoosen River is recommended in order to understand this relationship and develop management recommendations for Walker Reservoir that are also protective of the Tankerhoosen River.



#### Valley Falls Pond Dam

An engineering evaluation of Valley Falls Pond Dam was performed in 1997 by Karl Acimovic, P.E. on behalf of the Vernon Parks and Recreation Department. The dam was also determined to be in poor to fair condition due to the poor structural condition of the downstream earth embankment, seepage from the downstream toe of embankment, and poor condition of the secondary spillway and inadequate spillway capacity. A number of recommendations were made including tree removal, increasing the spillway capacity, a new intake/outlet structure, embankment reconstruction and toe drain installation, and reconstruction of the primary spillway. The dam should be re-evaluated to verify what modifications, if any, were implemented in response to the 1997 study findings and to assess current conditions.

#### **Belding Pond Dam**

The Natural Resources Conservation Service (NRCS) is evaluating the feasibility of removing the Belding Pond Dam, which is located along the Tankerhoosen River upstream of the Belding Wildlife Management Area. As described previously, removal of the dam could potentially provide for additional passage of resident fish populations upstream to Walker Reservoir and tributaries of the Upper Tankerhoosen River, including Rickenback Brook and Barrows Brook. The feasibility evaluation should consider a range of factors including potential impacts of removal on stream geomorphology, habitat, recreation, economics, and management of legacy sediment accumulated behind the dam.

## 6.3.5 Aquatic Invasive Species Study

In 2008, the Vernon Conservation Commission verified the presence of the aquatic invasive species, variable leaf milfoil, in Valley Falls Pond, which is located along Railroad Brook before the confluence with the Tankerhoosen River in the Belding WMA. Variable leaf milfoil is one of the two most common invasive milfoil species found in Connecticut, the other being Eurasian milfoil.

Variable leaf milfoil is native to the southern U.S. It first arrived in Connecticut in 1936, and has become a nuisance in many Connecticut lakes, especially in the southeast part of the state. Like Eurasian milfoil, variable leaf milfoil produces long stems that rise to the water's surface, where they spread, producing dense mats of vegetation. Control of this species can be difficult. According to "Nuisance Aquatic Vegetation Management," a guidebook published by DEP (undated), milfoil should generally not be cut to control it, since each piece can grow into another plant. The guidebook states that the most effective chemical controls are systemic herbicides applied at low dosages, which would require a DEP permit. A physical removal method, referred to as "suction harvesting", is being used to remove variable leaf milfoil from Crystal Lake in Ellington and Stafford Springs, Connecticut.

Fanwort, another aquatic invasive plant species that can form large colonies in quiet water bodies, was recently noted in Walker Reservoir by Aquatics Research. Fanwort can grow aggressively and clog drainage canals, ponds, lakes, reservoirs, and slow-moving freshwater streams. It represents a threat to Walker Reservoir and other water bodies throughout the watershed.



An aquatic plant survey and feasibility study is recommended to evaluate the extent and distribution of variable leaf milfoil in Valley Falls Pond, evaluate a range of potential control alternatives, and to identify a preferred control strategy, including costs and potential funding sources. An aquatic plant study of Walker Reservoir is also recommended, including a plant survey for fanwort and other aquatic plants that could threaten the health of the reservoir and other water bodies in the watershed.

More information on aquatic invasive plants is available from:

- Connecticut Invasive Plants council is available at: http://nbiinin.ciesin.columbia.edu/ipane/ctcouncil/CT\_invasive.htm.
- Connecticut Agricultural Experiment Station at: <u>http://www.ct.gov/caes/</u>
- Connecticut Department of Environmental Protection at http://www.ct. gov/dep/cwp/view. asp?a=2702&q=323494&depNav\_GID=1641
- The Connecticut Aquatic Nuisance Species Management Plan: http://www. ctiwr.uconn.edu/ProjANS/SubmittedMaterial2005/Material200601/ANS%20Pl an%20Final%20Draft121905.pdf.
- The National Invasive Species Information Center: http://www. invasivespeciesinfo.gov/aquatics/watermilfoil.shtml.

## 6.3.6 Priority Stream Cleanups

The watershed field inventories identified isolated areas of trash and debris dumping along most of the assessed streams. Stream clean-ups and trash removal are often cosmetic and temporary. However, they are an effective tool for involving and educating the public about stream degradation. In addition, some trash and debris accumulation may present risks to infrastructure and increased flooding, such as when outfalls and culverts become clogged with trash.

Table 6-6 lists stream reaches where significant trash and debris were observed (see maps in Appendix C). These sites are recommended candidates for targeted stream cleanups.



Watershed	Stream Reach	ID	Location	Material
	GB-01	TR-01	Near bridge downstream of detention pond	Sticks, brush wood fencing
Gages Brook	GB-02	TR-01	300 ft upstream of detention pond, adjacent to agricultural field	Tires and automotive debris
	GB-08	TR-01	350 ft downstream of Mountain Springs Road	Tire, bathtub, and two 55-gal drums
	MTR-01	TR-01	650 ft upstream of TR-02	55-gal drum (unknown material, may be toxic)
	MTR-01	TR-02	North of residence on Frederick Road	Debris piled from removal of beaver dam
Middle Tankerhoosen	MTR-01	TR-03	South of residence on Susan Road	Approx. 16 closed 5- gal buckets
River	MTR-09	TR-01	Rear of residences on Tunnel View Terrace	Yard waste and tennis balls
	MTR-09	TR-02	Rear of residences on Tunnel View Terrace	Yard waste (small amount)
	MTR-09	TR-03	Rear of residences on Warren Avenue	Yard waste (small amount)
	MTR-09	TR-04	400 ft downstream of Tunnel Road	Leaves, logs, tires stumps
	TB-04B	TR-01	End of Yale Drive, outfall from detention pond	Grass and brush clippings
Tucker Brook	TB-04C	TR-01	Behind houses along Chatham Drive	Yard waste
	TB-04C	TR-02	Behind houses along Chatham Drive	Pieces of tree approx 1 ft diameter; 2-10ft long
Clarks Brook	CB-02	TR-01	50 ft upstream of Industrial Park Road stream crossing	6 tires; automotive waste; appliance; 55-gallon drum
	CB-03	TR-01	Rear of Industrial Park Road building complex	Automotive waste

#### Table 6-6. Priority Stream Cleanup Sites

# 6.4 Estimated Costs and Load Reductions

#### 6.4.1 Estimated Costs

Planning level costs were estimated for the targeted and site-specific recommendations in this plan, where sufficiently detailed information was available. The cost estimates assist watershed stakeholders to evaluate the financial resources and funding sources that may be required to implement the plan.

Table 6-7 summarizes typical ranges of planning level unit costs for the targeted recommendations, and some of the site-specific recommendations, that are identified in this plan. Additional information is required to develop more detailed cost estimates for these recommendations.



Recommendation	Planning Level Cost (\$)	Source
Invasive Species Management Plan	\$15,000 to 30,000	Professional engineering experience
Targeted Stormwater Outfall Retrofits (design and construction; 2009 \$ per cubic ft of runoff treated) Bioretention	\$10.00 to 25.00	Center for Watershed Protection, Urban Stormwater Retrofit Practices (2007)
Water Quality Swales	\$4.00 to 13.00 \$11.00 to 31.00	
Watershed Fish Passage Assessment Upper Tankerhoosen Lower Tankerhoosen	\$10,000 to 15,000 \$5,000 to 10,000	
Illicit Discharge Investigation	Costs vary significantly depending on investigation methods and findings	Center for Watershed Protection, IDDE Manual (2004), NEIWPCC IDDE Manual (2003)
Additional Subwatershed Field Assessments	\$10,000 to 15,000 (varies depending on the use of volunteers)	Center for Watershed Protection, Unified Stream Assessment (2005)
Riparian Buffer Restoration (\$ per acre)		NRCS, Coginchaug River Watershed Based Plan (2008)
Grass/herbaceous buffer Tree and shrub planting	\$450 to 850 \$2,000 to 3,000	
Streambank Restoration (good access, \$ per 100 linear feet)) Bank stabilization Channel rehabilitation	\$1,300 to 9,600 \$1,100 to 3,700	NOAA Stream Restoration Cost Estimates (2000)
Evaluation of Dams & Impoundments		Professional engineering experience
Walker Reservoir Dam Evaluation Walker Reservoir Water Quality Study Valley Falls Pond Dam Evaluation Belding Pond Dam Removal Feasibility Evaluation	\$5,000 to 10,000 \$20,000 to 30,000 \$5,000 to 10,000 \$30,000 to 40,000	
Aquatic Invasive Species Study and Invasives Control (Valley Falls Pond and Walker Reservoir)	Cost varies depending on removal method (mechanical harvesting, herbicide application, etc.)	
Stream Cleanups	Highly dependent on the amount of donated supplies and services	

#### Table 6-7. Typical Unit Costs for Management Plan Recommendations

More detailed planning level costs were estimated for the site-specific stormwater retrofits described in Section 6.3.1. These estimates are based upon unit costs derived from published sources and the conceptual designs presented in Appendix D of this plan. Capital (construction, design, permitting, and contingency) and operation and maintenance costs were included in the estimates, and a total annualized cost is presented in 2009 dollars based on the anticipated design life of each retrofit. Table 6-8 summarizes planning level cost estimates for the site-specific stormwater retrofits. A more detailed cost estimate table is included in Appendix E.



	st	De Perr Cont	esign, mitting, ingency			er			ost/yr
Recommendation	Construction Cc (2009)	% Construction	Cost	Total Cost	Lifespan (yrs)	Annual Cost Ov Lifespan	O&M (% Cost)	O&M (\$/yr)	Total Capitalized C over lifespan
Tankerhoosen Lake			1					n.	(
Sediment Forebay	\$93,700	32%	\$30,000	\$123,700	30	\$6,310	6%	\$380	\$6,690
Deep Sump CBs, piping, and swale	\$24,300	32%	\$7,800	\$32,100	50	\$1,250	15%	\$190	\$1,440
Northeast School	¢ 40, 100	2004	¢12 500	¢55 (00	45	#4.(/0	00/	\$270	¢5 000
Bioretention Area 1	\$42,100	32%	\$13,500	\$55,600	15	\$4,660	8%	\$370	\$5,030
Bioretention Area 2	\$31,100	32%	\$10,000	\$41,100	15	\$3,440	8%	\$280	\$3,720
SW Basin	\$18,100	32%	\$5,800	\$23,900	30	\$1,220	6%	\$70	\$1,290
Mount Vernon Apartme	ents	220/	¢12.00	¢F( 200	20	¢0.070	( 0(	¢170	¢2.040
SW Basin	\$42,600	32%	\$13,600	\$56,200	30	\$2,870	6%	\$170	\$3,040
Deep Sump CBs	\$18,800	32%	\$6,000	\$24,800	50	\$960	20%	\$190	\$1,150
SW Basin	\$21,600	32%	\$6.900	\$28 500	30	\$1.450	6%	\$00	\$1.540
Vogotatod Swalo	\$000	2270	\$200	\$1 200	10	¢1/10	7%	¢10	¢1,540
Vegetated Swale	etv (Route	30)	\$300	\$1,200	10	\$140	7.70	\$10	\$150
Pocket Wetland	\$5.500	32%	\$1,800	\$7,300	10	\$860	6%	\$50	\$910
Vegetated swale	\$9,600	32%	\$3,100	\$12,700	10	\$1,490	6%	\$90	\$1,580
ConnDOT Commuter I	_ot (Route	6/44 and	I-384 Inter	change)					
Vegetated swale	\$7,700	32%	\$2,500	\$10,200	29	\$530	7%	\$40	\$570
SW Basin	\$51,700	32%	\$16,500	\$68,200	30	\$3,480	6%	\$210	3,690
ConnDOT Commuter I	_ot (I-84, E	xit 67)	[		1	F			
SW Basin	\$38,500	32%	\$12,300	\$50,800	30	\$2,590	6%	\$160	\$2,750
Vegetated Swale	\$1,500	32%	\$500	\$2,000	10	\$230	7%	\$20	\$250
Gerber Technologies (	Jiffice Build	ing	¢(00	¢2 ( 02	20	¢100	2004	¢40	¢170
Sediment Forebay	\$2,000	32%	\$600	\$2,600	30	\$130	30%	\$40	\$170
Discharge Channel	\$9,000	32%	\$2,900	\$11,900	30	\$610	10%	\$60	\$670
Lake Street School									

#### Table 6-8. Planning Level Cost Estimates for Site-Specific Stormwater Retrofits

## 6.4.2 Load Reductions

Pollutant load reductions were estimated for the following watershed management plan recommendations using the STEPL pollutant loading model described in the *Baseline Watershed Assessment* report (Fuss & O'Neill, May 28, 2008):



- Implementation of LID treatment practices (bioretention, filter or buffer strips adjacent to impervious areas, and infiltration swales to treat runoff from impervious surfaces) for all future development and redevelopment activity in the watershed, assuming adoption of a local LID stormwater regulatory mechanism and design standards by the Town of Vernon and the other watershed towns that currently do not have such requirements,
- Implementation of stormwater retrofits in existing developed areas (commercial, industrial, institutional and roadway land uses) to treat runoff from a percentage of each subwatershed, which would be dictated by subwatershed feasibility factors and site-specific conditions.

Pollutant load reductions for total suspended solids (TSS), phosphorus (P), nitrogen (N), and biochemical oxygen demand (BOD) for the above scenarios were estimated for 1) existing conditions, 2) future buildout of the watershed without the proposed controls, and 3) future buildout with the proposed controls.

Table 6-9 summarizes anticipated sediment loads and anticipated load reductions resulting from the implementation of LID treatment practices for all future development and redevelopment projects in the watershed. Sediment load reductions resulting from the use of LID practices varies by subwatershed, but is generally between 4 and 10 percent. The anticipated load reductions for nutrients and BOD are of a similar magnitude (Table 6-10).

Subwatershed	Existing Conditions (tons/yr)	Future Buildout Without LID Controls (tons/yr)	Future Buildout With LID Controls (tons/yr)	Load Reduction Due to LID Controls (%)
Bolton Notch Pond	48.8	53.3	51.4	3.5%
Clarks Brook	88.2	100.4	92.1	8.1%
Gages Brook	92.3	112.8	102.6	9.0%
Gages Brook South Trib.	82.7	93.3	88.7	4.8%
Lower Tankerhoosen River	45.0	52.9	47.9	8.9%
Middle Tankerhoosen River	199.0	220.2	203.5	7.3%
Railroad Brook	32.0	52.7	37.5	28.2%
Tucker Brook	86.1	98.4	89.0	9.1%
Upper Tankerhoosen River	73.2	80.2	76.7	4.2%
Walker Reservoir	52.6	65.6	58.0	11.1%

#### Table 6-9. Anticipated Effectiveness of LID in Reducing Sediment Loads



Subwatershed	Future Buildout With LID Controls (tons/yr)		Load Reduction Due to LID Controls (%)			
	N	Р	BOD	N	Р	BOD
Bolton Notch Pond	1.1	0.18	4.1	2.0%	2.7%	2.1%
Clarks Brook	2.1	0.30	8.1	4.6%	6.4%	5.1%
Gages Brook	2.5	0.38	10.0	4.8%	7.4%	4.9%
Gages Brook South Tributary	2.0	0.31	7.5	2.7%	3.9%	2.9%
Lower Tankerhoosen River	1.1	0.16	4.0	5.8%	5.9%	7.2%
Middle Tankerhoosen River	4.7	0.66	18.0	4.4%	5.8%	5.2%
Railroad Brook	1.1	0.12	4.9	16.2%	20.5%	16.8%
Tucker Brook	2.2	0.28	8.8	5.6%	6.2%	6.4%
Upper Tankerhoosen River	1.8	0.26	7.1	2.6%	4.3%	2.9%
Walker Reservoir	1.3	0.20	4.8	6.5%	9.5%	7.8%

## Table 6-10. Anticipated Effectiveness of LID in Reducing Nutrient and BOD Loads

Note that sediment loads (Table 6-9) under the future buildout scenario, even with the implementation of LID controls alone, are slightly higher than existing sediment loads in all of the subwatersheds. This result suggests that other source controls/pollution prevention, stormwater retrofits, and watershed restoration practices are necessary to maintain existing pollutant loads or to achieve net reductions in pollutant loads under a future buildout scenario.

The pollutant loading model was then used to estimate the effectiveness of implementing stormwater retrofits in existing developed areas (commercial, industrial, institutional and roadway land uses) to treat runoff from a portion of each subwatershed. Ideally, the entire area watershed could be retrofitted to achieve maximum pollutant load reductions. In practice, stormwater retrofits can be difficult to implement in an urbanized watershed due to a variety of physical constraints and other factors. Therefore, stormwater retrofits are typically limited to treating runoff from some percentage of the total developed area in a subwatershed.

The pollutant loading model was then used to estimate the anticipated pollutant load reductions, compared to existing conditions, for stormwater retrofits applied to between 5 and 30 percent of the developed area (commercial, industrial, institutional and roadway land uses) in each subwatershed. Table 6-11 summarizes the results of this evaluation for sediment, which indicate that even modest applications of watershed-wide stormwater retrofits (20 to 30 percent of the area retrofitted), can result in significant pollutant load reductions (10 to 20 percent sediment load reductions).

Subwatershed	Sediment Load (tons/yr)							
	Existing Conditions	With Retrofits (5% of Watershed Area)	With Retrofits (10% of Watershed Area)	With Retrofits (20% of Watershed Area)	With Retrofits (30% of Watershed Area)			
Bolton Notch Pond	48.8	47.2	45.5	42.2	38.9			
Clarks Brook	88.2	85.9	83.5	78.9	74.2			
Gages Brook	92.3	89.8	87.2	82.1	77.0			
Gages Brook South Trib.	82.7	80.4	78.2	73.7	69.2			

#### Table 6-11. Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area



Subwatershed	Sediment Load (tons/yr)				
	Existing Conditions	With Retrofits (5% of Watershed Area)	With Retrofits (10% of Watershed Area)	With Retrofits (20% of Watershed Area)	With Retrofits (30% of Watershed Area)
Lower Tankerhoosen R.	45.0	43.5	42.0	39.1	36.2
Middle Tankerhoosen R.	199.0	193.9	188.8	178.6	168.5
Railroad Brook	32.0	31.6	31.3	30.6	29.8
Tucker Brook	86.1	84.3	82.5	78.9	75.3
Upper Tankerhoosen R.	73.2	71.7	70.2	67.1	64.1
Walker Reservoir	52.6	50.9	49.2	45.8	42.4

## Table 6-11. Anticipated Effectiveness of Stormwater Retrofits as a Function of Watershed Treatment Area

Finally, the potential effectiveness of 1) new LID controls for future development and redevelopment activity in the watershed and 2) stormwater retrofits at existing developed land uses were evaluated collectively to determine the minimum treatment area required for stormwater retrofits in each subwatershed to maintain existing pollutant loads under future buildout conditions. This approach provides a target stormwater retrofit treatment area (which varies by pollutant) for each subwatershed to meet the overall goal of "no net increase in watershed pollutant loads". Table 6-12 lists these minimum retrofit area targets.

Additional retrofits, source controls/pollution prevention, and other watershed restoration practices described in this plan could be implemented to achieve net reductions in future pollutant loads or to maintain existing loads if the target stormwater retrofit treatment areas are not feasible.

Subwatershed	Nitrogen	Phosphorus	Sediment	
Bolton Notch Pond	25%	15%	10%	
Clarks Brook	35%	15%	10%	
Gages Brook	50%	40%	25%	
Gages Brook South Tributary	50%	25%	15%	
Lower Tankerhoosen River	40%	15%	15%	
Middle Tankerhoosen River	30%	15%	5%	
Railroad Brook*				
Tucker Brook	50%	15%	10%	
Upper Tankerhoosen River	50%	50%	15%	
Walker Reservoir	50%	35%	20%	
* No commercial, industrial, institutional land use and only 17 acres of transportation land use in this subwatershed.				

#### Table 6-12. Minimum Retrofit Area (Percent of Subwatershed) Necessary to Maintain Existing Pollutant Loads

## 6.5 Plan Implementation

## 6.5.1 Schedule and Milestones

Table 6-13 is a proposed implementation schedule, including actions/milestones, anticipated timeline, products, and evaluation criteria. This table should be revised as necessary to reflect future changes to the watershed plan and implementation activities.

Actions	Lead Entity	Timeline	Products	Evaluation Criteria		
Objective 1. Build a Foundation for Implementing the Plan						
Form coalition	Friends of HRLP	1-2 yrs	Funding sources	Grant		
Adopt plan	Towns		and grant	applications		
Identify potential funding sources	Coalition	-	applications	submitted		
Submit grant applications	Coalition/Towns	-				
Objective 2. Enhance In-Stream and	Riparian Habitat					
Conduct fish passage assessments	Coalition	1-2 yrs	Assessment findings			
Revise local stream crossing & stormwater design standards	Towns	1-2 yrs	Revised standards			
Belding Pond Dam removal feasibility evaluation	NRCS, DEP	1-2 yrs	Evaluation findings			
Conduct aquatic invasive species study	Coalition, Towns	1-2 yrs	Study findings			
Priority stream restoration projects	Coalition, Towns	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring		
Objective 3. Protect/Restore Riparia	n Buffers					
Priority riparian buffer restoration projects	Coalition	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring		
Adopt stream buffer regulations, pending enabling legislation	Towns	2-4 yrs	Adopted regulations			
Revise riparian buffer recommendations (Tolland)	Towns	1-2 yrs	Revised recommend.			
Objective 4. Identify and Eliminate III	icit Discharges	•		·		
Targeted illicit discharge investigations	Towns	1-2 yrs	Investigation findings	# discharges removed		
Implement municipal IDDE programs	Towns	2-4 yrs	-			
Priority stream cleanup efforts	Coalition	1-2 yrs	Trash removed	# cleanups		
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants & feedback		
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs				
Objective 5. Residential Management Practices						
Increase watershed stewardship signage in residential areas	Towns	2-4 yrs	New signage	# signs		
Encourage disconnection of rooftop runoff	Towns	2-4 yrs	Rain barrels, disconnections	# participants		
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants &		
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs		feedback		
Objective 6. Municipal and Business Management Practices						
Review municipal facility compliance	Towns	1-2 yrs	Review findings	Improved BMPs		

Table 6-13. Pro	oposed Impleme	ntation Schedule
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Actions	Lead Entity	Timeline	Products	Evaluation Criteria
Improve municipal stormwater management programs	Towns	1-4 yrs	Revised SWMPs	
Implement street sweeping and catch basin cleaning	Towns, DOT	2-4 yrs	Sweeping and CB cleaning	Frequency
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants &
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs		feedback
Increase watershed stewardship signage in commercial areas	Towns	2-4 yrs	New signage	# signs
Objective 7. Implement Water Quality	Monitoring Progra	m		
Develop and implement long-term monitoring program	Coalition	1-2 yrs	Monitoring data, report	Review results with
LID demonstration monitoring	Coalition	2-4 yrs		agencies
Objective 8. Protect Open Space				
Priority land acquisitions	Towns	1-4 yrs	Protected land	#sites/ acres
Continue to implement municipal open space plans	Towns	1-4 yrs		protected
Seek alternative funding sources for open space acquisition	Towns	1-4 yrs		
Promote use of open space through trail maps and events	Coalition	1-2 yrs	New maps and events sponsored	# events
Develop and implement invasive species management plan	Coalition	2-4 yrs	Management plan	
Objective 9. Promote LID and Sustai	nable Site Design			
Monitor effectiveness of LID regulations (Tolland)	Town	1-4 yrs	LID measures installed	Photos, WQ monitoring, 3 <sup>rd</sup> party reviews
Revise Inland Wetland regulations for consistency (Tolland)	Town	1-2 yrs	Revised regulations	
Develop and implement new stormwater/LID regulations (Vernon) Form advisory committee	Town	1-2 yrs	New SW/LID regulations, revised existing	
Develop Town stormwater/LID manual and/or guidance Update existing zoning,			regulations	
subdivision, wetlands regulations				
Priority stormwater retrofits	Coalition	2-10 yrs	Completed projects	Photos, # sites, WQ monitoring
Incorporate LID into Town projects	Town	2-4 yrs	LID measures	Photos, WQ
LID demonstration projects (green roads, public works, schools)	Town	1-2 yrs	installed	monitoring
Develop education/outreach materials	Coalition, Towns	1-2 yrs	Educational materials	Number of participants &
Deliver education/outreach to the public	Coalition, Towns	2-4 yrs		feedback
Objective 10. Assess Additional Sub	watersheds	•		
Perform stream and upland assessments	Coalition	1-2 yrs	Inventory findings	<pre># projects identified</pre>

#### Table 6-13. Proposed Implementation Schedule



#### 6.5.2 Funding Sources

A variety of local, state, and federal sources are potentially available to provide funding for the implementation of this watershed management plan, in addition to potential funds contributed by local grassroots organizations and concerned citizens. Table 6-14 is a list of potential funding sources that has been developed by DEP and NRCS, and further refined through this planning process. The funding entities and grant programs listed in the table is not intended to be an exhaustive list; the table can be used as a starting point to seek funding opportunities for implementation of the recommendations in this watershed plan. The information presented in this watershed management plan and the supporting study documentation will support future grant proposals by demonstrating a comprehensive, scientifically-based approach for addressing identified concerns consistent with EPA's recommended watershed-based approach. The table of potential funding sources is intended to be a living document that should be updated periodically to reflect the availability of funding or changes to the funding cycle, and to include other funding entities or grant programs.

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline	
DEP Watershed Funding Website						
http://www.ct.gov/dep/cwp/view.asp?a=2 funding sources for funding watershed-ba	2719&q=3354948 ased planning pro	kdepNav_GID=1 ojects.	654&pp=12&n=1	Index of many po	tential	
DEP CT Landowner Incentive Program	Up to \$25,000	At least 25%				
http://www.ct.gov/dep/cwp/view.asp?a=2	2 <u>723&amp;q=3257348</u>	kdepNav_GID=1	<u>655</u>			
DEP Long Island Sound License Plate Program	\$25,000			January	March	
http://www.ct.gov/dep/cwp/view.asp?a=2	2705&q=3237828	kdepNav_GID=1	<u>635</u>			
DEP Open Space and Watershed Land Acquisition				March	June	
860-424-3016 <u>david.stygar@ct.gov</u> <u>http</u>	://www.ct.gov/dep	o/cwp/view.asp?	<u>a=2706&amp;q=32383</u>	4&depNav_GID=	<u>1641</u>	
DEP Recreation and Natural Heritage Trust Program						
http://www.ct.gov/dep/cwp/view.asp?a=2	2706&q=3238408	kdepNav_GID=1	641			
Eastman Kodak / Nat'l Geographic American Greenways Awards optional Program	\$2500	\$300	Optional	April	June	
jwhite@conservationfund.org, Jen White	9	·				
EPA Healthy Communities Grant Program	\$35,000	\$5,000	Optional, up to 5%	March	Мау	
617-918-1698 Padula.Jennifer@epa.gov						
Northeast Utilities Environmental Community Grant Program	\$250	\$1,000			April 15	
http://www.nu.com/environmental/grant.asp Cash incentives for non-profit organizations						

#### Table 6-14. Potential Funding Sources



#### Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline
EPA Targeted Watershed Grants			25% of total		
Program			project costs (non-federal)		
http://www.epa.gov/twg/ Requires Gov	ernor nomination.		· · · ·		
DEP CWA Section 319 NPS			40% of total		0.1.1
			project costs		October
			(non-federal)		15
Nonpoint Source Management <u>http://w</u> 20-25 projects targeting both priority w	<u>ww.ct.gov/dep/nps</u> atersheds and sta	<u>s</u> tewide issues			
DEP Section 6217 Coastal NPS					
			N/A		
http://www.ct.gov/dep/cwp/view.asp?as Section 6217 of the CZARA of 1990 re control NPS pollution in coastal waters best available technology for reducing	= <u>2705&amp;q=323554</u> quires the State of . Management me nonpoint source p	<u>&amp;depNav_GID=</u> f Connecticut to easures are ecor collution.	<u>1709</u> implement specific nomically achievab	: management me le measures that	easures to reflect the
DEP Hazard Mitigation Grant			75% Federal /		
Program	07000 005/54		25% Local		
http://www.ct.gov/dep/cwp/view.asp?as local governments for projects that redunatural hazards.	uce or eliminate th	e long-term risk	to human life and	property from the	effects from
Based Restoration Program Partnership					
FishAmerica Foundation	Average	and improve fres	shwater habitats in	portant to migrate	bry fish.
703 510 9691 x247 fishamorica@asaf	\$7,500				
105-517-7071 X247 <u>IISHdifferta@a3ai</u>	istning.org				
Municipal Flood & Erosion Control Board	1/3 project cost	2/3 project cost			
NFWF Long Island Sound Futures Fund Small Grants	\$6,000	\$1,000	Optional (non- federal)	December	March
NFWF Long Island Sound Futures Fund Large Grants	\$150,000	\$10,000	Optional (non- federal)	December	March
631-289-0150 Lynn Dwyer Lynn.Dwye	er@nfwf.org				
NRCS Conservation Reserve Program					
Jan Dybdahl, (860) 871-4018 <u>http://wv</u>	<u>/w.ct.nrcs.usda.gc</u>	<u>. vo</u>			
NRCS Wildlife Habitat Incentives Program (WHIP)	\$50,000/year	\$1,000	25%		
Jan Dybdahl, (860) 871-4018 http://ww For creation, enhancement, maintenan	vw.ct.nrcs.usda.go	ov at; for privately o	owned lands.		
NRCS Environmental Quality Incentives Program (EQIP)	\$50,000/year		25-50%		
Jan Dybdahl, (860) 871-4018 http://ww For implementation of conservation me	w.ct.nrcs.usda.go asures on agricul	ov tural lands.			
NRCS Healthy Forests Reserve Program					
For restoring and enhancing forest ecc	systems http://ww	w.nrcs.usda.gov	v/programs/HFRP/	ProgInfo/Index.ht	m
NRCS Wetlands Reserve Program					



#### Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline	
Nels Barrett, (860) 871-4015 http://www.ct.nrcs.usda.gov For protection, restoration and enhancement of wetlands						
USFS Watershed and Clean Water Action and Forestry Innovation Grants						
http://www.na.fs.fed.us/watershed/gp_i Foresters to implement a challenge gra restoration and protection efforts.	nnovation.shtm Th nt program to pro	nis effort betwee mote watershed	n USDA FS-North health through su	eastern Area and pport of state and	State local	
Corporate Wetlands Restoration Partnership (CWRP)	Typically \$20,000	Typically \$5,000	3 to 1	April and August		
http://www.ctcwrp.org/9/ Can also appl	y for in-kind servio	ces, e.g. surveyi	ng, etc.			
DEP 319 NPS Watershed Assistance Small Grant 860-361-9349 rivers@riversalliance.org	]		40% of total project costs (non-federal)			
Trout Unlimited Embrace A Stream	\$5,000					
USFWS National Coastal Wetlands Conservation Grant Program	\$1 million		50%			
Ken Burton 703-358-2229 Only states of	can apply.					
YSI Foundation	\$60,000		Optional	March	April	
937-767-7241 x406 Susan Miller Susar	n Miller smiller@y	si.com	L			
	Other Finar	ncial Opportur	nities			
Private Foundation Grants and Aware http://www.rivernetwork.org Private fou activities. Many private foundations pos potential funding are provided in the co Congressional Appropriation - Direct	ds ndations are pote st grant guidelines ntact information. Federal Funding	ntial sources of on websites. Tv	funding to support vo online resource	watershed mana s for researching	gement sources of	
State Appropriations - Direct State Fu	uro, Snays, Murpr Indina	19				
http://www.cqa.ct.gov/ Membership Drives						
Membership drives can provide a stable source of income to support watershed management programs.         Donations         Donations can be a major source of revenue for supporting watershed activities, and can be received in a variety of						
ways. User Fees, Taxes, and Assessments						
axes are used to rund activities that do not provide a specific benefit, but provide a more general benefit to the community.  Rates and Charges						
Alabama law authorizes some public utilities to collect rates and charges for the services they provide.						
Stormwater Utility Districts A stormwater utility district is a legal cor storm sewers are maintained in order to assess a fee to all property owners.	Stormwater Utility Districts A stormwater utility district is a legal construction that allows municipalities to designated management districts where storm sewers are maintained in order to the quality of local waters. Once the district is established, the municipality may assess a fee to all property owners					
Impact Fees Impact fees are also known as capital of	ontribution, faciliti	es fees, or syste	em development cl	harges, among ot	her names.	



#### Table 6-14. Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Application s Open	Deadline			
Special Assessments								
Special assessments are created for the	e specific purpose	e of financing ca	pital improvements	s, such as provisi	ons, to serve			
a specific area.		-						
Sales Tax/Local Option Sales Tax								
Local governments, both cities and cour	nties, have the au	uthority to add ac	ditional taxes. Loo	cal governments of	can use tax			
revenues to provide funding for a variety	of projects and	activities.						
Property Tax								
These taxes generally support a signific	ant portion of a c	ounty's or munic	ipality's non-public	c enterprise activi	ties.			
Excise Taxes								
These taxes require special legislation,	and the funds ge	nerated through	the tax are limited	to specific uses:	lodging,			
food, etc.								
Bonds and Loans								
Bonds and loans can be used to finance	e capital improve	ments. These pre	ograms are approp	priate for local gov	vernments			
and utilities to support capital projects.								
Investment Income								
Some organizations have elected to est	ablish their own f	oundations or er	ndowment funds to	o provide long-teri	m funding			
stability. Endowment funds can be estab	olished and mana	aged by a single	organization-spec	ific foundation or	an			
organization may elect to have a commu	unity foundation t	o hold and admi	nister its endowme	ent. With an endo	wment fund,			
the principal or actual cash raised is inve	ested. The organ	ization may elec	t to tap into the pri	ncipal under certa	ain			
established circumstances.		Nu alitu Taa dia a						
Emerging Opportunities For Program	Support Water C	2uality Trading	una in the sustainable		a art of the			
watershed to meet or exceed regulatory	nase credits for	Joilutant reductio	ons in the watershe	ed of a specified p	bart of the			
trading framoworks. Credits can be tradi	of voluntary yoa	lis. There are a r		botwoon NDSs	y cieuli			
trauing traineworks. Credits can be traded, or bought and sold, between point sources only, between NPSS only, of between point sources and NDSs.								
Mitigation and Conservation Banking								
Mitigation and Conservation banks are created by property ewners who restore and/or preserve their lend in its natural								
condition Such banks have been developed by public nonprofit and private entities. In exchange for preserving the								
land, the "bankers" get permission from appropriate state and federal agencies to sell mitigation banking credits to								
developers wanting to mitigate the impacts of proposed development. By purchasing the mitigation bank credits, the								
developer avoids having to mitigate the	impacts of their c	levelopment on	site. Public and no	nprofit mitigation	banks may			
use the funds generated from the sale o	f the credits to fu	nd the purchase	of additional land	for preservation a	and/or for the			
restoration of the lands to a natural state	2.							

Source: Coginchaug River Watershed Based Plan, NRCS, July 2008.



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# Appendix A

Baseline Watershed Assessment Watershed Field Inventories and Land Use Regulatory Review (CD-ROM)

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## Baseline Watershed Assessment Tankerhoosen River Watershed

Friends of the Hockanum River Linear Park of Vernon, Inc.

In Association With:

Town of Vernon North Central Conservation District Rivers Alliance of Connecticut Hockanum River Watershed Association Belding Wildlife Trust

Vernon, CT

May 28, 2008



Fuss & O'Neill, Inc. 78 Interstate Drive West Springfield, MA 01089



#### BASELINE WATERSHED ASSESSMENT Tankerhoosen River Watershed

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#### 1.0 INTRODUCTION

The Friends of the Hockanum River Linear Park of Vernon, Inc. (the "Friends") has retained Fuss & O'Neill to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The Watershed Management Plan will be developed through a collaborative effort with a Technical Advisory Committee consisting of the Friends, the Town of Vernon (Planning Department and Conservation Commission), the North Central Conservation District, the Hockanum River Watershed Association, Rivers Alliance of Connecticut, and the Belding Wildlife Trust. The first part of the plan will consist of an assessment of existing conditions in the watershed, an evaluation of pollutant sources in the watershed to prioritize watershed protection and restoration strategies, as well as prioritization of action items that could be adopted by governmental agencies and private groups to protect and improve the health of the Tankerhoosen River watershed. The recommended plan will be developed to address the priorities and issues identified in previous phases of the plan development, with participation by the Technical Advisory Committee.

#### 2.0 BACKGROUND

The Tankerhoosen River watershed is a small but very important 12.85 square-mile subregional basin within the Hockanum River watershed (<u>Figure 1-1</u>). Approximately 70% of the watershed is located within the Town of Vernon, with the remaining portions within the Towns of Tolland, Bolton, and Manchester (<u>Table 1-1</u>).

Town Name	Town Acreage	Acreage in Watershed	% of Town in Watershed	% of Watershed
Manchester	17,408	461	2.7	5.6
Vernon	11,904	5,572	46.8	67.9
Tolland	25,856	1,547	5.9	18.6
Bolton	9,920	646	6.5	7.9
Totals	65,088	8,226		100.0

Table 1-1: Distribution of Municipalities in the Tankerhoosen River Watershed

A basic profile of the watershed is provided in <u>Table 1-2</u>. Later sections of this document provide more detailed information on these watershed characteristics.





Area	С	12.85 square miles (8,226 acres)
Stream Length	С	approximately 17.2 miles
Subwatersheds	С	10 subwatersheds
Jurisdictions	С	4 towns and cities
Water Quality	С	2006 DEP Impaired Waters List for habitat for fish and
		other aquatic life
Current Impervious Cover	С	9.8%
Subwatersheds Selected for	С	Clarks Brook
Detailed Assessment based	С	Gages Brook
on Vulnerability Assessment	С	Gages Brook South Tributary
	С	Lower Tankerhoosen River
	С	Walker Reservoir
Subwatersheds Selected for	С	Clarks Brook
Detailed Assessment based	С	Gages Brook
on Restoration Potential	С	Lower Tankerhoosen River
	С	Middle Tankerhoosen River
	С	Tucker Brook
Major Transportation Routes	С	Interstates 84 and 384
	С	U.S. Routes 6 and 44
	С	State Routes 30 and 31
Significant Natural and	С	Belding Wildlife Management Area
Historic Features	С	Valley Falls Park
	С	Northern Connecticut Land Trust
	С	Bolton Notch Pond
	С	Walker Reservoir
	С	Talcottville Historic District

Table 1-2:	Profile of the	Tankerhoosen	River \	<b>Vatershed</b>
		1 4111003011	111001	vatorshou

The high water quality (classified as A) in the upper regions of the Tankerhoosen River sustain a significant natural resource of the State of Connecticut —the Belding Wild Trout Management Area, one of only two Class I wild trout areas east of the Connecticut River. The importance of these small, high quality watersheds to the downstream health of the larger river basins, and therefore to Long Island Sound, is well recognized. Of utmost importance to these high quality watersheds is protection of the headwaters regions.

The headwaters region of the Tankerhoosen River is bisected by Interstate 84. Recent development pressure in this headwaters region at the Exit 67 interchange in Vernon poses a major threat to the long-term health of the watershed. Further stresses on the headwaters have been created by development of an industrial park in Tolland through which a key headwater stream flows, as well as the presence of the highway itself, which continues to generate increasing traffic loads from development along the I-84 corridor. There has also been declining water quality in the lower reaches of the Tankerhoosen River in recent years. The lower region of the watershed is classified as "B", and was cited as impaired in the DEP's most recent "List of Connecticut Waterbodies Not Meeting Water Quality Standards".



The importance of protecting the pristine upper region of the Tankerhoosen is recognized by both local and state agencies. The 2000-2004 State Plan of Conservation and Development identifies the riverway as a proposed preservation and conservation area. The Vernon Open Space Plan proposes a greenway plan of 2000 preserved acres along the Tankerhoosen. Most recently, the Nature Conservancy has identified several key watersheds in the state that it considers particularly important to the future protection of Long Island Sound, including the Tankerhoosen River watershed. The need for local decision-makers to give utmost consideration to the environmental consequences of development proposals that would impact the River, has been expressed by The Nature Conservancy (TNC) and by the Connecticut Department of Environmental Protection (DEP).

To address these very real and immediate threats, the Friends began a watershed assessment for the Tankerhoosen River in March 2007. The objective of this initial assessment was to describe and understand the overall health, quality and flow of waters within the watershed and to identify potential threats to water quality in the watershed. The assessment included water quality monitoring and natural resource inventories to begin establishing baseline conditions against which future monitoring can be measured. The next step in the watershed planning process is to develop a comprehensive management plan that will provide guidance to local decision-makers and to serve as an educational tool and reference document for those interested in protection of the Tankerhoosen River.

#### 3.0 DEVELOPMENT OF THE BASELINE ASSESSMENT

The initial task in developing a Watershed Management Plan for the Tankerhoosen River is to develop an understanding of baseline, or existing conditions in the watershed. To accomplish this, the following tasks were completed:

- Reviewed existing watershed data, studies, and reports;
- Compiled and analyzed available Geographic Information System (GIS) data for the watershed;
- Consulted with the Technical Advisory Committee, the watershed municipalities, and the regional planning agency regarding available land use information, mapping, and land use planning regulations;
- Identified and delineated subwatersheds within the over Tankerhoosen River watershed; and
- Conducted a comparative subwatershed analysis to prioritize watershed field inventories and management plan recommendations.

The results of this watershed inventory are presented in this document, including a description of current watershed conditions for the following categories:

- Geological and historical perspective;
- Natural resources including hydrology, water quality, wetlands and watercourses, fish and wildlife resources and habitat;
- Watershed modifications including dams, water supply, wastewater discharges, and regulated sites; and
- Land use and land cover.



In addition, the results of a comparative subwatershed analysis are also presented.

#### 4.0 GEOLOGIC AND HISTORICAL PERSPECTIVE

#### 4.1 <u>Geology</u>

The State of Connecticut is comprised of three distinct geologic units divided longitudinally across the state. These three units are known as the Western Uplands, the Central Valley, and the Eastern Uplands. The Western and Eastern Uplands are comprised of metamorphic rocks —rocks subjected to intense heat and pressure of the Earth's interior —while the Central Valley is a younger unit comprised of sedimentary rocks. The Central Valley began forming about 225 million years ago when the super-continent Pangaea began to break apart. A large rift formed a long, narrow valley through the middle of the state, eventually filling with sediments from the eroding hills to the east and west (presently known as the Eastern and Western Uplands). The sediments were compacted into soft, easily eroded, red and brown sandstones through which the Connecticut Rivers flows.

The Tankerhoosen River watershed is almost entirely within the Eastern Uplands. The westernmost portion of the watershed is located within the Central Valley. The boundary between the Central Valley and the Eastern Uplands is located near the Vernon-Manchester town line and known as the Bolton Range. The Bolton Range was formed as a result of the different rates of erosion of the less resistant sediments of the Central Valley creating an abrupt rise into the resistant rocks of the Eastern Uplands.

Drastic changes in the surficial geology have occurred within Connecticut since the formation of these geologic regions. Above the sandstone of the Central Valley and the metamorphic bedrock of the Eastern Uplands lie extensive glacial deposits, or "glacial till," left as the large glaciers receded. Melting glacier ice formed rivers which sorted glacial till into layers of sand and gravel, or "stratified drift." The Tankerhoosen River flows through hills of glacial till in the steep Eastern Uplands and then drops into the stratified drift of the Central Valley (Bell, 1985).

#### 4.2 <u>Population and Industry</u>

Beginning about 10,000 years ago, as the last glacial ice retreated from New England, Native American populations settled Connecticut and the areas along the Tankerhoosen River. The river was used by Native Americans as a source of fish and a travel route to the Connecticut River (Hockanum River Watershed Association, 1998). The Podunks of East Hartford and Manchester, the Nipmucks of Ellington and Tolland were among the tribes that farmed corn in the fertile river floodplains of the Tankerhoosen River. In addition to agriculture, the tribes used the land within the watershed for hunting, gathering, and fishing.

European settlers brought a marked change in land use to Connecticut. Land was cleared and agriculture was the primary use through the Revolutionary War era. However, the availability of more fertile lands in western New York, northern Ohio, and Pennsylvania led to the great migration of Connecticut farmers during the 1800s. Those who stayed worked in the many factories that arose along the rivers and streams, and manufacturing became a major economic force (Gibbons et al., 1992).



The Tankerhoosen River was no exception to the development patterns across Connecticut. From the headwaters at Gages Brook, the elevation drop of the Tankerhoosen River was ideally suited to power a wide variety of mills. During the eighteenth and nineteenth centuries, several mills associated with the textile, cotton-wool, energy, and paper industries were built near these waterfalls and in other areas in the watershed. The Talcottville Historical District is located in southwestern portion of the Tankerhoosen River watershed near the confluence with the Hockanum River. One of the first cotton mills in America was built by Peter Dobson in the early 1800's in Talcottville. The mill burned down in 1909, not to be rebuilt. Peter Dobson is also famous for early observations that ice may have played a role in the erosion and transport of rock in the region.

The Vernon Depot, located within the watershed on Church Street, was an active transportation center during the early part of the twentieth century. The Hartford, Providence and Fishkill Railroad ran seven times a day at the Depot, with connections to Rockville. The Keystone Arch on Tunnel Road (also known as the Keystone Tunnel) was constructed circa 1850 to allow trains to traverse Tunnel Road without disrupting street traffic toward Vernon Center. The 108-foot long tunnel is constructed of 30 arches, each of which consists of a center keystone with nine stones forming the curves on either side. The tunnel is considered by historians to be a fine piece of historic architecture and as a monument to the integrity and skilled workmanship of its builders.

Valley Falls was the site of the first industry in Vernon, a saw mill, in 1740. Valley Falls Park hosted a small mill complex for flaxseed oil and cotton between 1850 and 1877. Beginning in the mid-1800s until the mid-1900s the property was converted into farmland for producing corn, hay, oats, butter, and cheese. In 2001, the historic farmhouse and six outbuildings were purchased by the Friends of Valley Falls, Inc. to ensure preservation of the historical complex. Alternate forms of manufacturing power put most of the mills out of business by the late 1950s. Dozens of the mill buildings and their associated dams remain an integral component of the river.

Rapid population growth in the post-war era of the 1950s and 1960s slowed significantly as developable land became scare (see <u>Figure 4-1</u>). Today, the population of the Tankerhoosen River watershed is approximately 16,000, which is more than double the population of the watershed in the 1950s. Commercial and residential development has occurred in the watershed since the 1970s, with a continued decline in industrial uses. Significant commercial development along the major transportation corridors and residential development in the watershed has increased watershed impervious coverage and contributed to degraded water quality in portions of the Tankerhoosen River and its tributaries. Numerous historical impoundments within the watershed also continue to serve as barriers to fish passage along the Tankerhoosen River and its tributaries.

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Source: Connecticut Population Projections, Series 95.1, Office of Policy and Management, September 1995



#### 4.3 <u>Recreation Resources</u>

The Tankerhoosen River provides many opportunities for recreational activities, such as fishing, swimming, and limited boating. Along the river, there are both town and state lands that are preserved for parks, wildlife sanctuaries and rail-trails. Recreational activities in these areas include hiking, biking, cross-country skiing, ice skating, nature observation, and aesthetic enjoyment.

Some of the prominent recreational centers in the watershed include the Walker Reservoir East, the Belding Wildlife Management Area, Valley Falls Park, Bolton Notch Pond, Freja Park, the Rails-to-Trails, and Phoenix Mill Park. Each of these areas provides parking, picnicking, and trails for walking and cross-country skiing. The Belding Wildlife Management Area was the location of the first Class I Trout Management Area in Connecticut. Recreational areas that also have historical significance include the Dobsonville Pond and Talcottville Pond. Additionally, the area associated with the confluence of the Tankerhoosen and Hockanum Rivers includes a privately owned recreational facility and is the starting point for the annual Manchester Canoe and Kayak Race.

#### 4.4 <u>Watershed Restoration Efforts</u>

The Connecticut River Watch Program (CRWP), a volunteer water quality monitoring, protection, and improvement program for the Connecticut River and its tributaries, is working closely with the Hockanum River Watch Program (HRWA) and North Central Conservation District to develop and support a community-based river monitoring and assessment program in the Tankerhoosen River watershed. The CRWP monitoring program has included stream

walk surveys and rapid bioassessments (cost-effective biological survey techniques) along the Tankerhoosen River, as well as other areas of the larger Hockanum River watershed. The Connecticut DEP also conducts routine ambient water quality and benthic monitoring at approximately twelve locations along the Hockanum and Tankerhoosen Rivers. The data assist in documenting the chemical and biological quality of surface waters within the watershed and will be used to support the development of a Total Maximum Daily Load (TMDL), which will address sources of water quality impairment in the Hockanum and Tankerhoosen Rivers.

Baystate Environmental Consultants, Inc. (BEC) conducted a feasibility study in 2002 for the dredging of Tankerhoosen Lake and subsequently prepared a Watershed Management Plan for Tankerhoosen Lake in 2004. The plan identified watershed factors that have directly affected or have the potential to affect the water quality and overall health of Tankerhoosen Lake. The project recommended a Town-wide approach for reducing the quantity of pollutants, specifically sediment and nutrients, reaching Tankerhoosen Lake. BEC personnel conducted field observations of the major contributing watercourses and impoundments in the Tankerhoosen Lake watershed to identify point sources of sediment and nutrients as well as nonpoint source pollutants. BEC recommended that the Town of Vernon require the implementation of stormwater best management practices (BMPs) that maximize to the extent practicable, the removal of total suspended solids and nutrients. In addition to the lake dredging project recommended in the feasibility study, BEC also recommended several structural and nonstructural elements, including a sediment trap at the inlet of Tankerhoosen Lake, installation of deep sump catch basins at key locations, maintenance of cross-culverts and drainage structures, and grass swales and vegetated filter strips. None of the BEC recommendations has been implemented to date.

#### 5.0 NATURAL RESOURCES

#### 5.1 <u>Hydrology</u>

The Tankerhoosen River watershed is 12.85 square-miles, with the majority of the watershed (approximately 70 percent) located within the Town of Vernon (Figure 1-1). Gages Brook and its associated southern tributary comprise the headwaters region of the watershed, eventually flowing into Walker Reservoir East. Gages Brook is located in the northwest portion of the Town of Vernon and within the western portion of neighboring Tolland. A few small impoundments are located within the Gages Brook watershed. The brook receives drainage from the I-84 corridor near the Vernon-Tolland town boundary. In Tolland, Gages Brook flows through an industrial park and residential areas.

Walker Reservoir is no longer an active public water supply but rather a recreational resource that attracts hikers, fisherman, and ice skaters. The Tankerhoosen River, which is a moderately sized (16 feet wide) upland stream, originates at the outlet of Walker Reservoir East and bisects the Town of Vernon on the south side of Interstate 84. The river flows southwest for approximately five miles to the Hockanum River in the Talcottville section of Vernon.



Barrows Brook, Rickenback Brook, and several other small tributaries drain the eastern portion of the upper Tankerhoosen River watershed between Walker Reservoir and the confluence with Railroad Brook near Webster Pond. Barrows Brook is the furthest upstream tributary to the Tankerhoosen River and flows through undeveloped, privately owned land. Rickenback Brook flows east to west through a relatively undeveloped portion of Vernon and discharges to the Tankerhoosen River approximately 0.4 miles upstream of the river's confluence with Railroad Brook. Portions of this brook are within the Belding Wildlife Management Area and have been established for catch and release trout fishing (BEC, 2004).

Railroad Brook drains the southern portions of the watershed, beginning at Bolton Notch Pond in Bolton, and flows north through Valley Falls Park and the Belding Wildlife Management Area before joining the Tankerhoosen River. Valley Falls Pond is located along Railroad Brook within the confines of the Valley Falls Park property. Railroad Brook flows through primarily undeveloped land and discharges to the Tankerhoosen River approximately 1.6 miles upstream of Tankerhoosen Lake (BEC, 2004).

Clarks Brook and Tunnel Brook join the Tankerhoosen River in the middle portion of the watershed prior to the river's confluence with the DEP-owned Tankerhoosen Lake, the first of three DEP-owned run-of-river ponds. Clarks Brook originates north of I-84 and drains primarily industrial/commercial and undeveloped land within the Town of Vernon. Clarks Brook discharges to the Tankerhoosen River approximately 0.5 miles upstream of the river's confluence with Tunnel Brook. Tunnel Brook is located in the central portion of Vernon, flowing north to south and crossing the I-84 corridor. The brook empties into the Tankerhoosen River approximately 0.65 miles upstream of the inlet to Tankerhoosen Lake (BEC, 2004).

Dobsonville Pond is located just downstream of Tankerhoosen Lake. Tucker Brook, which drains the southeastern portion of the watershed and a residential section of the Town of Manchester, joins the Tankerhoosen River immediately upstream of Dobsonville Reservoir dam. Further downstream is Talcottville Pond and the confluence with the Hockanum River near the Vernon/Manchester town line.

Overall the Tankerhoosen River is comprised of a large percentage of first and second order (i.e., headwater) streams according to the Strahler Stream Order classification system. Stream hydrology and water quality in headwater streams are important components of ecosystem health because they are a critical food source for the entire river, influence downstream conditions, and support biodiversity.

Ten subwatersheds within the Tankerhoosen River watershed have been delineated for the purposes of this assessment. The subwatershed delineations are based on the CTDEP local basin delineations, modified slightly based on surface water hydrology and grouped accordingly to facilitate assessment and development of watershed management plan recommendations. <u>Figure 5-1</u> depicts the subwatersheds identified in this assessment, and <u>Table 5-1</u> summarizes the basic characteristics of the identified subwatersheds.

Subwatershed	Acronym	Area (acres)	Area (square miles)
Bolton Notch Pond	BNP	344	0.54
Clarks Brook	СВ	647	1.01
Gages Brook	GB	695	1.09
Gages Brook South Tributary	GBST	680	1.06
Lower Tankerhoosen River	LTR	321	0.50
Middle Tankerhoosen River	MTR	1,578	2.46
Railroad Brook	RB	1,208	1.89
Tucker Brook	TB	934	1.46
Upper Tankerhoosen River	UTR	1472	2.30
Walker Reservoir	WR	347	0.54
Tankerhoosen River Watershed		8,226	12.85

Table 5.1.	Tankarhoosan	Divor	Subwatersheds
	Talikeliiuuseli	River	Supwatersneus

The Tankerhoosen River Watershed is located in an area with a temperate and humid climate. Based on historical climate information available from the NOAA National Weather Service weather station in Harford/Bradley International Airport in Windsor Locks, Connecticut, precipitation is generally well-distributed throughout the year with the wettest conditions in August and November and driest in February (worldclimate.com for Hartford/Bradley International Airport, Hartford County). In Windsor Locks, the mean annual precipitation over a 41-year period of record is 44.4 inches, and the 24-hour average temperature ranges from a high of 73.6°F in July to a low of 24.6°F in January.

Generally, the designated 100-year floodplain of the Tankerhoosen River is confined along a narrow corridor (<500 feet wide) surrounding the river. The entire length of the Tankerhoosen River is within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain, with the exception of a small reach near the river's headwaters, between Reservoir Road and Fish and Game Road. The lower reach of Railroad Brook (below Valley Falls Pond including the pond) is also within the 100-year floodplain. Walker Reservoir West and East and portions of Gages Brook also lie within the designated 100-year floodplain (BEC, 2004).



Figure 5-1: Tankerhoosen River Subwatersheds



#### 5.2 <u>Water Quality</u>

#### 5.2.1 Classifications and Impairments

The Federal Clean Water Act (CWA) was developed to protect the nation's surface waters. Through authorization of the CWA, the United States Congress declared as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water wherever attainable". Connecticut Water Quality Standards are established in accordance with Section 22a-426 of the Connecticut General Statutes and Section 303 of the CWA. The Water Quality Standards are used to establish priorities for pollution abatement efforts. Based on the Water Quality Standards, Water Quality Classifications establish designated uses for surface and ground waters and identify the criteria necessary to support these uses. The Water Quality Classification system classifies inland surface waters into four different categories ranging from Class AA to D. <u>Table 5-2</u> summarizes the Connecticut Surface Water Quality Classifications.

Table 5-2: Connecticut Inland Surface Water Quality Clas	sifications
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Designated Use	Class AA	Class A	Class B	Class C	Class D	
Existing/proposed drinking water supply	•					
Potential drinking water supply	•	٠				
Fish and wildlife habitat	•	٠	٠	Class C and D waters may be suitable for certain fish and wildlife habitat, certain recreational activities, industrial use, and navigation		
Recreational use	•	•	•			
Agricultural and industrial use	•	•	•			

Source: DEP Surface Water Quality Standards, December 17, 2002

<u>Figure 5-2</u> depicts the Water Quality Classifications of surface waters in the Tankerhoosen River watershed. Surface waters throughout the Tankerhoosen River watershed are classified as Class A with the exception of the Tankerhoosen Lake, Dobsonville Pond, and Talcottville Pond which are classified as Class B/A.

The CWA (Federal Clean Water Act) requires states to:

- 1. Adopt Water Quality Standards,
- 2. Assess surface waters to evaluate compliance with Water Quality Standards,
- 3. Identify those waters not currently meeting Water Quality Standards, and
- 4. Develop Total Maximum Daily Load (TMDL) analysis and other management plans to bring water bodies into compliance with Water Quality Standards.

A portion of the Tankerhoosen River does not meet Water Quality Standards for at least one of the designated uses. The impaired segment consists of the lower 1.51 miles of the Tankerhoosen River from Tankerhoosen Lakes to its confluence with the Hockanum River. The impaired uses include habitat for fish, other aquatic life, and wildlife. The causes and sources of impairment in the lower reaches of the Tankerhoosen River have not been identified and are currently listed as "unknown." TMDLs provide the framework to restore impaired waters by establishing the maximum amount of a pollutant that a water body can

assimilate without adverse impact to aquatic life, recreation, or other public uses. The 2006 List of Connecticut Waterbodies Not Meeting Water Quality Standards includes a priority ranking system for development of a TMDL specific to the contaminants in each impaired segment: high (H), medium (M), low (L), or under study (T). DEP has identified the impaired segment of the Tankerhoosen River as a high priority for development of a TMDL to restore the impairment. <u>Table 5-3</u> summarizes the location and nature of the impairment.

Location Description	Waterbody Segment Length	Impaired Designated Use	Use Support	Cause	TMDL Priority	Potential Source
From mouth at Hockanum River , upstream to Tankerhoosen Lake	1.51 miles	Habitat for Fish, Other Aquatic Life and Wildlife	Ρ	Impairment Unknown	Н	Source Unknown

Table 5-3:	Tankerhoosen	River	Watershed	Impaired	Waters

Source: DEP, 2006

H —high priority for which there is assessment information that suggests that a TMDL may be needed to restore the water quality impairment.

P – partially supporting

#### 5.2.2 Tankerhoosen River Watershed Water Quality Monitoring Study

A water quality monitoring study was conducted in October and November 2006 to establish current baseline water quality conditions in the watershed, identify water quality impacts, and begin to develop a water quality database for the watershed (Fuss & O'Neill, 2007). Chemical water quality monitoring and biological assessments were conducted during dry and wet weather conditions. Samples were collected from fourteen locations throughout the watershed on four occasions (Figure 5-2). A variety of parameters were measured including pH, temperature, dissolved oxygen, and conductivity, which all reported values within normal ranges. These results indicate that the water quality of the watershed is generally good. However, some of the measured parameters including turbidity, metals, nitrogen, phosphorus, and bacteria highlighted some of water quality issues in the watershed. A brief discussion of the water quality parameters and identified issues is provided below:

#### Turbidity

Based on the wet weather monitoring results, excessive turbidity is a water quality issue in the Tankerhoosen River and its tributaries, particularly Gages Brook (Figure 5-3). Stream channel erosion and stormwater runoff from impervious surfaces and construction sites are potential sources of the observed turbidity during large precipitation events such as the August 2006 wet weather monitoring event, although it is difficult to attribute the turbidity excursions to a particular source. During the August 2006 wet weather monitoring event, turbidity measurements generally exhibited a declining trend from upstream to downstream within the watershed. Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries.



Surface Water Bodies and DEP Surface Water Quality Classifications

Data Source: Connecticut Department of Environmental Protection Map printed November 2007.

Figure 5-2: DEP Water Quality Classifications

F:P2005\0257\A20\ArcMap\SurfaceWater.mxd

FUSS&O'NEILL



Figure 5-3: Turbidity – Tankerhoosen River Watershed

#### Metals

The monitoring data suggest a wet weather source of metals to Gages Brook (Figure 5-4 and Figure 5-5). Results from the August 2006 monitoring event indicate a wet weather source of metals close to the I-84 crossing of Gages Brook, as the dissolved copper concentration was consistently below detection limits at the Gages Brook headwaters monitoring location (GB1) and in excess of the chronic aquatic life criterion at several of the downstream Gages Brook locations. The highest wet weather lead concentration was measured in the Gages Brook monitoring location immediately downstream of I-84, which further suggests that highway runoff is a likely source of metals to Gages Brook. Exceedances of the CT WQS for lead were also measured along the Tankerhoosen River at the Fish and Game Road. (TR1) and Bolton Road (TR2) monitoring locations. Elevated dissolved copper and lead concentrations were also measured at the Clarks Brook monitoring location. The data suggest that metals are a potential source of impairment in Gages Brook, Clarks Brook, and the Tankerhoosen River during wet weather. The November 2005 results also indicate dry weather sources of dissolved copper to Gages Brook between the headwaters monitoring location (GB1) and the monitoring location behind the Tolland Agricultural Center (GB2).





Figure 5-4: Dissolved Copper – Tankerhoosen River Watershed



Figure 5-5: Lead – Tankerhoosen River Watershed



#### Nitrogen & Phosphorus

Many of the monitoring locations exceeded the EPA recommended Total Nitrogen criterion for rivers in Ecoregion XIV of 0.71 mg/L (Figure 5-6). Nitrogen concentrations were consistently higher at the Gages Brook monitoring locations than the other monitoring locations in both wet and dry weather.



Figure 5-6: Nitrogen Species – Tankerhoosen River Watershed

Phosphorus concentrations measured during the wet and dry weather events significantly exceeded the CT WQS and EPA criterion at most locations (Figure 5-7). The elevated phosphorus levels are an indicator of potential organic enrichment and algal growth in water bodies along the Tankerhoosen River and its tributaries, which could impair aquatic life support and contact recreation under certain conditions.



Figure 5-7: Phosphorus – Tankerhoosen River Watershed

#### Indicator Bacteria

Elevated levels of indicator bacteria (total coliform and *E. coli*) were measured at all monitoring locations during the October 2006 wet weather monitoring event, suggesting stormwater runoff and other non-point sources (pet waste, waterfowl, septic systems, etc.) as likely contributors of elevated pathogen levels in the Tankerhoosen River and its tributaries. Dry weather indicator bacteria concentrations were much lower than wet weather. Natural sources of indicator bacteria such as waterfowl or wildlife may have contributed to several dry weather exceedances of the CT WQS for total coliform at the Gages Brook monitoring location behind the Tolland Agricultural Center and at the Tankerhoosen River monitoring location just upstream of Fish and Game Road.

#### **Bioassessment Results**

The 2006 bioassessment data (RBV and Fuss & O'Neill data collectively) vary considerably by site, but generally indicate very good water quality at most of the monitoring locations, with the exception of the lower Tankerhoosen River near the confluence with the Hockanum River and downstream of Dobsonville Pond. This finding is consistent with previous impairments identified in the lower reaches of the Tankerhoosen River by the CTDEP. Despite the water quality issues identified in Gages Brook, Clarks Brook, and in certain reaches of the



Tankerhoosen River (i.e., heavy metals, turbidity and suspended solids, and potential nutrient enrichment), the 2006 bioassessment data indicate little or no impairment to the benthic communities at the monitored locations.

#### 5.3 <u>Wetlands</u>

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Wetlands and buffer zones between watercourses and developed areas help to preserve stream water quality by filtering pollutants, encouraging infiltration of stormwater runoff, and protecting against stream bank erosion.

Wetlands in Connecticut are designated by soil classification. <u>Figure 5-8</u> depicts the extent and distribution of wetland soils in the Tankerhoosen River watershed based on Natural Resources Conservation Service soil classifications. <u>Figure 5-8</u> also depicts wetland mapping available from the U.S. Fish & Wildlife Service National Wetlands Inventory. Wetlands soils comprise 11.3% of the overall watershed (approximately 926 acres), while 4% of the watershed area (approximately 320 acres) is mapped as freshwater emergent wetlands or freshwater forested/shrub wetlands. The concentration of wetland soils is generally higher in the undeveloped portions of the watershed. Mapped wetland soils are generally located in riparian and floodplain areas along the Tankerhoosen River and its major tributaries. <u>Table 5-4</u> summarizes wetland soils coverage by subwatershed.

Subwatershed Name	Wetland Soils Area (ac)	% of Subwatershed
Bolton Notch Pond	20	5.8 %
Clarks Brook	101	15.5 %
Gages Brook	111	15.9 %
Gages Brook South Tributary	34	5.1 %
Lower Tankerhoosen River	7	2.3 %
Middle Tankerhoosen River	188	11.9 %
Railroad Brook	136	11.3 %
Tucker Brook	109	11.7 %
Upper Tankerhoosen River	193	13.1 %
Walker Reservoir	27	7.6 %
Tankerhoosen River Watershed	926	11.3%

Table 5-4: Wetland Soils Coverage in the Tankerhoosen River Subwatersheds



At least twenty vernal pools have been identified within the Tankerhoosen watershed by certified scientists (see <u>Figure 5-8</u>). The majority of these were cited by Mr. Ed Pawluk of Connecticut Ecosystems, LLC in a study conducted for the Vernon Conservation Commission. Several of these pools are considered exemplary vernal pools, and as such merit the highest possible level of protection and conservation (Connecticut Ecosystems, LLC, 2005).

In 1993, a comprehensive survey of plant life was conducted in the 1,400-acre watershed from Valley Falls Park in Vernon to Bolton Notch State Park in Bolton (Sexton, 1993). The study was sponsored by the Town of Bolton Conservation Commission and the Town of Vernon Conservation Commission. A total of 345 species representing 82 families were identified. A small band of marble exists a short distance north and south of the cut at Bolton Notch. A plant species unique to this area includes the Yellow Lady's Slipper. Marble is rare east of the Connecticut River and supports additional plants preferring more basic soil including the purple cliff-brake and maidenhair fern (Sexton, 1993).







#### 5.4 Fish and Wildlife Resources

Portions of the Tankerhoosen River have abundant habitats supportive of a variety of fish and wildlife. Various waterbodies, wetlands, and upland areas provide habitat to fish, mammals, amphibians, and birds.

Particularly notable is the 282-acre Belding Wildlife Management Area located in the central portion of the Tankerhoosen River watershed. The Belding Wildlife Management Area is a significant natural resource of undeveloped land owned by the State of Connecticut and managed by the DEP. A 1.4-mile section of the Tankerhoosen River within the Belding Wildlife Management Area is managed as a Class 1 Wild Trout Management Area and is one of only two such areas in eastern Connecticut. This section of stream is characterized by natural reproduction sufficient to produce robust populations of native brook trout (up to 8-10 inches) and wild brown trout (up to 10-11 inches) exhibiting above average growth rates (DEP correspondence, 2003).

Areas in the Tankerhoosen River watershed that provide significant habitat are summarized in <u>Table 5-5</u>. These areas provide habitat for some of the most valuable or unique natural resources or ecosystems in their respective communities. Other open space areas are described in the Land Use and Land Cover section of this report.

Town	Areas
Vernon	<ul> <li>Vernal Pools on Box Mountain</li> <li>Tancanhoosen LLC Parcel</li> <li>Talcottville Gorge</li> <li>Belding Wildlife Management Area</li> <li>Belding Wild Trout Management Area</li> <li>Valley Falls Park</li> <li>Rambling Ridge Property</li> <li>Northern Connecticut Land Trust Properties</li> </ul>
Tolland	Tolland and Charter Marshes
Bolton	<ul><li>Freja Park</li><li>Bolton Notch State Park</li></ul>

 Table 5-5: Areas Providing Habitat for Valuable or Unique Natural Resources

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

Freja Park is a 21-acre, wooded town-owned area located west of Bolton Notch Pond. Freja Park serves as a gateway for the 1,400-acre Bolton Notch/Valley Falls watershed area. The town of Bolton originally acquired the property in 1968, but the park suffered from abuse and neglect. Beginning in March 1998, restoration efforts have been underway including numerous Earth Day Clean-up events with the help of volunteers, Boy Scouts, Conservation Commission members. A total of over two tons of litter have been removed from the park.



#### 5.4.1 Fisheries

The Tankerhoosen River historically hosted large runs of many anadromous fish species. Development of the river with dams from 1700 to the 1920s created barriers to fish migration, which extirpated the salmon run and severely limited the upstream habitat for shad and river herring. Despite these obstacles, the Tankerhoosen River and its tributaries support a variety of fish species as detailed in <u>Table 5-6</u>.

The Tankerhoosen River is a cold water stream starting only a short distance below Walker Reservoir. The generally cold water temperatures in the Tankerhoosen are the result of extensive spring water inputs (DEP correspondence, 2008).

As indicated previously, the Belding Wild Trout Management Area in the upper portions of the Tankerhoosen River watershed is a Class 1 Wild Trout Management Area with self-sustaining native trout populations that rank among the best of their kind in the state. Portions of the remainder of the Tankerhoosen River are stocked annually by the DEP Inland Fisheries Division. Valley Falls Park Pond is stocked in the spring and winter with about 4,400 rainbow trout and generates between 7,500-8,000 angler hours of fishing annually. Walker Reservoir, upstream of the Belding Wildlife Management Area, is stocked each spring with over 1,800 adult brown and rainbow trout (DEP correspondence, 2003).

	Bolton	Gages	Lower	Middle	Upper	Railroad
	Notch	Brook	Tankerhoosen	Tankerhoosen	Tankerhoosen	Brook
	Pond		River	River	River	
American Eel				Х	Х	Х
Brown Bullhead	Х					Х
Black Crappie	Х				Х	
Blacknose Dace		Х		Х	Х	Х
Brook Trout		Х		Х	Х	Х
Brown Trout			Х	Х	Х	Х
Bluegill	Х		Х	Х	Х	Х
Chain Pickerel	Х		Х	Х		
Common Shiner				Х	Х	Х
Creek Chub				Х	Х	
Fallfish				Х	Х	
Fathead Minnow		Х				
Golden Shiner	Х			Х	Х	
Longnose Dace				Х	Х	
Largemouth Bass		Х	Х	Х	Х	Х
Pumpkinseed	V	V	Y	V	Y	V
Sunfish	~	~	Λ	~	~	~
Rainbow Trout				Х	Х	Х
Rockbass			Х			
Smallmouth Bass			Х			
Tessellated Darter			Х	Х	Х	
White Sucker		Х		Х	Х	Х
Yellow Perch	Х			Х		Х
Tiger Trout					Stocked in Pond	
Golden Trout					Stocked in Pond	

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#### Table 5-6: Fish Species


#### 5.4.2 Birds

Bird surveys were conducted in 2004 at the Tancanhoosen LLC property, within Valley Falls Park, and at various Town of Vernon properties, including areas around Walker Reservoir East and on the Connecticut Light & Power line site.

Eighty bird species were detected during the 2004 surveys. Seventy four species were counted during standardized bird counts at 24 count points, and 6 more were detected as incidental observations. The greatest number of species occurred at Walker Reservoir, while the former gravel pit on the Tancanhoosen LLC property contained the most uncommon birds. Prairie warbler, field sparrow, brown thrasher and eastern towhee were detected on the Tancanhoosen LLC property throughout the breeding season. Populations of these species are declining and brown thrasher is on Connecticut's list of Species of Special Concern. These birds are dependent on early successional habitats such as grassland and shrubland. These habitat types have been lost to reforestation and human development. The gravel pit is at an early successional stage with open, grassy habitat and short, scattered pine trees. This site will eventually revert to a forested habitat unless actively managed to maintain early successional habitat. Once the site is reforested, early successional species will disappear from this site (Seymour, 2004).

The Tankerhoosen River watershed also supports a wide range of bird of species. Surveys performed in 2003 and 2004 reported evidence of great blue heron, wood duck, willow flycatcher, hermit thrush, black-throated blue warbler, broad-winged hawk, hairy woodpecker, pileated woodpecker, olive-sided flycatcher, yellow-throated vireo, red-breasted nuthatch, blue-gray gnatcatcher, Nashville warbler, pine warbler, blackpoll warbler, blackburnian warbler, cerulean warbler, worm-eating warbler, and Canada warbler. European starling and house sparrow, two introduced invasive species, were also identified (Seymour, 2004). A complete species list is provided in <u>Appendix A</u>.

During 1999, a bird survey was completed to determine the species diversity and the relative abundance of breeding landbirds within Freja Park and Bolton Notch State Park (Comins, 1999). Of the total 55 species were recorded, 51 were likely nesting species and four were probably non-nesting visitors or migrants. An additional fourteen species were not recorded on the survey, but were identified as likely to occur during the nesting season. Another twenty-nine species have reasonable possibility of occurring in the nesting season from time to time or could be attracted to the area. Two Connecticut State Species of Special Concern were recorded; six species were listed as National Audubon Society Watch List High Conservation Priority species in Connecticut were recorded; an additional six species not listed as watch species were listed by Partners in Flight as High Conservation Priority Species in Connecticut; fourteen species that were uncommon nesters in the Hartford area were recorded (Comins, 1999). See report for additional listing of specific species.

## 5.4.3 Amphibians & Reptiles

Amphibian and reptile surveys were conducted in 2004 within the Tankerhoosen River watershed, including the Belding Wildlife Management Area, Barrows Brook, and Railroad Brook. Some of the species identified included Northern redback salamander, Northern two-lined salamander, Spotted salamander, American toad, Northern spring peeper, Gray treefrog,



Wood frog, Green frog, Pickerel frog, Painted turtle, and Garter snake. The most abundant amphibian species detected during this study was the northern redback salamander. A complete list of the identified amphibian and reptile species is included as <u>Appendix A</u>. A previously undocumented vernal pool was discovered between Reservoir Road and Walker Reservoir West. Additional vernal pools were identified on Bolton Road and above Valley Falls Park (Seymour, 2004).

## 5.4.3 Threatened and Endangered Species

The DEP Natural Diversity Data Base (NDDB) maintains information on the location and status of endangered, threatened, and special concern species in Connecticut. Figure 5-9 displays the generalized areas of endangered, threatened, and special concern species in the Tankerhoosen River watershed. The areas represent a buffered zone around known species or community locations. The locations of species and natural community occurrences depicted on the NDDB mapping are based on data collected over the years by the Environmental and Geographic Information Center's Geologic and Natural History Survey, other units of the DEP, conservation groups, and the scientific community. Approximately ten such areas were identified throughout the watershed. Because new information is continually being added to the Natural Diversity Database and existing information updated, the areas are reviewed on an annual basis by the DEP. Areas can be removed or added based upon the results of the review.

Common Name	Scientific Name	Status			
Flora					
Climbing fern	Lygodium palmatum	Special Concern			
Sphagnum	Sphagnum pulchrum				
Beaked sedge	Carex rostrata				
Leatherleaf	Chamaedaphne calyculata				
Fauna					
Eastern pearlshell	Margaritifera margaritifera	Special Concern			
Brown thrasher	Toxostoma rufum	Special Concern			
Southern bog lemming	Synaptomys cooperi	Special Concern			
Wood turtle	Clemmys insculpta	Special Concern			
Purple martin	Progne subis	Threatened			
Eastern box turtle	Terrapene c. carolina	Special Concern			
Habitats					
Medium fen					
Subacidic rocky summit/outcrop					

Table 5-7: Endangered, Threatened, and Special Concern Species

Source: DEP Natural Diversity Data Base, 2008.

- "Endangered Species" means any native species documented by biological research and inventory to be in danger of extirpation (local extinction) throughout all or a significant portion of its range within Connecticut and to have no more than five occurrences in the state.
- "Threatened Species" means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within Connecticut and to have no more than nine occurrences in the state.
- "Species of Special Concern" means any native plant or any native nonharvested wildlife species documented to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population, or has become locally extinct in Connecticut.



Figure 5-9: CTDEP Natural Diversity Database Areas – Tankerhoosen River Watershed

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# 6.0 WATERSHED MODIFICATIONS

#### 6.1 <u>Dams, Impoundments, & Water Supply</u>

The historical industrial use of the Tankerhoosen River and its major tributaries has left behind many small dams and impoundments. Most of this infrastructure is no longer used for power generation, and many of these impoundments currently provide aquatic and wildlife habitat and recreational opportunities. Many of the dams in the watershed are also an impediment to fish migration.

According to the DEP Dam Safety Regulations, the hazard classification of a dam is based on the damage potential from failure of the structure. <u>Figure 6-1</u> shows the location and hazard classification of the identified dams within the watershed. Some of the dams which no longer serve an integral function to industry or public use have fallen into disrepair and pose a potential hazard to downstream properties.

<u>Table 6-1</u> lists the major drinking water supplies within the Tankerhoosen River watershed which are regulated under the DEP Water Diversion program.

Name	Name of Diversion	MGD	Town
	Vernon Well #1	0.1728	Vernon
Connectiout Water	Vernon Well #2	0.1728	Vernon
	Vernon Well #3	0.1440	Vernon
Company	Vernon Well #4	0.1728	Vernon
	Vernon Well #5	0.4320	Vernon
Manchester Water Department	New Bolton Well Field, Well #1,2,3	Various	Bolton

Table 6-1: Major Drinking Water Supplies

The DEP, with Cooperation from the Connecticut Water Company, has identified two preliminary (Level B) Aquifer Protection Areas associated with these wells within the Tankerhoosen River watershed, as shown in <u>Figure 6-2</u>. Aquifer Protection Areas are designated around active well fields in sand and gravel aquifers that serve more than 1,000 people. Level B mapping identifies the general area of aquifer contribution/recharge based primarily on topography. The watershed communities are required to establish land use regulations for these areas to limit potential contamination to public groundwater supplies. Private groundwater supply wells are also prevalent throughout areas of the watershed that are not served by public water supplies.





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Figure 6-2: CTDEP Aquifer Protection Areas – Tankerhoosen River Watershed



#### 6.2 <u>Wastewater Discharges</u>

As summarized in <u>Table 6-2</u>, there are number of industrial, commercial, and municipal facilities in the Tankerhoosen River Watershed with surface water discharges regulated under the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the Connecticut DEP. The facilities listed in <u>Table 6-2</u> have either permitted wastewater or stormwater discharges to surface waters. The majority of these facilities are located in Vernon. There are no municipal wastewater treatment plants located within the Tankerhoosen River watershed.

Town	Facility	Location	Permit Number
Vernon	Carpenter's Mobil	447 Hartford Turnpike	GVS000915
	Company 1 Firehouse	724 Hartford Turnpike	GVM000592
	Connecticut Golfland	95 Hartford Turnpike	GPL000108
	First Student	25 Whitney Ferguson	GSI001217
		Road	
	Motiva Enterprises LLC	444 Hartford Turnpike	GGR001404
	Moore's Automotive	1245 Hartford	GVM000806
		Turnpike	
	Mount Vernon	1120 Hartford	GVS000863
	Apartments	Turnpike	
	Oakland Meadows	1158 Hartford	GSN001098
		Turnpike	
	Tighitco, Inc.	101-77 Industrial Park	GSI001599
		Road	
	Vernon Maintenance	37 Campbell Avenue	GVS000988
			GS1000074
	VMS Construction	120 Bolton Road	GVM000980
	Company		001001170
Bolton	I ransportation Facility	326 Boston Turnpike	GSI0011/9
	Hull's Autobody	299-301 Boston Turnpike	GVM000800
Tolland	Dari Farms	Gerber Drive	GSN000814
	Mr. Sparkle Car Wash	157 Hartford Turnpike	GVM000646
	Connecticut Light &	45 Tolland Stage Road	GVS001027
	Power Co.		
	Gerber Scientific Inc.	24 Industrial Park Road	GSI000914
		West	
	Standard Register Co.	259 Hartford Turnpike	GPP000152
		•	GPH000345
	CNC Software Inc.	671 Old Post Road	GSN000070
	Belvedere Ridge	601 Old Post Road	GSN001308

T	able	6-2:	NPDFS	Regulated	<b>Facilities</b>
	ubic	0 2.		regulated	i ucintico

Source: DEP December 2007

<u>Figure 6-3</u> depicts sewer service areas in the watershed. Areas outside of the mapped sewer service areas are presumed to be on individual sewage disposal (i.e., septic) systems. Approximately 23% of the overall Tankerhoosen River watershed area is served by municipal sanitary sewers.

## 6.3 <u>Regulated Sites</u>

Historical and current industrial and commercial development within the Tankerhoosen River watershed poses a potential threat to surface water and groundwater supplies in the watershed. Illegal waste disposal, improper use and disposal of chemicals such as used oil, pesticides, and herbicides, and chemical spills are potential sources of contaminants from industrial and commercial facilities. As summarized in the following table, several hazardous waste generators and other regulated sites are located within the watershed. These facilities are located in both Vernon and Tolland in the central and upper portions of the watershed.

Site Type	Number of sites			
Site Type	Vernon	Tolland		
Hazardous Waste Generator	5	6		
Air Emissions	1	2		
CERCLA Site	1 (1 on Final NPL)	0		

## Table 6-3: Summary of Regulated Sites

Source: epa.gov/region1/superfund/sites/precision, accessed Nov. 2007.

There is one site that is listed as potential hazardous waste site that EPA has evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as "Superfund." This site, Precision Plating Corporation, is located in the Hillside Industrial Park in Vernon and is currently on the Final National Priorities List (NPL). Chromium contaminated groundwater at the site is being remediated under the direction of the DEP.



Figure 6-3: Sewer Service Areas – Tankerhoosen River Watershed

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# 7.0 LAND USE AND LAND COVER

The type and distribution of land use within a watershed have direct impact on nonpoint sources of pollution and water quality. This section describes the land use and land cover patterns in the Tankerhoosen River watershed.

## 7.1 <u>Current Conditions</u>

#### 7.1.1 Land Use

<u>Figure 7-1</u> depicts general land use patterns in the Tankerhoosen River watershed. The data in <u>Figure 7-1</u> are parcel-based land use categories for the watershed communities, provided by the Capital Region Council of Governments (CRCOG). The land uses in the watershed include 20 land use categories (<u>Table 7-1</u>). Approximately 60% of the watershed consists of developed land uses, with single-family residential comprising the largest percentage (40%). Highway and other road right-of-ways comprise approximately 9% of the watershed area. Approximately 30% is classified as resource/recreation land use, which includes committed and uncommitted open space. Major portions of the riparian areas adjacent to the Tankerhoosen River and its tributaries are located within resource/recreation areas. Areas in the northern portion of the watershed are more commercialized and have a greater retail and industrial use, with commercial, retail, and industrial land uses comprising approximately 4% of the watershed area. The majority of the commercial, industrial, and retail areas are located in headwater regions adjacent to the major transportation corridors of 1-84/Route 30 and 1-384.

Land Use Type	Acres	Percent of Watershed
Agriculture	103	1 %
One Family	3160	38 %
Two Family	48	<1 %
Three Family	2	<1 %
Multi Family	39	<1 %
Condominium	165	2 %
Group Quarters	12	<1 %
Commercial	110	1 %
Retail	88	1 %
Mixed Use	3	<1 %
Industrial	183	2 %
Government/Non-Profit	102	1 %
School	26	<1 %
Cemetery	22	<1 %
Health/Medical	6	<1 %
Resource/Recreation	2398	29 %
Undeveloped	851	10 %
Right-of-way	770	9 %
Water	77	<1 %
Unknown	61	<1 %

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Table 7-1: Current Land Use – Tankerhoosen River Watershed





Figure 7-1: Current Land Use – Tankerhoosen River Watershed

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In the Tankerhoosen River watershed, several tracts of potentially developable land have been permanently preserved as "committed" open space. Committed open space parcels in the Town of Vernon and the Town of Bolton were identified through available land use mapping and confirmed by members of the Technical Advisory Committee and the Bolton Conservation Commission. Committed open space parcels in Tolland and Manchester were determined through available mapping from each Town's Plan of Conservation and Development (POCD) and from the Connecticut Office of Policy and Management Municipal Plans of Conservation and Development. In general, the committed open space areas include deeded open space that is privately owned, parcels owned by land trusts, land owned by the State of Connecticut as well as parks owned by the Town of Vernon and Town of Bolton, including the Hop River State Park Trail, Valley Falls Park, Freja Park, and Bolton Notch State Park. This land is protected against future development and is generally located in the central and southern portion of the watershed. <u>Figure 7-2</u> identifies the committed open space land in the watershed.

In addition, several parcels within the watershed are designated for agricultural or forestry use under Public Act 490. While development is not prohibited on this land, this program reduces the tax burden on this land, thereby relieving some of the pressure to develop the land and allows it to continue to serve as open space.

## 7.1.2 Zoning

<u>Figure 7-3</u> depicts parcel-based zoning designations in the Tankerhoosen River watershed, as provided by CRCOG. The majority of the Tankerhoosen River watershed is zoned for residential uses. Commercial and industrial zones associated with the I-384 and I-84 corridors are located in the southern and northern portions of the watershed, respectively.





Figure 7-2: Committed Open Space – Tankerhoosen River Watershed



Figure 7-3: Watershed Zoning as Defined by CRCOG – Tankerhoosen River Watershed

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## 7.1.3 Land Cover

<u>Figure 7-4</u> depicts the general land cover in the Tankerhoosen River watershed. Data shown in <u>Figure 7-4</u> are land cover categories derived from 2002 Landsat satellite imagery with ground resolution of 30 meters. The land cover data in the watershed are summarized into ten categories (<u>Table 7-2</u>). These ten categories are those used in the Connecticut Land Cover Map Series and are described following the table (University of Connecticut Center for Land Use Education and Research).

	1	985	2002		Relative	Relative
Land Cover Type	Acres	Percent of	Acres	Percent of	Percent	Rate of
		Watershed		Watershed	Change <sup>1</sup>	Change <sup>2</sup>
Barren	91	1 %	162	2 %	1%	78%
Coniferous Forest	454	6 %	430	5 %	-1%	-5%
Deciduous Forest	4581	56 %	4085	50 %	-6%	-11%
Developed	1793	22 %	2201	27 %	5%	23%
Forested Wetland	192	2 %	175	2 %	0	-9%
Non-forested	2	< 1 %	19	<1 %	0	912%
Wetland						
Other grasses and	551	7 %	603	7 %	0	9%
agriculture						
Turf and grass	448	5 %	447	5 %	0	0%
Utility Right of Way	19	< 1 %	17	<1 %	0	-12%
Water	95	2 %	88	1 %	1%	-7%

<sup>1</sup>Calculation = % land cover 2002 - % land cover 1985

<sup>2</sup>Calculation = (acres land cover 2002 – acres land cover 1985) / acres land cover 1985

	19	85	20	02	Relative	Relative
Land Cover Type	Acres	Percent	Acres	Percent	Percent	Rate of
		of Basin		of Basin	Change <sup>1</sup>	Change <sup>2</sup>
Barren	91	1	162	2	1%	78%
Coniferous Forest	454	6	430	5	-1%	-5%
Deciduous Forest	4581	56	4085	50	-6%	-11%
Developed	1793	22	2201	27	5%	23%
Forested Wetland	192	2	175	2	0	-9%
Non-forested Wetland	2	< 1	19	<1	0	912%
Other grasses and	551	7	603	7	0	9%
agriculture						
Turf and grass	448	5	447	5	0	0%
Utility Right of Way	19	< 1	17	<1	0	-12%
Water	95	2	88	1	1%	-7%

<sup>1</sup>Calculation = % land cover 2002 - % land cover 1985

<sup>2</sup>Calculation = (acres land cover 2002 – acres land cover 1985) / acres land cover 1985

Source: University of Connecticut's Center for Land Use Education and Research (CLEAR)

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- Barren Mostly non-agricultural areas free from vegetation, such as sand, sand and gravel operations, bare exposed rock, mines, and quarries. Also includes some urban areas where the composition of construction materials spectrally resembles more natural materials. Also includes some bare soil agricultural fields.
- Coniferous Forest Includes Southern New England mixed softwood forests. May include isolated low density residential areas.
- Deciduous Forest Includes Southern New England mixed hardwood forests. Also includes scrub areas characterized by patches of dense woody vegetation. May include isolated low density residential areas.
- Developed High density built-up areas typically associated with commercial, industrial and residential activities and transportation routes. These areas contain a significant amount of impervious surfaces, roofs, roads, and other concrete and asphalt surfaces.
- Forested Wetland Includes areas depicted as wetland, but with forested cover. Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Non-forested Wetland Includes areas that predominantly are wet throughout most of the year and that have a detectable vegetative cover (therefore not open water). Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.
- Other Grasses and Agriculture Includes non-maintained grassy areas commonly found along transportation routes and other developed areas and also agricultural fields used for both crop production and pasture.
- Turf & Grass A compound category of undifferentiated maintained grasses associated mostly with developed areas. This class contains cultivated lawns typical of residential neighborhoods, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas. Also includes some agricultural fields due to similar spectral reflectance properties.
- Utility Includes utility rights-of-way. This category was manually digitized on-screen from rights-of-way visible in the Landsat satellite imagery. The class was digitized within the deciduous and coniferous categories only.
- Water Open water bodies and watercourses with relatively deep water.

#### Forest Cover

Forested areas are the predominant land cover type in the Tankerhoosen River watershed. Approximately 55% of the watershed consists of deciduous and coniferous forests, primarily in the central and southern portions of the watershed. <u>Table 7-3</u> compares the total acres and percent forest cover by subwatershed. The percent forest cover in each subwatershed ranges from approximately 31% in the Walker Reservoir subwatershed to approximately 86% in the Railroad Brook subwatershed. Based on a literature threshold values documented in several studies (CLEAR, 2007), watershed forest cover of 65% or greater is the minimum needed for a healthy aquatic invertebrate community. Only two of the ten subwatersheds, Railroad Brook and the Upper Tankerhoosen River, exceed the threshold value of 65%. Based on a recommendation of the American Forests organization, 40% forest cover is a reasonable threshold goal for urban areas. All but two subwatersheds, Clarks Brook (34.8 %) and Walker Reservoir (31.3 %), both of which are located in the northern and most developed portion of the watershed, meet this goal.





Figure 7-4: Land Cover – Tankerhoosen River Watershed

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in each Subwatershed	Developable Forest Cover in Subwatershed (acres)	Percent of Forest Cover that is Developable
Bolton Notch Pond	171	49.6 %	41	24.0 %
Clarks Brook	226	34.8 %	70	30.9 %
Gages Brook	314	45.2 %	134	42.6 %
Gages Brook South Tributary	395	58.1 %	171	43.3 %
Lower Tankerhoosen River	149	46.6 %	82	54.9 %
Middle Tankerhoosen River	625	39.6 %	122	19.6 %
Railroad Brook	1043	86.3 %	346	33.2 %
Tucker Brook	374	40.0 %	119	31.8 %
Upper Tankerhoosen River	1110	75.4 %	278	25.0 %
Walker Reservoir	109	31.3 %	54	49.2 %
Tankerhoosen River Watershed	4515	54.9 %	1416	31.4 %

I able 7-3: Forest Cover – I ankernoosen River Watersne
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<u>Table 7-3</u> also includes a comparison of the amount of forest cover in each subwatershed that could potentially be developed in the future (i.e., "developable"). Refer to Section 7.2.1 for a discussion of the determination of "developable" areas and watershed buildout scenario. The percent of forest cover that is developable for each subwatershed ranges from approximately 20% in the Middle Tankerhoosen River subwatershed and up to approximately 55% in the Lower Tankerhoosen River subwatershed. These results suggest that future development within the watershed has the potential to significantly reduce forest cover and, in some subwatersheds, to below recommended thresholds.

## Riparian Vegetation

Riparian, or streamside, corridors are critical areas important to stream stability, pollutant removal, and wildlife habitat. These areas are also sometimes called "buffer" areas, but are not to be confused with regulatory review zones, which are often also called buffers (CLEAR 2007). A stream walk survey of the Tankerhoosen River conducted in 1999 revealed that riparian buffers of 100 feet are common between the river and developed areas. However, some areas along the lower reaches of the Tankerhoosen River were identified as having stream buffers of less than 25 feet, according to the results of a 2000 stream walk survey of the Tankerhoosen River.

In order to assess the status and of the riparian corridors in the Tankerhoosen River watershed, the acreage of forest cover within the riparian area (defined as a 200-foot buffer on both sides of streams and a 200-foot buffer from waterbody shorelines) was calculated for each of the ten subwatersheds based on the 2002 Center for Land Use Education and Research (CLEAR) forest land cover classes (coniferous and deciduous forest). The results are provided in

Table 7-4.

	Forest Cover in 200-	Percent of 200-foot
Subwatershed Name	foot Riparian Corridor	Riparian Corridor that is
	(acres)	Forested
Bolton Notch Pond	19	34.9 %
Clarks Brook	42	46.3 %
Gages Brook	85	61.4 %
Gages Brook South Tributary	93	62.3 %
Lower Tankerhoosen River	31	35.8 %
Middle Tankerhoosen River	99	41.8 %
Railroad Brook	167	87.2 %
Tucker Brook	92	51.8 %
Upper Tankerhoosen River	216	80.7 %
Walker Reservoir	21	23.1 %
Tankerhoosen River Watershed	866	58.3%

Table 7-4: Fores	st Cover in Riparia	n Areas in the	Tankerhoosen	<b>River Subwatersheds</b>
			Turiker 1005cm	

Forest cover within the 200-foot riparian corridor for the overall Tankerhoosen River Watershed is nearly 60%, although the amounts vary considerably by subwatershed. Railroad Brook (87.2%) and the Upper Tankerhoosen River (80.7%) subwatersheds have the highest percentage of forest cover within the 200-foot riparian corridor. Walker Reservoir (23.1%) and Bolton Notch Pond (34.9%) have the lowest percentage of forest cover within the 200-foot riparian corridor. These results indicate that large portions of the watershed streams and waterbodies are well-protected by intact riparian forest cover, although several subwatersheds have significantly lower riparian forest cover.

## Developed Areas

Developed areas are also a dominant land cover type in the Tankerhoosen River watershed. Approximately 27% of the watershed consists of commercial, industrial, residential, and transportation land cover types (i.e. "developed" category) that follow the major transportation corridors, regional retail and commercial areas, and population centers. Approximately 7% of the watershed consists of other grass and agriculture, although only a small portion of this (approximately 1%) consists of land in active agricultural use.

A comparison of watershed land cover data between 1985 and 2002 (<u>Table 7-2</u>) shows a moderate increase in watershed development during this period (5% increase in developed cover types) and a corresponding loss of coniferous (1% decrease) and deciduous forest (6% decrease).

#### 7.1.4 Impervious Cover

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology (Center for Watershed Protection, 2003; Schueler et al., 1992; Schueler, 1994; Schueler, 1995; Booth and Reinelt, 1993, Arnold and Gibbons, 1996; Brant, 1999; Shaver and Maxted, 1996). Research has also demonstrated similar



effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases (NRDC, 1999). Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. <u>Figure 7-5</u> illustrates this effect. These research findings have been integrated into a general watershed planning model known as the impervious cover model (ICM) (CWP, 2003). The ICM has also been confirmed locally in Connecticut by the CTDEP, which has determined a statewide impervious cover threshold of 12 percent for aquatic life impairment (Belucci, CTDEP, 2007).



Figure 7-5: Relationship Between Watershed Imperviousness and Stream Health Source: www.cwp.org

A GIS-based impervious cover analysis was performed for the Hockanum River watershed and including the Tankerhoosen River watershed by staff from the Department of Natural Resources Management and Engineering at the University of Connecticut (Civco, 2005). The satellite-derived land cover data described previously were used in the analysis. This technique, known as "direct impervious surface modeling", extracted impervious surface data directly from 2002 Landsat imagery to estimate the amount of impervious surface within each pixel. The DEP GIS basin layer was used to calculate the percent of imperviousness by basin. Figure 7-5 graphically summarizes the results of this analysis.

The overall imperviousness of the Tankerhoosen River watershed is estimated at approximately 9.7% (<u>Table 7-5</u>). This level of impervious cover is slightly below the CTDEP aquatic life impairment threshold of approximately 12%, where ecological stress and stream impacts become apparent. As shown in <u>Figure 7-6</u>, impervious cover in much of the central and southern portions of the watershed (Upper Tankerhoosen River and Railroad Brook

watersheds) is less than 5%, consistent with the high percentage of forest cover and conservation land in these areas. The headwater tributaries of the Tankerhoosen River, specifically Gages Brook, are estimated to have approximately 11.5% impervious cover, while localized subwatershed areas around Bolton Notch Pond, Walker Reservoir, and Dobsonville Pond have impervious cover near or above 20%.

Subwatershed	Percent Impervious Cover
Bolton Notch Pond	16.6 %
Clarks Brook	17.2 %
Gages Brook	11.5 %
Gages Brook South Tributary	11.3 %
Lower Tankerhoosen River	15.8 %
Middle Tankerhoosen River	12.9 %
Railroad Brook	1.7 %
Tucker Brook	8.1 %
Upper Tankerhoosen River	4.5 %
Walker Reservoir	19.9 %
Total	9.7 %

Table 7-5: Percent Impervious Cover – Tankerhoosen Watershed

The results of this analysis provide an initial diagnosis of potential stream and receiving water quality within the watershed study area. The analysis method and ICM are based on several assumptions and caveats, which limits its application to screening-level evaluations. Some of the assumptions of the ICM include:

- Requires accurate estimates of percent impervious cover, which is defined as the total amount of impervious cover over a subwatershed area. The resolution of the land cover data used in the evaluation is relatively coarse, although sufficient for screening analysis.
- Predicts potential rather than actual stream quality.
- Does not predict the precise score of an individual stream quality indicator but rather predicts the average behavior of a group of indicators over a range of impervious cover.
- The 10 and 25 % thresholds are approximate transitions rather than sharp breakpoints.
- The ICM has not been validated for lakes, reservoirs, aquifers, and estuaries.
- Does not currently predict the impact of watershed best management practices (treatment or non-structural controls).
- Does not consider the geographic distribution of the impervious cover relative to the streams and receiving waters. Effective impervious cover (impervious cover that is hydraulically connected to the drainage system) has been recommended as a better metric, although determining effective impervious cover requires extensive and often subjective judgment as to whether it is connected or not.
- Impervious cover is a more robust and reliable indicator of overall stream quality beyond the 10 percent threshold. The influence of impervious cover on stream quality is relatively weak compared to other potential watershed factors such as percent forest cover, riparian community, historical land use, soils, agriculture, etc. for impervious cover less than 10 percent.





## 7.2 <u>Future Conditions</u>

A watershed buildout analysis was also conducted as part of this assessment to assist in the identification of subwatersheds with the highest restoration potential as well as the greatest vulnerability. The purpose of the analysis is to estimate the future land use and impervious cover conditions of the watershed as a result of maximum development allowed by the current zoning within the watershed.

## 7.2.1 Land Use

Watershed lands that could be developed in the future (i.e., "developable" land) were subdivided into two categories, based on the CRCOG parcel-based land use data:

- <u>New Development</u> areas that are currently undeveloped and could become new developments in the future. Land designated as "new development" includes those parcels that are designated as "undeveloped" and "resource/recreation" in the CROCG land use data and not identified as committed open space.
- <u>Redevelopment</u> areas that are currently underdeveloped and could be redeveloped with a higher intensity land use in the future. Land designated for "redevelopment" were limited to single-family residential parcels in the CRCOG land use data that could be subdivided and/or redeveloped in the future.

Areas having the following physical and/or regulatory constraints were also removed from consideration for future development or redevelopment: water bodies, wetland soils, and soils whose slope characteristics defined by NRCS exceed 15% (i.e., steep slope soils). Resulting fragments of land smaller than ¼-acre in size for new development and 3 acres in size for redevelopment were also removed from the analysis. <u>Table 7-6</u> and <u>Figure 7-7</u> summarize the amount of developable land by subwatershed, including the new development and redevelopment categories.

Subwatershed	New Development (acres)	New Development Percent in Subwatershed	Redevelopment (acres)	Redevelopment Percent in Subwatershed
Bolton Notch Pond	49	14.3 %	11	3.2 %
Clarks Brook	57	8.8 %	52	8.1 %
Gages Brook	129	18.5 %	72	10.3 %
Gages Brook South Tributary	123	18.1 %	102	15.0 %
Lower Tankerhoosen River	91	28.5 %	17	5.4 %
Middle Tankerhoosen River	127	8.0 %	141	8.9 %
Railroad Brook	212	17.6 %	172	14.3 %
Tucker Brook	122	13.1 %	89	9.5 %
Upper Tankerhoosen River	238	16.1 %	150	10.2 %
Walker Reservoir	108	31.3 %	13	3.8 %
Total	1257	15.3 %	820	10.0 %

Table 7-6: Develo	pable Land –	Tankerhoosen	Watershed
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Figure 7-7: Developable Land – Tankerhoosen River Watershed

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The future land use buildout scenario was estimated by assigning new land uses to developable areas (See <u>Section 7.2.1</u>), while maintaining the existing land uses for developed and unbuildable land (wetland soils, steep slope soils, etc.). The developable areas were assigned a future land use based on maximum degree of development allowed by the existing zoning category. <u>Table 7-7</u> presents the future land use category assigned to each developable parcel based on the zoning category. This analysis assumes development of Act 490 parcels consistent with the underlying zoning and does not account for future zone changes or future land development regulatory changes.

Zoning Category	Assigned Future Land Use
1-3 Unit Residential, High Density	Condominium
1-3 Unit Residential, Medium Density	Three Family
1-3 Unit Residential, Medium-Low Density	Two Family
1-3 Unit Residential, Low Density	One Family
Cluster/Open Space Residential	One-Family
Industrial	Industrial
Multi-Family	Multi-Family
Planned Area Development Including Residential	Mixed Use
Planned Industrial	Industrial
Planned Residential	Multi-Family
Town Center	Mixed Use
Town Scale Commercial	Commercial

# Table 7-7: Assigned Future Land Use Category

The results of the buildout analysis are summarized in <u>Table 7-8</u>, which compares acreage of existing and future land use in the watershed. The most significant potential land use change is in the residential land use categories, which is predicted to increase by approximately 15% watershed-wide. The area of resource/recreation and undeveloped land is predicted to decrease by approximately 15% watershed-wide, while commercial and industrial land are predicted to increase by approximately 3%.

Table 7-8: Existing and Future Land Use – Tankerhoosen Watershed

Land Use Type	Acresexisting	Percent of Basin <sub>Existing</sub>	Acres <sub>Future</sub>	Percent of Basin <sub>Future</sub>	Relative Percent Change
Agriculture	103	1 %	89	1 %	0
One Family	3160	38 %	3415	42 %	4%
Two Family	48	<1 %	811	10 %	10%
Three Family	2	<1 %	3	<1 %	0
Multi Family	39	<1 %	60	1 %	1%
Condominium	165	2 %	177	2 %	0
Group Quarters	12	<1 %	12	<1 %	0
Commercial	110	1 %	206	3 %	2%
Retail	88	1 %	88	1 %	0
Mixed Use	3	<1 %	33	<1 %	0
Industrial	183	2 %	270	3 %	1%

Land Use Type	AcresExisting	Percent of Basin <sub>Existing</sub>	Acres <sub>Future</sub>	Percent of Basin <sub>Future</sub>	Relative Percent Change
Government/Non-Profit	102	1 %	102	1 %	0
School	26	<1 %	26	<1 %	0
Cemetery	22	<1 %	14	<1 %	0
Health/Medical	6	<1 %	6	<1 %	0
Resource/Recreation	2398	29 %	1787	22 %	-7%
Undeveloped	851	10 %	233	3 %	-7%
Right-of-way	770	9 %	770	9 %	0
Water	77	<1 %	77	<1 %	0
Unknown	61	<1 %	46	<1 %	0

## 7.2.2 Impervious Cover

The watershed buildout analysis was used in conjunction with the existing conditions impervious cover analysis (Section 7.1.3) to estimate future impervious cover in the Tankerhoosen River subwatersheds. To complete this analysis, impervious cover was included as a parameter in the pollutant load model described in Section 8.1. Each urban land use type was assigned an impervious cover coefficient based on literature values (see Table 2 in Appendix B). Land use data for both existing and buildout conditions were then entered into the model to determine the change in impervious cover for each subwatershed. The predicted change in impervious cover was then added to the existing impervious cover estimates described in Section 7.1.3 to estimate future impervious cover.

<u>Table 7-9</u> presents estimates of existing and future impervious cover (<u>Figure 7-8</u>) by subwatershed. The shaded cells in the table highlight the subwatersheds in which future impervious cover is predicted to approach or exceed either the "sensitive" (10% to 12%) or "impacted" (25%) threshold values as described by the Impervious Cover Model.

Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change (ICFuture – ICExisting)
Bolton Notch Pond	16.6 %	18.9 %	2.3 %
Clarks Brook	17.2 %	20.6 %	3.4 %
Gages Brook	11.5 %	14.2 %	2.7 %
Gages Brook South Tributary	11.3 %	13.5 %	2.2 %
Lower Tankerhoosen River	15.8 %	23.0 %	7.2 %
Middle Tankerhoosen River	12.9 %	15.5 %	2.6 %
Railroad Brook	1.7 %	3.4 %	1.7 %
Tucker Brook	8.1 %	10.3 %	2.2 %
Upper Tankerhoosen River	4.5 %	4.7 %	0.2 %
Walker Reservoir	19.9 %	29.13 %	9.2 %
Total	9.87 %	12.47 %	2.6 %

Table 7-9: Percent Impervious Cover – Existing and Future Conditions

It is significant to note that, based on this analysis, the overall impervious cover in the Tankerhoosen River watershed is predicted to increase from less than 10% to greater than



Figure 7-8: Future Impervious Cover – Tankerhoosen River Watershed



12%, which is considered impacted (see <u>Figure 7-5</u>). The largest change in impervious cover is predicted in the Walker Reservoir subwatershed, where imperviousness could increase from approximately 20%, or "impacted," to approximately 29%, or "non-supporting." Additionally, the impervious cover in Gages Brook and the associated Gages Brook South Tributary subwatersheds, both of which are important headwater streams, is predicted to cross the statewide 12% sensitive threshold value.

Another useful metric was developed by Goetz et al. (2003) for the Chesapeake Bay region, which combines subwatershed impervious cover and tree cover within the 100-foot stream buffer. Each of the subwatersheds within the Tankerhoosen River Basin was analyzed with regard to the combined impervious cover/riparian zone metric, which is summarized in the following matrix by Goetz et al. (2003).

Stream Health	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer
Excellent	< = 6%	>=65%
Good	6-10%	60-65%
Fair	10-25%	40-60%
Poor	> 25%	<40%

Natural vegetation was determined using the CLEAR land cover data and included the deciduous forest, coniferous forest, forested wetland, and non-forested wetland categories. The following table presents the results from the combined impervious cover/riparian zone metric.

Table 7-10: Impervious Cover/Riparian Zone Metric – Existing and Future Conditions

	Exis	ting	Future		
Subwatershed	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Stream Buffer	
Bolton Notch Pond	16.6 %	40.4 %	18.9 %	39.8 %	
Clarks Brook	17.2 %	51.9 %	20.6 %	38.0 %	
Gages Brook	11.5 %	59.5 %	14.2 %	50.1 %	
Gages Brook South Tributary	11.3 %	69.6%	13.5 %	40.2 %	
Lower Tankerhoosen River	15.8 %	42.7 %	23.0 %	26.0 %	
Middle Tankerhoosen River	12.9 %	49.7 %	15.5 %	41.8 %	
Railroad Brook	1.7 %	89.4 %	3.4 %	73.7 %	
Tucker Brook	8.1 %	65.5 %	10.3 %	49.6 %	
Upper Tankerhoosen River	4.5 %	84.6 %	4.7 %	76.3%	
Walker Reservoir	19.9 %	41.2 %	29.13 %	31.8 %	

Overall, most of the Tankerhoosen River subwatersheds are currently categorized as "fair" to "good" based on the riparian zone metric published by Goetz et al. (2003), while several of the



key headwater streams, including Railroad Brook and the Upper Tankerhoosen River, fall into the highest category. Comparison between the existing and future ratings indicates that four of the ten subwatersheds (Clarks Brook, Gages Brook South Tributary, Lower Tankerhoosen River, and Tucker Brook) are predicted to experience a decline in stream health as a result of future development and, in particular, development within the riparian corridor.

# 8.0 POLLUTANT LOADING

A pollutant loading model was developed using the land use/land cover data described in <u>Section 7.0</u>. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing and future conditions and not to predict future water quality. This section summarizes the methods and results of the analysis, which are presented in greater detail in <u>Appendix B</u>.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads for sediment and nutrients based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.

Data obtained as part of the Land Use/Land Cover analysis presented in <u>Section 7.0</u> were used to generate model inputs. Several other model parameters were specified for each pollutant and subwatershed, including:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model was applied to each subwatershed to estimate pollutant loads for each subwatershed under existing land use and future land use scenarios, as described in <u>Section 7.0</u>. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. <u>Table 8-1</u> presents the results of this analysis. Results are shown in terms of increase in pollutant loading rate (the mass of pollutant to be discharged from each acre of land in a watershed) and percent increase in pollutant load (based on the total pollutant discharge from each of the watersheds).

	Loading Rate Increase (Load Increase per Acre, mass [Ib or ton]/ac-yr)			Load Increase (%) (Total for Each Watershed)				
Watershed	N	Р	BOD	Sediment	N	Р	BOD	Sediment
Bolton Notch Pond (318 ac)	0.66	0.10	2.7	0.012	9.6%	8.0%	10.9%	7.7%
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%
Gages Brook South Tributary (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%
Lower Tankerhoosen River (306 ac)	1.31	0.10	6.3	0.022	20.0%	8.9%	27.6%	14.7%
Middle Tankerhoosen River (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%
Upper Tankerhoosen River (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%

Table 8-1: Projected Pollutant Loading Rate and Load Increases

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

- Gages Brook. The existing conditions pollutant load model indicates that this subwatershed is characterized by both relatively high total pollutant loads and pollutant loading rates, with approximately 70% urban land use, the largest amount of industrial land use, and the second-highest commercial land use composition in the entire watershed. The buildout condition of this watershed is projected to result in a 19% increase in urban land use with a corresponding decrease in forest; and the new urban land is likely to consist of new residential and industrial development. As such, relatively large loads and loading rate increases may occur.
- Lower Tankerhoosen River. The existing conditions pollutant load model for this subwatershed predicts relatively small loads (since the watershed area is small) and moderate loading rates. Under a buildout scenario, this subwatershed is projected to result in more than a 20% increase in nitrogen and BOD loads. The resulting loading rates for these parameters are projected to be the second highest of the Tankerhoosen River subwatersheds.
- Railroad Brook. The projected buildout pollutant loadings in this subwatershed for nitrogen and BOD are anticipated to increase by approximately 57% and 70%, respectively. Significant increases are also anticipated in phosphorus and sediment loads. Currently, the Railroad Brook sub watershed is heavily forested, with comparatively little development. Several large tracts of land within this subwatershed are potentially available for future development, especially in Bolton and South Vernon,



which makes this watershed vulnerable to potentially significant pollutant load increases.

• *Walker Reservoir.* The existing conditions pollutant loading model suggests that this subwatershed has some of the highest levels of pollutant loads within the overall Tankerhoosen River watershed. Potential land use changes in this subwatershed include significant areas of new residential and mixed-use development, much of which is located adjacent to Walker Reservoir. These changes are predicted to result in the greatest increases in pollutant loading rates for all of the parameters evaluated.

## 9.0 COMPARATIVE SUBWATERSHED ANALYSIS

A Comparative Subwatershed Analysis was performed for the Tankerhoosen River subwatersheds to identify the subwatersheds with the greatest vulnerability and restoration potential. Subwatershed "metrics" were used to conduct this analysis. Metrics are numeric values that characterize the relative vulnerability and restoration potential of a subwatershed. The results of this analysis will be used to prioritize field assessment efforts in future phases of this study and to guide plan recommendations.

The analysis involves a screening level evaluation of selected subwatershed metrics that are derived by analyzing available GIS layers and other subwatershed data sources. The basic approach used to conduct the Comparative Subwatershed Analysis consisted of:

- 1. Delineation of subwatershed boundaries and review of available metric data.
- 2. Selection and calculation of metrics that best describe subwatershed vulnerability and restoration potential. (The metrics used to rank subwatershed vulnerability were selected separately from the metrics used to rank subwatershed restoration potential.)
- 3. Developing weighting and scoring rules to assign points to each metric.
- 4. Computing aggregate scores and developing initial subwatershed rankings.

Subwatersheds with higher aggregate "vulnerability" scores are more sensitive to future development and should be the focus of watershed conservation efforts to maintain existing high-quality resources and conditions. Subwatersheds with higher aggregate "restoration potential" scores are more likely to have been impacted and have greater potential for restoration to improve upon existing conditions. This approach enables watershed planners to allocate limited resources on subwatershed where restoration and conservation efforts have the greatest chances of success. The subwatersheds used in this analysis are those identified in <u>Section 5.1</u> of this document.

The following sections describe the metrics used and the rationale for their selection, how the various metrics were calculated, and the results of the evaluation. Available GIS and other data were used to compute the value of each metric.



Subwatershed Metric	How Metric is Measured	Indicates Higher Vulnerability Potential When	Metric Points
1. Impervious Cover Change	% increase in impervious cover in subwatershed	Increase in IC is high, suggesting greater development potential and stream impacts	Award 1 pt for each 1% increase in impervious cover
2. Impervious Cover Threshold	Comparison of current and future IC relative to ICM threshold	Predicted IC crosses "impacted" (12%) threshold, development could result in significant stream impacts	Award 5 pts for each exceedance of the 12% threshold
3. Stream Order	% of subwatershed consisting of 1 <sup>st</sup> or 2 <sup>nd</sup> order streams	Subwatershed consists of more lower order streams, vulnerability of headwater streams for habitat and water quality protection	Award 6 pts if 100% of streams are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 4 pts if 50% are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 2 pts if 33% are 1 <sup>st</sup> and 2 <sup>nd</sup> order; 0 pts if 0% are 1 <sup>st</sup> and 2 <sup>nd</sup> order
4. Pollutant Loading	% increase in pollutant loading in subwatershed	Increase in pollutant loading is high, suggesting water quality impacts from future development	Award 1 pt for each pollutant loading parameter > 10% and 3 pts for each parameter >20%
5. Industrial/ Commercial Land	% of subwatershed as industrial or commercial land	Industrial/commercial land is high, greater potential for water quality impacts from pollutant hot spot	Award 1 pt for each 2% of subwatershed classified as industrial or commercial/retail
6. Forest Cover	% of subwatershed with developable forest cover	Area of developable forest cover is high, potential for significant future reductions in forested land	Award 1 pt for each 5% of subwatershed with developable forest cover
7. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is high, potential for significant future reductions in forested riparian areas if public ownership of corridor is low	Add 1 pt for each 10% increase in forest cover
8. Public Ownership of Stream Corridor	% of stream corridor that is publicly owned	Public ownership is low (see metric 7)	Add 1 pt for each 10% reduction of stream corridor in public ownership
9. Road Crossings	number of road crossings / square mile	Number of road crossings is high, greater potential for direct stormwater discharges from roadways	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts
10. Developed Areas with Septic	% of subwatershed served by septic	Area served by septic is high, indicating potential for pollutant loadings from failing septic systems	Award 1 pt for each 5% of subwatershed area served by septic
11. Drinking Water Resources	Acreage of developable land within a public drinking water supply area	Area of developable land is high, greater potential for impacts to sensitive surface and groundwater drinking water supplies	Award 3 pts for each subwatershed within an aquifer protection area

# Table 9-1: Summary of Subwatershed Vulnerability Metrics



## 9.1 <u>Priority Subwatersheds for Conservation</u>

The results of the subwatershed vulnerability analysis are summarized in <u>Table 9-2</u>.

Table 9-2: Results of Subwatershed Vi	/ulnerability Analysis
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Subwatershed	Impervious Cover Change	Impervious Cover Threshold	Stream Order	Pollutant Loading	Industrial/ Commercial Land	Developable Forest Cover	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Drinking Water Resources	Total
Bolton Notch Pond	2	10	6	1	7	2	3	3	0	5	0	41
Clarks Brook	3	10	6	4	7	2	5	5	1	4	0	47
Gages Brook	3	5	6	6	11	4	6	6	3	5	0	55
Gages Brook South Tributary	2	5	6	4	1	5	6	5	3	5	0	42
Lower Tankerhoosen River	7	10	0	7	2	5	4	5	7	5	0	53
Middle Tankerhoosen River	3	10	2	2	2	2	4	5	3	3	3	38
Railroad Brook	2	0	6	12	0	6	9	0	5	1	0	40
Tucker Brook	2	0	6	2	0	3	5	6	3	2	0	28
Upper Tankerhoosen River	0	0	4	2	0	4	8	3	3	3	0	27
Walker Reservoir	9	10	4	4	2	3	2	5	10	6	0	56

As shown in <u>Table 9-2</u>, the following subwatersheds are considered most vulnerable to future development impacts and should be given highest priority for conservation efforts to maintain existing resource conditions:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Walker Reservoir.



Subwatershed Metric	How Metric is Measured	Indicates Higher Restoration Potential When	Metric Points
1. Existing Impervious Cover	% impervious cover in subwatershed	Current impervious cover is low, suggesting range of possible sites for storage retrofits and stream repairs	<10% = 10 pts; 10 to 15% = 5 pts; >15% = 1 pt
2. Publicly- owned land	% of subwatershed that is publicly owned	Public land ownership is high, providing range of potential sites for restoration practices	Award 1 pt for each 2.5% of subwatershed in public ownership
3. Industrial Land	% of subwatershed that is industrial land	Industrial land is high, suggesting potential for source controls, discharge prevention, and on-site retrofits	Award 1 pt for each 2% of subwatershed classified as industrial
4. Forest Cover	% forest cover in subwatershed	Forest cover is low, suggesting potential for upland and riparian reforestation	<35% = 7pts; 36 to 50% = 5 pts; 50 to 70% = 3 pts; >70% = 1pt
5. Wetland Cover	% of subwatershed that is wetlands	Wetland cover is high, suggesting potential for wetland and riparian restoration	Award 1 pt for each 2% of subwatershed area
6.Development Potential	% of developable land in subwatershed	No more development is expected; stable conditions increase feasibility of stream repairs and storage retrofits	30 to 35% = 1pts; 25 to 30% = 4 pts; 20 to 25% = 7 pts; 15 to 25% = 10pt
7. Stream Density	stream miles / square mile	Stream density is high, suggesting greater feasibility of corridor practices	Award 1 pt for each 10% increase in stream density from watershed average of 1.3 stream miles / square mile
8. Stream Corridor Forest Cover	% of stream corridor that is forested	Corridor forest cover is low, suggesting feasibility of riparian reforestation and stream repairs	Add 1 pt for each 10% reduction in forest cover
9. Public Ownership of Corridor	% of stream corridor that is publicly owned	Public corridor ownership is high, suggesting greater feasibility of corridor practices	Add 1 pt for each 10% of stream corridor in public ownership
10. Road Crossings	number of road crossings / square mile	Number of road crossings is high, suggesting greater potential for stream repairs, culvert modifications	<1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; >15 = 10 pts
11. Developed Areas with Septic	% of subwatershed that is served by septic	Area served by septic is high, suggesting greater potential for septic system upgrades	Award 1 pt for each 5% of subwatershed area served by septic
12. Water Quality Impairments	number of water quality impairments / square mile	Number of water quality impairments is high, suggesting regulatory need to focus on WQ improvements	Award 3 pts for each water quality impairment identified

# Table 9-3: Summary of Subwatershed Restoration Potential Metrics

# 9.2 <u>Priority Subwatersheds for Restoration</u>

The results of the subwatershed restoration potential analysis are summarized in <u>Table 9-4</u>.

Subwatershed	Existing Impervious Cover	Publicly-owned Land	Industrial Land	Forest Cover	Wetland Cover	Development Potential	Stream Density	Stream Corridor Forest Cover	Public Ownership of Stream Corridor	Road Crossings	Developed Areas Served by Septic	Water Quality Impairments	Total
Bolton Notch Pond	1	1	1	5	3	10	0	6	6	0	5	0	38
Clarks Brook	1	10	5	7	8	10	0	4	11	1	4	0	60
Gages Brook	5	12	6	5	8	4	10	3	12	3	5	6	79
Gages Brook South Tributary	5	3	0	3	3	1	14	2	9	3	5	9	57
Lower Tankerhoosen River	1	6	1	5	1	1	15	5	11	7	5	6	64
Middle Tankerhoosen River	5	6	1	5	6	10	5	5	10	5	3	0	61
Railroad Brook	10	0	0	1	6	1	9	0	0	5	1	0	34
Tucker Brook	10	10	0	5	6	7	11	4	11	1	2	0	66
Upper Tankerhoosen River	10	3	0	1	7	4	12	1	6	3	3	3	52
Walker Reservoir	1	10	1	7	4	1	0	7	9	10	6	0	55

Table 9-4: Results of Subwatershed Restoration Potential Analysis

As shown in <u>Table 9-4</u>, the following subwatersheds should be given highest priority for restoration potential to improve upon existing conditions:

- Clarks Brook,
- Gages Brook,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook.

Based on the CSA results, the following subwatersheds are recommended for detailed assessment and planning:

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



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# APPENDIX A

# SPECIES LIST BELDING WILDLIFE MANAGEMENT AREA

### APPENDIX A

### FLORA OF BELDING WMA.

### **Club Mosses**

<u>Club-moss family</u> (Lycopodiaceae) Tree club moss (*Lycopodium obscurum*)

### Ferns

Bracken Fern Family (Dennstaedtiaceae) Hay-scented fern (Dennstaedtia punctilobula) Bracken fern (Pteridium aquilinum)

<u>Wood fern family</u> (Dryopteridaceae) Sensitive fern (*Onoclea sensibilis*) Spinulose wood fern (*Dryopteris spinulosa*) Christmas fern (*Polystichum acrosticoides*) Rock polypody (*Polypodium virginianum*)

<u>Royal fern family</u> (Osmundaceae) Cinnamon fern (*Osmunda cinnamomea*) Interrupted fern (*Osmunda claytoniana*) Royal fern (*Osmunda regalis*)

<u>Maidenhair Fern family</u> (Pteridaceae) Maidenhair fern (*Adiantum pedatum*)

<u>Marsh Fern family</u> (Thelypteridaceae) New York fern (*Thelypteris noveboracensis*)

### **Gymnosperms**

<u>Pine family</u> (Pinaceae) Eastern white pine (*Pinus strobes*) Eastern red cedar (*Juniperus virginiana*) Red pine (*Pinus resinosa*) Pitch pine (*Pinus rigida*) Eastern hemlock (*Tsuga Canadensis*) Norway spruce (*Picea abies*)

### **Angiosperms (Flowering plants)**

<u>Magnolia family</u> (Magnoliaceae) Tulip tree (*Liriodendron tulipifera*)

Laurel family (Lauraceae) Northern spicebush (Lindera benzoin) Sassafras (Sassafras albidum) and an an an arrest and an arrest and an arrest and an arrest and a second and a s

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Buttercup family (Ranunculaceae) Wood anemone (Anemone quinquefolia) Rue anemone(Thalictrum thalictroides) Goldthread (Coptis groenlandica) Kidneyleaf buttercup (Ranunculus abortivus) American pokeweed (Phytolacca Americana)

<u>Buckwheat family</u> (Polygonaceae) Arrow-leaf tearthumb (*Polygonum sagittatum*)

<u>Witch-hazel family</u> (Hamamelidaceae) Witchhazel (*Hamamelis virginiana*)

<u>Plane-tree family</u> (Plantanaceae) American sycamore (*Platanus occidentalis*)

Beech family (Fagaceae) Black oak (Quercus velutina) Red oak (Quercus rubra) White oak (Quercus alba) Scarlet oak (Quercus coccinea) American chestnut (Castanea dentata) American beech (Fagus grandifolia)

<u>Birch family</u> (Betulaceae) Speckled alder (*Alnus rugosa*) Black birch (*Betula lenta*) Gray birch (*Betula populifolia*) Paper birch (*Betula papyrifera*) Yellow birch (*Betula alleghaniensis*)

<u>Bayberry family (</u>Myricaceae) Sweetfern (*Comptonia peregrina*)

<u>Walnut family</u> (Juglandaceae) Pignut hickory (*Carya glabra*) Shagbark hickory (*Carya ovata*)

(Hypericaceae) St. John's wort (*hypericum perforatum*)

<u>Wintergreen family (Pyrolaceae)</u> Shinleaf (*Pyrola elliptica*) Spotted wintergreen (*Chimaphila maculata*) Indianpipe (Monotropa uniflora) Pinesap (Monotropa hypopithys)

Heath family (Ericaceae) Eastern teaberry (Gaultheria procumbens) Black huckleberry (Gaylussacia baccata) Mountain laurel (Kalmia angustifolium) Pinxter flower (Rhododendron nudiflorum) Highbush blueberry (Vaccinium corymbosum) Lowbush blueberry (Vaccinium angustifolium)

<u>Primrose family</u> (Primulaceae) Starflower (*Trientalis borealis*) Whorled loosestrife (*Lysimachia quadrifolia*)

<u>Violet family</u> (Violaceae) Common blue violet (*Viola papilionaceae*) Northern white violet (*Viola pallens*) Sweet white violet (*Viola blanda*) Field violet (*Viola arvensis*)

<u>Willow family (Salicaceae)</u> Quaking aspen (*Populus tremuloides*)

<u>Cucumber family</u> (Cucurbitaceae) Bur cucumber (*echinocystis lobata*)

Elm family (Ulmaceae) American elm (Ulmus americana)

Rose family (Rosaceae) White meadowsweet (Siriea latifolia) Steeplebush (Spirea tomentosa) Blackberry (Rubus allegheniensis) Raspberry (Rubus occidentalis) Multiflora Rose (Rosa multiflora) Strawberry (Fragaria virginiana) Black cherry (Prunus serotina) Apple (Prunus malus)

### Pea family

Hop clover (*Trifolium aureum*) Red clover (*Trifolium pretense*) Cow vetch (*Viccia cracca*)

<u>Maple family</u> Sugar maple (*Acer saccharum*) Red maple (*Acer rubrum*) الا المراجع ال المراجع المراجع

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<u>Touch-me-not Family</u> (Balsaminaceae) Spotted touch-me-not (*Impatiens capensis*)

<u>Milkwort family</u> (Polygalaceae) Fringed polygala (*Polygala paucifolia*) Field milkwort (*Polygala sanguinea*)

<u>Staff-tree family</u> (Celastraceae) Winged euonymus (*Euonymus alatus*) Asiatic bittersweet (*Celastrus orbiculatus*)

<u>Holly family</u> (Aquifoliaceae) Winterberry (*Ilex verticillata*)

<u>Oleaster family</u> (Eleagnaceae) Autumn olive (*Eleagnus umbellate*) Russian olive (*Eleagnus angustifolium*)

<u>Grape family</u> (Vitaceae) Virginia creeper (*Parthenocissus quinquefolia*) Fox Grape (*Vitis labrusca*)

<u>Dogwood family</u> (Cornaceae) Silky dogwood (*Cornus amomum*)

<u>Ginseng family</u> (Araliaceae) Ginseng (*Panax quinquefolium*) Dwarf ginseng (*Panax trifolium*)

<u>Carrot family</u> (Apiaceae) Queen Anne's Lace (*Daucus carota*)

<u>Honeysuckle family</u> (Caprifoliaceae) Tartarian Honeysuckle (*Lonicera tatarica*) Elderberry (*Sambucus canadensis*) Maple-leaved viburnum (*Viburnum acerifolium*) Arrowwood (*Viburnum dentatum*)

<u>Aster family</u> (Asteraceae) Yarrow (*Achillea millefolium*) New York Aster (*Aster novi-belgii*) Oxeye daisy (*Chrysanthemum lleucanthemum*) Bull thistle (*Cirsium vulgare*)

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Bedstraw family (Rubiaceae) Bluets (Houstonia caerulea) Partridgeberry (Mitchella repens)

Joe-Pve weed (Eunatorium maculata)

Dogbane family (Apocynaceae) Periwinkle (Vinca minor) Common milkweed (Asclepias syriaca)

Nightshade family (Solanaceae) Bittersweet nightshade (Solanum dulcamara) Jimsonweed (*Datura stramonium*)

Olive family (Oleaceae) White ash (*Fraxinus americana*)

Figwort family (Scrophulariaceae) Blue toadflax (Linaria canadensis) Butter-and-eggs (Linaria vulgaris) Monkey flower (Mimulus ringens) Common mullein (Verbascum thapsus) Thyme-leaved speedwell (Verbascum serpyllifolia)

Mint family (Lamiaceae) Heal-all (Prunella vulgaris) Wild mint (mentha arvensis)

Melanthium family (Melanthiaceae) False hellebore (*Veratrum nigrum*)

Trillium family (Trilliaceae) Purple trillium (*Trillium erectum*) Nodding trillium (*Trillium cernuum*)

Lily family (Liliaceae)

Canada Mayflower (*Maianthemum canadense*) False Solomon's seal (Smilacina racemosa) Smooth Solomon's seal (*Polygonatum biflorum*) Trout lily (*Erythronium americanum*) Indian cucumber root (Medeola virginiana)

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Cathrier family (Smilaceae)

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### Greenbrier (Smilax rotundifolia)

<u>Orchid family</u> (Orchidaceae) Nodding ladies' tresses (*Spiranthes cernua*) Pink lady's slipper (*Cypripedium acaule*) Rattlesnake plantain (*Goodyera pubescens*)

<u>Asparagus family</u> (Asparagaceae) Asparagus (*Asparagus officinalis*)

<u>Spiderwort family</u> (Commelinaceae) Asiatic dayflower

<u>Rush family</u> Juncaceae Canadian rush (*Juncus canadensis*) Common rush (*Juncus effusus*) Poverty rush (*Juncus tenuis*)

Sedge family (Cyperaceae) Yellow nutsedge (Cyperus esculentus) Fringed sedge (Carex crinita) Greater bladder sedge (Carex intumescens) Shallow sedge (Carex lurida) Pennsylvania sedge (Cares pensylvanica) Tussock sedge (Carex stricta) Green bulrush (Scirpus atrovirens) Wool grass (Scirpus cyperinus) Panicled bulrush (Scirpus microcarpus) Fox sedge (Carex vulpinoidea) - Metzler

Grass family (Poaceae)

Orchard grass (Dactylis glomerata) Crabgrass (Digitaria sanguinalis) Witch grass (Panicum capillare) Reed canary grass (Phalaris arundinaceae) Green foxtail (Setaria viridis) Velvet grass (Holcus lanatus) – Metzler Timothy (Phleum pretense) – Metzler Cheatgrass (Bromus tectorum) – Metzler Sweet vernal grass (Anthoxanthum odoratum) - Metzler

<u>Water plantain family</u> Alismataceae Arrowhead (*Sagittaria latifolila*)

<u>Arum family</u> (Araceae) Skunk cabbage (Symplocarpus foetidus) Jack-in-the-pulpit (Arisaema triphyllum) Cat-tail family (Typhacea) Common cattail (Typha latifolia)

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### FAUNA OF BELDING W MA.

### **INVERTEBRATES**

Annelids Earthworm (Oligochaeta) Leech (Hirudinea)

### Crustaceans

Crayfish (Decapoda)

### **Molluses**

Pea clam (*Sphaeriidae*) Eastern pearlshell (*Margaritifera margaritifera*) Eastern elliptio (*Elliptio complanata*) Lymnaid snail (*Pseudosuccinea columella*) Planorbid snail (Helisoma)

#### Insects

Mayflies (Ephemeroptera) Drunella (Ephemerellidae) Flat-head mayfly (*Heptageniidae:Epeorus*) Stenonema (*Heptageniidae*) Baetidae

True flies (Diptera) Midge (Chironomidae) Dance fly (*Empididae*) Sand fly (*Psychodidae*) والمراجع والمراجع والمراجع والمتعاد والمحاصر والمحاص والمحاص والمحاص والمحاص والمحاص والمحاص والمحاص والمحاص وا Black fly (Simuliidae) Crane fly (*Tipulidae*) Phantom crane fly (Ptychopteridae :Bittacomorpha clavipes)

Stoneflies (Plecoptera) Chloroperlidae Glossosomatidae Nemouridae Peltoperlidae Perlidae Perlodidae

**<u>Caddisflies</u>** (Trichoptera)

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Chimarra Hydropsychidae Lepidostoma Limnephilidae Philopotamidae Rhyacophila

<u>Dobsonflies and fishflies</u> (Megloptera) Corydalus Nigronia

<u>Beetles</u> (Coleoptera) Predaceous diving beetle (*Dytiscidae*) Water beetle (*Elmidae*) Water scavenger beetle (*Hydrophilidae*) Water penny beetle (*Psephenidae*) Scarab beetle (*Scarabaeidae*) Green tiger beetle (*Cicindela sexguttata*) Burying beetle (*Nicrophorus arbicollis*)

ODONATA

Damselflies River jewelwing (Calopteryx maculata) Ebony jewelwing (Calopteryx aequibilis) Elegant spreadwing (Lestes inaequalis) Fragile forktail (Ischnura posita)

### Dragonflies

Brown darner (*Boyeria vinosa*) Common green darner (*Anax junius*) Spangled skimmer (*Libellula cyanea*) Yellow-legged meadowhawk (*Sympetrum vicinum*) Banded-winged meadowhawk (*Sympetrum semicinctum*) Cherry-faced meadowhawk(*Sympetrum internum*) Clubtail (Gomphidae)

# Lepidoptera

## Butterflies

Peck's skipper (*Polites peckius*) Crossline skipper (*Polites origenes*) Delaware skipper (Anatrytone logan) Tiger swallowtail (Papilio glaucus) Spicebush swallowtail (*Papilio Troilus*) Cabbage butterfly (*Pieris rapae*) Clouded sulphur (*Colias philodice*) Small copper (Lycaena phlaeas) Eastern tailed blue (*Everes comyntas*) Spring azure (Celastrina "ladon") Red-spotted purple (*Limenitis arthemis*) Great spangled fritillary (Speyeria cybele) Pearl crescent (*Phyciodes tharos*) Monarch (Danaus plexippus) Viceroy (Limenitis archippus)

### Moths

Garden tortrix (*Ptycholoma peritana*) Lesser maple spanworm moth (Itame pustularia) Blurry chocolate angle (Semiothisa transitaria) Minor angle (Semiothisa minorata) Four-spotted angle (Semiothisa quadrinotaria) White spring moth (*Lomographa vestaliata*) Lesser grapevine looper moth (*Eulithis diversilineata*) Greater grapevine looper moth (*Eulithis gracilineata*) Sweetfern geometer (*Cylophora pendulinaria*) Cross-lined wave (Calothysanis amaturaria) Red twin spot (*Xanthorhoe ferrugata*) White-striped black (Trichodezia albovittata) Brown bark carpet (*Horisme intestinata*) Black-rimmed prominent (*Pheosia rimosa*) Painted lichen moth (*Hypoprepia fucosa*) Clymene moth (*Haploa clymene*) Harnessed moth (Apantesis phalerata) Pink-shaded fern moth (*Callopistria mollissima*) Copper underwing (Amphipyra pyramidoides) Common pinkband (*Ogdoconta cinereola*) Eight-spotted forester (Alypia octomaculata) Pink-barred lithacodia (Lithacodia carneola) Decorated owlet (Pangrapta decoralis) Spotted grass moth (*Rivula propingualis*) American idia (*Idia americalis*) Common idia (*Idia aemula*) Early zanclognatha (Zanclognatha cruralis)

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 a) the second sec  Morbid owlet (*Chytolita morbidalis*) Dark-spotted palthis (*Palthis angulalis*)

### FISH

American Eel (Anguilla rostrata) Bluegill (Lepomis macrochirus) Brook Trout (Salvelinus fontinalis) Blacknose Dace (Rhinichthys atratulus) Brown Trout (Salmo trutta) Chain Pickerel (Esox Niger) Fallfish (Semotilus corporalis) Golden Shiner (Notemigonus crysoleucas) Longnose Dace (Rhinichthys cataractae) Largemouth Bass (Micropterus salmoides) Rainbow Trout (Oncorhynchus mykiss) Tessellated darter (Etheostoma olmstedi) White Sucker (Catostomus commersoni) Yellow Perch (Perca flavescens)

### AMPHIBIANS

American toad (Bufo americanus) Gray treefrog (Hyla versicolor) Northern spring peeper (Pseudacris c. crucifer) Bullfrog (Rana catesbeiana) Green frog (Rana clamitans melanota) Pickerel frog (Rana palustris) Wood frog (Rana sylvatica) Northern Redback salamander (Plethodon cinereus) Spotted salamander (Ambystoma maculatum) Northern two-lined salamander (Eurycea bislineata) Red-spotted newt (Notophthalmus v. viridescens)

### REPTILES

Painted turtle (*Chrysemys picta*) Eastern box turtle (*Terrapene c. carolina*) Eastern milk snake (*Lampropeltis t. triangulum*) Eastern garter snake (*Thamnophis s. sirtalis*)

### BIRDS

Ciconiiformes Great Blue Heron (Ardea herodias) Turkey Vulture (Cathartes aura) **Falconiformes** Red-tailed Hawk (Buteo jamaicensis) Broad-winged hawk (Butea platypterus) Cooper's hawk (Accipiter cooperii) Sharp-shinned hawk (Accipiter striatus) Gallifomes Wild Turkey (Meleagris gallopavo) Charadriiformes American woodcock (Scolopax minor) Killdeer (Charadrius vociferus) **Columbiformes** Mourning Dove (Zenaida macroura) Cuculiformes Yellow-billed cuckoo (Coccyzus americanus) **Strigiformes** Barred Owl (Strix varia) Great horned owl (Bubo virginianus) **Apodiformes** Chimney Swift (Chaetura pelagica) **Coraciiformes** Belted Kingfisher (Ceryle alcyon) Piciformes Downy Woodpecker (Picoides pubescens) Hairy woodpecker (Picoides villosus) Red-bellied Woodpecker (Melanerpes carolinus) Pileated woodpecker (Dryocopus pileatus) Yellow-shafted Flicker (Colaptes auratus) **Passeriformes Tvrannidae** Eastern Wood-Pewee (Contopus virens) Eastern Phoebe (Sayornis phoebe) Great Crested Flycatcher (Myiarchus crinitus) Olive-sided flycatcher (Nuttallornis borealis) Eastern Kingbird (Tyrannus tyrannus) Vireonidae Red-eyed Vireo (Vireo olivaceus) Warbling Vireo (Vireo gilvus) Yellow-throated vireo (Vireo flavifrons) Corvidae Common raven (Corvus corax) American Crow (Corvus brachyrhynchos) Blue Jay (Cyanocitta cristata)

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### Hirundidae

Tree Swallow (Iridoprocne bicolor) Barn Swallow (Hirundo rustica)

### Paridae

Black-capped Chickadee (Poecile atricapillus) Tufted Titmouse (Baeolophus bicolor) Sittidae

Red-breasted Nuthatch (Sitta carolensis) White-breasted Nuthatch (Sitta Canadensis)

### Certhiidae

Brown creeper (Certhia familiaris)

### Troglodytidae

Carolina Wren (Thryothorus ludovicianus) House Wren (Troglodytes aedon)

### Turdidae

Eastern Bluebird (Sialia sialis) Swainson's thrush (Catharus ustulatus) Veery (Catharus fuscescens) Wood Thrush (Hylocichla mustelina) American Robin (Turdus migratorius)

### Mimidae

Gray Catbird (Dumetella carolinensis) Northern Mockingbird (Mimus polyglottos) Brown Thrasher (Toxostoma rufum)

### **Bombycillidae**

Cedar Waxwing (Bombycilla cedrorum) **Parulidae** 

Blue-winged Warbler (Vermivora pinus) Nashville warbler (Vermivora ruficapilla) Northern parula (Parula americana) Yellow Warbler (Dendroica petechia) Chestnut-sided warbler (Dendroica pensylvanica) Yellow-rumped warbler (Dendroica coronata) Black-throated green warbler (Dendroica virens) Pine Warbler (Dendroica pinus) Prairie warbler (Dendroica discolor) Palm warbler (Dendroica palmarum) Blackpoll warbler (Dendroica striata) Blackburnian warbler (Dendroica fusca) Cerulean warbler (Dendroica cerulean) Black-and-white warbler (Mniotilta varia) American redstart (Setophaga ruticilla) Ovenbird (Seirus aurocapillus) Louisiana waterthrush (Seiurus motacilla) Common Yellowthroat (Geothlypis trichas) Canada warbler (Wilsonia canadensis)

### Thraupidae

Scarlet Tanager (Piranga olivacea)

### Emberizidae

Eastern Towhee (Pipilo erythrophthalmus) Chipping Sparrow (Spizella passerina) White-throated sparrow (Zonotrichia albicollis) Song Sparrow (Melospiza melodia) Dark-eyed junco (Junco hyemalis)

### Cardinalidae

Northern Cardinal (*Cardinalis cardinalis*) Rose-breasted Grosbeak (*Pheucticus ludovicianus*) Indigo Bunting (*Passerina cyanea*) Icteridae

Red-winged Blackbird (Agelaius phoeniceus) Common Grackle (Quiscalus quiscula) Brown-headed Cowbird (Molothrus ater) Baltimore Oriole (Icterus galbula) Fringillidae American Goldfinch (Carduelis tristis)

### MAMMALS

Short-tailed shrew (Blarina brevicauda) Red-backed vole (Clethrionomys gapperi) Meadow vole (Microtus pennsylvanicus) Deer mouse (Peromyscus leucopus) Jumping mouse (Zapodidae) Chipmunk (Tamiasciurus hudsonicus) Gray squirrel (Sciurus carolinensis) Red squirrel (Tamiasciurus hudsonicus) Muskrat (Odontra zibethicus) Porcupine (Erethizon dorsatum) Eastern cottontail rabbit (Sylvilagus floridanus) Gray fox (Urocyon cinereoargenteus) Raccoon (Procyon lotor) Short-tailed weasel (Mustela erminae) Fisher (Martes pennanti) Striped skunk (Mephitis mephitis) White-tailed deer (Odocoileus virginianus)



# APPENDIX B

# POLLUTANT LOADING EVALUATION

### Pollutant Loading Analysis Tankerhoosen River Watershed Baseline Assessment

# 1.0 INTRODUCTION

A pollutant loading analysis was performed for the Tankerhoosen River watershed in support of the Baseline Watershed Assessment to assess the potential for increases in nonpoint source (NPS) pollutant loads. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. The predicted change in pollutant loadings in each of the subwatersheds was then examined to assess their relative vulnerability to future development.

# 2.0 MODEL DESCRIPTION

A pollutant loading model was developed using the land use/land cover data described in <u>Section 7.0</u> of the Baseline Watershed Assessment report (Fuss & O'Neill 2008). The model was used to compare pollutant loadings from the watershed under existing land use conditions to future pollutant loadings under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing to future conditions and not to predict future water quality.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.

The focus of the Tankerhoosen watershed pollutant loading model was future development of presently undeveloped land and re-development of developed land with higher-intensity land uses (See <u>Section 7.2 of Fuss & O'Neill 2008</u>), since these are likely sources of increased pollutant loads. Agricultural NPS pollutant loadings were not considered in the analysis since agricultural land comprises a very small percentage of the land uses within the watershed.

The pollutants modeled in this analysis are the default pollutants contained in the STEPL model: total phosphorus, total nitrogen, biological oxygen demand, and total suspended solids. These pollutants are the major parameters of concern in environmental systems.

Nitrogen and phosphorus are nutrients that promote the growth of algae and plants in water. When this biomass dies and settles to the bottom of water bodies, its decomposition consumes oxygen which is needed by other organisms for survival. Nitrogen is generally present in relatively small quantities compared to other nutrients in salt water systems, such as Long Island Sound, so limiting its concentration limits the growth of algae. In fresh water systems, such as the stream and impoundments in the Tankerhoosen River watershed, phosphorus is the nutrient that is relatively scarce and thus limits algal growth.



Biological oxygen demand (BOD) is a measure of the amount of oxygen that a pollutant consumes as it decomposes (e.g., one pound of BOD consumes one pound of oxygen). A given BOD loading to a water body effectively consumes an equivalent amount of oxygen from that water body, making it unavailable to aquatic organisms.

Total suspended solids (TSS) is a measure of both biodegradable and mineral sediment. Its discharge to a water body results in turbidity and sedimentation. TSS may also have secondary effect; biodegradable TSS exerts a BOD load, and mineral TSS can be associated with particulate phosphorus.

# 3.0 MODEL PARAMETER SELECTION

STEPL uses algorithms that calculate nutrient and sediment loads from different land uses to determine watershed pollutant loadings. The user specifies several model parameters for each land use in the watershed that are used to estimate runoff quantity and pollutant levels. These parameters include:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model uses these parameters to estimate the runoff quantity and pollutant loading using data specific to each subwatershed, supplied by the user, as well as default climate data for the subject county. In addition to these parameters, the model includes percent impervious surface values for each land use. As part of this project, the model was modified to accept user-specified impervious surface values for each land use.

A literature review was conducted to determine EMCs values for use in the study. STEPL includes default EMC values for each land use within the watershed. Since comparison between existing and proposed watershed conditions is the focus of this project, EMC values were selected to reflect the relative difference in NPS pollutant characteristics between the existing and future land use. <u>Table 1</u> shows EMC values from several sources for the pollutants of interest.

						Lar	nd Use					
Source	Pollutant	Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units
	N	1.9	1.5	2	2.2	1.8	2.5	2.2	0.2	3	1.5	mg/L
STEDI	Р	0.3	0.15	0.2	0.4	0.3	0.4	0.4	0.1	0.5	0.15	mg/L
SIEPL	BOD	4	4	9.3	10	7.8	9	10	0.5	9.3	4	mg/L
	TSS	-	70	75	100	67	120	100	-	150	70	mg/L
NSQD	N*	-	1.2	2.2	2	-	2.1	-	-	2.3	-	mg/L
	Р	-	0.25	0.22	0.3	-	0.26	-	-	0.25	-	mg/L
	BOD	-	4.2	11.9	9	-	9	-	-	8	-	mg/L

Table 1. Runoff Event Mean Concentrations (EMCs)



						Lai	nd Use					
Source	Pollutant	Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units
	TSS	-	51	43	48	-	77	-	-	99	-	mg/L
	N*	-	1.5	1.75	2.6	-	-	-	-	-	-	mg/L
NURP	Р	-	0.1	0.201	0.38	-	-	-	-	-	-	mg/L
	BOD	-	-	9.3	10	-	-	-	-	-	-	mg/L
	TSS	-	70	57	101	-	-	-	-	-	-	mg/L
	N*	-	-	2	2	-	-	2	-	2	-	mg/L
	Р	-	-	0.26	0.26	-	-	0.26	-	0.26	-	mg/L
VVIIVI	BOD	-	-			-	-		-		-	mg/L
	TSS	-	-	55	55	-	-	55	-	55	-	mg/L
	N*	-	-	13.7	13.7	-	10.6	10.0	-	-	-	kg/ha/yr
BEC	Р	-	-	2.7	2.7	-	2.6	1.9	-	-	-	kg/ha/yr
DEC	BOD	-	-			-			-	-	-	kg/ha/yr
	TSS	-	-	748.0	748.0	-	802.5	456.0	-	-	-	kg/ha/yr
	N*	1.9	1.5	2.2	2	1.8	2.5	1.8	0.2	3	1.5	mg/L
Colootod	Р	0.3	0.15	0.4	0.2	0.3	0.4	0.3	0.1	0.5	0.15	mg/L
Juictieu	BOD	4	4	10	9.3	7.8	9	7.8	0.5	9.3	4	mg/L
	TSS	-	70	100	75	67	120	67	-	150	70	mg/L

See References for Source Information

The majority of selected values were obtained from STEPL, with adjustments to ensure consistency with other sources. These adjustments include exchanging the multi-family and commercial values, since development included in the multi-family category is assumed to be less intensive in the Tankerhoosen watershed (See <u>Section 4.0</u>) than typical, and since the default commercial sediment EMC value was lower than sediment levels of other less sediment-intensive land uses. Similarly, since the single-family land use category selected for the watershed includes only large lot residential areas, the selected EMCs for these areas were reduced to Institutional land use levels.

As part of this project, the impervious surface coefficients in STEPL were adjusted for use in generating existing and proposed impervious surface estimates. The default factors, literature values for factors, and selected factors are presented in <u>Table 2</u>.

	Impervious Cover Coefficients						
Land Use	STEPL	NEMO <sup>1</sup>	Selected				
Commercial	0.85	0.205 - 0.557	0.50				
Industrial	0.70	0.264 - 0.557	0.40				
Institutional	0.50	-	0.30				
Transportation	0.95	0.433	0.43				
Multi-family	0.75	0.09 - 0.39	0.24				
Single-family	0.30	0.065 - 0.12	0.10				
Vacant (developed)	0.70	-	0.41				
Open Space	0.01	0.001 - 0.094	0.01				

# Table 2. Impervious Surface Coefficients

<sup>1</sup>Sleavin et al. (2000) and Prisloe et al. (2003)



The STEPL model also includes input parameters related to failing septic systems in the watershed. Parameters include the typical population per household and septic system failure rate. Default values were used for the typical population per household and septic system failure rate due to the limited availability of local data.

# 4.0 MODEL INPUT DATA

Land use/land cover data that is described in <u>Section 7.0</u> of the Baseline Watershed Assessment was adapted for integration into the STEPL model. Data was prepared in this manner for both the existing conditions and future conditions (watershed buildout) pollutant loading scenarios. STEPL allows fewer land use categories than contained in the land use/land cover data obtained from other sources, so several data categories were combined for use in the model. <u>Table 3</u> summarizes the assignment of STEPL land use categories for each of the land use/land cover data categories.

Data Category	STEPL Category
Agriculture	Cropland
Cemetery	Open Space (urban)
Commercial	Commercial (urban)
Condominium	Multi-family (urban)
Government/Non-Profit	Institutional (urban)
Group Quarters	Institutional (urban)
Health/Medical	Institutional (urban)
Industrial	Industrial (urban)
Mixed Use	Commercial (urban)
Multi-Family	Multi-family (urban)
One Family	Multi- or Single-family (urban)
Resource/Recreation	Forest
Retail	Commercial (urban)
ROW	Transportation (urban)
School	Institutional (urban)
Three Family	Multi-family (urban)
Two Family	Multi-family (urban)
Undeveloped	Forest
Unknown	Vacant - Developed (urban)
Water	Not Considered

Table 3. Source Data - STEPL Category Correlation

STEPL defines urban land uses differently from agriculture and forest. All urban land uses are lumped into a single land use category, and urban land cover characteristics are distinguished based on land use subcategories, which include commercial, industrial, institutional, transportation, multi-family residential, single-family residential, urban cultivated, vacant (developed), and open space land uses. Since the source land use data included many residential land use categories and STEPL only provides two residential categories, residential uses for all but the largest single-family residential parcels was included in the multi-family category. The Tankerhoosen River watershed has large areas of rural-residential land use with parcel sizes of greater than 2 acres. As such, parcels smaller than two acres were considered to

be high density residential and parcels larger than two acres were considered low density residential. <u>Table 4</u> summarizes the composition of single-family residential land use based on parcel size ranges.

Watershed	0 - 22k sf	22k sf - 2 ac	2 - 5 acres	> 5 acres
Bolton Notch Pond	3.2%	49.7%	47.1%	0.0%
Clarks Brook	21.4%	36.0%	18.0%	24.6%
Gages Brook	11.4%	37.8%	25.4%	25.4%
Gages Brook South Tributary	0.9%	47.4%	33.6%	18.1%
Lower Tankerhoosen River	21.4%	43.9%	34.4%	0.3%
Middle Tankerhoosen River	13.6%	60.3%	15.7%	10.5%
Railroad Brook	0.2%	45.9%	53.7%	0.2%
Tucker Brook	22.0%	54.4%	11.1%	12.6%
Upper Tankerhoosen River	1.0%	79.9%	18.8%	0.3%
Walker Reservoir	17.0%	43.2%	24.0%	15.7%

 Table 4. Composition of Single-Family Residential Land Use Based on Parcel Size

Septic system data is also required for the STEPL model. Sewer service area GIS data from Connecticut DEP was used to screen out developed parcels in the Tankerhoosen watershed; parcels located completely outside of mapped sewer service areas were assumed to be served by septic systems. The resulting number of developed parcels without sewer service were divided into residential systems (single-family through multi-family systems) and other developed systems (including condominiums, industrial, commercial, and institutional systems). The residential systems were assumed to have similar characteristics and the other developed systems were assumed to be approximately 5 times the size of the residential systems, on average (this factor was estimated based on the total land area feeding these systems and an estimated intensity of use).

Hydrologic Soil Group (HSG) data are also required by the model. This data, which is available from the U.S. Natural Resource Conservation Service (NRCS), describes the infiltration characteristics of most soils in the county. Identifiers for the soil groups range from Type A soils, including sands and other soils that are very well drained and result in little runoff, to Type D soils, which are poorly drained, often being compacted, having high clay content and high groundwater levels. Soils data were compiled for each subwatershed and assimilated into an average HSG value. Each subwatershed was found to have Type B soil characteristics, on average, with the exception of the Gages Brook subwatershed, which was found to have Type C soil characteristics.

# 5.0 CURRENT POLLUTANT LOADINGS

# 5.1 <u>Input</u>

The following land use data were entered into the STEPL spreadsheet to create an existing conditions pollutant loading model. These inputs were reduced form the data presented in <u>Section 7.1</u> of the Baseline Watershed Assessment. In general, agricultural land use (i.e. cropland) was the least common of the non-urban uses. In most subwatersheds, urban uses dominate, although forests compose more than half of the land area in the Railroad Brook and Upper Tankerhoosen River watersheds.

		Land Use A	Area (ac)		Land Us	se Area Con	nposition
Watershed	Urban	Cropland	Forest	Total	Urban	Croplan d	Forest
Bolton Notch Pond	183.9	0.0	134.7	318.6	58%	0%	42%
Clarks Brook	533.3	3.6	110.5	647.4	82%	1%	17%
Gages Brook	485.8	28.2	181.5	695.5	70%	4%	26%
Gages Brook South Tributary	491.3	5.7	183.3	680.3	72%	1%	27%
Lower Tankerhoosen River	179.4	0.0	127.1	306.5	59%	0%	41%
Middle Tankerhoosen River	1185.5	22.6	362.4	1570.5	75%	1%	23%
Railroad Brook	377.6	0.0	825.3	1202.8	31%	0%	69%
Tucker Brook	648.8	43.0	241.8	933.5	69%	5%	26%
Upper Tankerhoosen River	519.2	0.0	952.6	1471.9	35%	0%	65%
Walker Reservoir	192.2	0.0	129.8	322.0	60%	0%	40%

# Table 5. Land Use Input Data

<u>Table 6</u> presents the composition of the urban land use areas listed in <u>Table 5</u>. In general, residential land use is the most prevalent in the urbanized areas, although transportation corridors are the predominant urban land use in the Bolton Notch Pond and Lower Tankerhoosen River watersheds, and comprise greater than 20% of urban land use in three of the ten watersheds.

	Urban Land Use Composition (%)							
Watershed	Com.	Ind.	Inst.	Trans.	Dense Res.	Rural Res.	Vacant	Open Space
Bolton Notch Pond	25.5	2.1	5.7	29.4	17.6	15.7	4.0	0.0
Clarks Brook	4.2	11.9	0.3	13.9	49.7	18.6	1.4	0.0
Gages Brook	13.7	16.7	8.8	7.7	27.5	25.0	0.0	0.6
Gages Brook South Tributary	2.4	0.0	4.0	19.7	35.4	37.9	0.6	0.0
Lower Tankerhoosen River	4.3	4.1	9.8	32.6	30.6	14.1	2.0	2.5
Middle Tankerhoosen River	2.7	1.9	1.8	17.9	55.8	18.5	1.0	0.4
Railroad Brook	0.0	0.0	0.0	4.5	43.4	50.7	1.4	0.0
Tucker Brook	0.3	0.0	4.5	11.9	63.9	19.3	0.1	0.0
Upper Tankerhoosen River	0.0	0.0	0.7	13.6	66.9	15.1	3.3	0.4
Walker Reservoir	6.3	2.7	0.0	37.8	39.4	11.5	2.3	0.0

Table 6. Urban Land Use Composition

<u>Table 7</u> presents the total estimated number of septic systems in the Tankerhoosen River watershed, determined using the methods described in <u>Section 4.0</u>. Septic systems are assumed to be present at lots not included in or abutting the sewer service area shown in the Baseline Watershed Assessment report. As discussed in <u>Section 4.0</u>, "other" septic systems includes septic systems for land uses other than single-family and multi-family residential land uses, such as condominiums, group quarters, commercial, industrial parcels. These systems are assumed to serve an equivalent population of 5 times a residential system on average. Note that these

septic system estimates and are intended only for estimating increases in NPS pollutant loads and should not be used for other purposes.

	Number of Septic Systems				
Watershed	Residential	Other	Equivalent Total		
Bolton Notch Pond	43	2	53		
Clarks Brook	108	8	148		
Gages Brook	81	1	86		
Gages Brook South Tributary	236	4	256		
Lower Tankerhoosen River	43	1	48		
Middle Tankerhoosen River	169	7	204		
Railroad Brook	76	0	76		
Tucker Brook	98	0	98		
Upper Tankerhoosen River	198	3	213		
Walker Reservoir	42	2	52		

Table 7	Estimated	Number	of Septic	Systems
	Lotination	Number	or Septic	Jystoms

# 5.2 <u>Results</u>

<u>Table 8</u> presents total estimated loadings of total nitrogen, total phosphorus, BOD, and TSS for each subwatershed, as well as the loading rate for each subwatershed. In terms of total existing loads, the largest loads of pollutants originate in the Middle Tankerhoosen River, Gages Brook, Gages Brook South Tributary, Clarks Brook, and Tucker Brook subwatersheds. As such, pollutants from these areas are likely to have the largest effect on water quality in the Tankerhoosen River.

Since some of these watersheds are large compared to others, it is useful to look at the data in terms of the loading rate, which is the load of pollutant per unit land area. A high loading rate indicates dense pollutant sources, which suggests that implementation of best management practices (BMPs) in these areas would be more effective in reducing pollutant loads. Pollutant loading rates are relatively uniform between many of the watersheds. Outstanding loading rates include those from Railroad Brook and the Upper Tankerhoosen River, which are significantly lower than rates from other subwatersheds, and those from the Walker Reservoir, which are significantly elevated compared to loads from other subwatersheds. The highlighting in <u>Table 8</u> identifies subwatersheds with high (orange), moderate (yellow), and low (green) pollutant loadings.

	Ν	Р	BOD	Sediment	Ν	Р	BOD	Sediment
Watershed	lb∕yr	lb∕yr	lb/yr	t/yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	t/ac-yr
Bolton Notch Pond (318 ac)	2175	385	7895	51	6.8	1.2	24.8	0.2
Clarks Brook (647 ac)	4157	669	15686	92	6.4	1.0	24.2	0.1
Gages Brook (695 ac)	4640	787	18084	115	6.7	1.1	26.0	0.2
Gages Brook South Tributary (680 ac)	4062	720	14877	89	6.0	1.1	21.9	0.1
Lower Tankerhoosen River (306 ac)	2009	343	6987	47	6.6	1.1	22.8	0.2

Table 8	Estimated	Existing	Pollutant	I nads
I able 0.		LAISUNY	FUIIULAIIL	Luaus



	N	Р	BOD	Sediment	Ν	Р	BOD	Sediment
Watershed	lb∕yr	lb∕yr	lb/yr	t∕yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	t/ac-yr
Middle Tankerhoosen River (1570 ac)	9364	1473	34764	216	6.0	0.9	22.1	0.1
Railroad Brook (1203 ac)	1890	359	7451	40	1.6	0.3	6.2	0.0
Tucker Brook (934 ac)	4481	699	17014	118	4.8	0.7	18.2	0.1
Upper Tankerhoosen River (1472 ac)	3868	683	14562	82	2.6	0.5	9.9	0.1
Walker Reservoir (322 ac)	2312	390	7965	54	7.2	1.2	24.7	0.2
Total (8149 ac)	38960	6509	145286	903	4.8	0.8	17.8	0.1

- *Bolton Notch Pond.* Although this subwatershed is the second smallest in the study area, it is characterized by the second highest nitrogen loading rate, is tied for the highest phosphorus and sediment loading rate, and has the third highest BOD loading rate. These high values reflect the large composition of commercial land use (approximately 26%) and transportation land use (approximately 29%) in the subwatershed.
- *Gages Brook.* This watershed is characterized by both relatively high total pollutant loads and pollutant loading rates. This watershed is 70% urban land, and has the highest industrial land use composition and second-highest commercial land use composition.
- *Middle Tankerhoosen River.* This watershed has moderate pollutant loading rates. Although it is the largest subwatershed in the study area, it also has total pollutant loads that are approximately twice as high as those of other large subwatersheds.
- *Walker Reservoir*. Although the Walker Reservoir subwatershed is similar in size to the Bolton Notch Pond subwatershed, its pollutant loading rates for nitrogen, phosphorus, and sediment are significantly higher. These loading rates reflect the highly urbanized nature of this subwatershed, which also has the highest percentage of transportation land use.

### 5.3 Discussion

The sources of pollutants in the watershed are generally associated with urban land use, as presented in <u>Table 9</u>. Note that urban areas are estimated to account for between 80% and 95% of the NPS pollutant load in the watershed, although urban uses comprise only 59% of the total watershed land use area (See <u>Table 5</u>)

	NL oad PL oad		BOD	Sediment
Source		F LUau	Load	Load
Urban	91.9%	81.5%	93.1%	88.6%
Cropland	1.9%	2.6%	1.0%	7.8%
Forest	2.3%	6.7%	1.5%	3.6%
Septic	3.9%	9.2%	4.3%	0.0%
Total	100.0%	100.0%	100.0%	100.0%

Table 9. Pollutant Source by Land Use

By subdividing the urban pollutant loads into the distinct urban categories that were included in the model (See <u>Table 10</u>), it is apparent that transportation land use accounts for the largest NPS pollutant loads in the watershed, with higher-density residential use being the second largest source of pollutant loads. Higher-density residential land use is a significant source since it is the predominant land use in the watershed (See <u>Table 6</u>). Transportation use is a significant source since it has the highest pollutant EMCs, and commercial uses are a significant source for the same reason (See <u>Table 1</u>).

Urban Land	N Load	P Load	BOD	Sediment	N Load	P Load	BOD	Sediment
			Load	Load			Load	Load
036	lb/year	lb/year	lb/year	tons/year	Load         N Load         P Load         Load         Load           Load         N Load         P Load         Load         Load         Stress           tons/year         %         %         %         %         %         %           51         6%         8%         8%         %         %         %         %           46         5%         6%         5%         %         %         %         %           20         3%         3%         3%         % </td <td>%</td>	%		
Commercial	2242	408	10191	51	6%	8%	8%	6%
Industrial	1898	304	6834	46	5%	6%	5%	6%
Institutional	1061	177	4596	20	3%	3%	3%	2%
Transportation	17400	2900	53938	435	49%	55%	40%	54%
Dense Residential	9890	989	45990	185	28%	19%	34%	23%
Rural Residential	2970	495	12871	55	8%	9%	10%	7%
Vacant	297	30	792	7	1%	1%	1%	1%
Open Space	39	4	103	1	0%	0%	0%	0%

Table 10. Pollutant Loads and Source	es for Urban Categories
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# 6.0 FUTURE POLLUTANT LOADINGS

# 6.1 <u>Input</u>

Future land use estimates, presented in <u>Table 11</u>, were used in the STEPL model to simulate a watershed buildout scenario. Also summarized in <u>Table 11</u> is the predicted "increase" in urban land use for each subwatershed. These model inputs were derived form the data presented in <u>Section 7.2</u> of the Baseline Watershed Assessment report. Much of the future developed area in the watershed is currently forested, such that the increase in urban area for each subwatershed includes a corresponding reduction in forested land.

	Lar	nd Use Area	(ac)	Land	sition)	Urban	
Watershed	Urban	Cropland	Forest	Urban	Cropland	Forest	Increase
Bolton Notch Pond	233.3	0	85.3	73%	0%	27%	15%
Clarks Brook	590.4	2.4	54.6	91%	0%	8%	9%
Gages Brook	614.4	28.2	52.9	88%	4%	8%	19%
Gages Brook South Tributary	614.3	5.7	60.3	90%	1%	9%	18%
Lower Tankerhoosen River	270.7	0	35.8	88%	0%	12%	30%
Middle Tankerhoosen River	1312.5	10.1	247.9	84%	1%	16%	8%
Railroad Brook	589.9	0	612.9	49%	0%	51%	18%
Tucker Brook	771.2	43.0	119.3	83%	5%	13%	13%
Upper Tankerhoosen River	746.1	0	725.7	51%	0%	49%	15%
Walker Reservoir	296.4	0	25.7	92%	0%	8%	32%

# Table 11. Land Use Input Data

<u>Table 12</u> summarizes a break-down of the urban land uses presented in <u>Table 5</u>. Much of the future development and redevelopment is anticipated in areas that are currently zoned for residential uses. As such, residential land use is likely to become a larger percentage of urban land use in many of the subwatersheds.

			Urban	Land Use	Composi	tion (%)		
Watershed	Com.	Ind.	Inst.	Trans.	Dense Res.	Rural Res.	Vacant	Open Space
Bolton Notch Pond	20.2	6.5	4.5	23.2	16.0	26.6	3.1	0.0
Clarks Brook	6.0	15.2	0.3	12.6	57.1	7.6	1.3	0.0
Gages Brook	15.6	16.8	7.0	6.1	23.2	30.8	0.0	0.5
Gages Brook South Tributary	2.6	3.5	3.2	15.7	30.3	44.2	0.5	0.0
Lower Tankerhoosen River	3.5	2.7	6.5	21.6	59.8	2.8	1.3	1.6
Middle Tankerhoosen River	5.9	1.7	1.6	16.1	67.5	6.0	0.9	0.4
Railroad Brook	0.0	0.0	0.0	2.9	86.1	10.1	0.9	0.0
Tucker Brook	0.2	0.0	3.8	10.0	81.5	4.4	0.1	0.0
Upper Tankerhoosen River	0.0	0.0	0.5	9.5	33.9	55.0	0.9	0.3
Walker Reservoir	15.1	3.7	0.0	24.5	36.9	19.8	0.1	0.0

# Table 12. Urban Land Use Composition

<u>Table 13</u> presents the total estimated number of existing and future septic systems in the Tankerhoosen River watershed, determined using the methods described in <u>Section 4.0</u>. Septic systems are assumed to be present at lots not included in or abutting the sewer service area shown in the Baseline Watershed Assessment report. As discussed in <u>Section 4.0</u>, "other" septic systems includes septic systems for land uses other than single-family and multi-family residential land uses, such as condominiums, group quarters, commercial, industrial parcels. These systems are assumed to serve an equivalent population of 5 times a residential system on average.

	Existing	Future	Other	Future
	Equivalent	Residential	Future	Equivalent
Watershed	Total	Systems	Systems	Total
Bolton Notch Pond	53	8		61
Clarks Brook	148	3	9	196
Gages Brook	86	5		91
Gages Brook South Tributary	256	14	1	275
Lower Tankerhoosen River	48	4		52
Middle Tankerhoosen River	204	11	9	260
Railroad Brook	76	26		102
Tucker Brook	98	6		104
Upper Tankerhoosen River	213	19		232
Walker Reservoir	52	7	1	64

# Table 13. Estimated Number of Septic Systems

### 6.2 <u>Results</u>

<u>Table 14</u> presents projected future pollutant loads under a watershed buildout scenario. An increase in pollutant loads is predicted in all subwatersheds. The Railroad Brook subwatershed is predicted to have the highest increase in nitrogen, BOD, and sediment loads. Large increases are also predicted in nitrogen, phosphorus, and BOD in the Middle Tankerhoosen River subwatershed. The largest phosphorus increases are predicted in the Gages Brook subwatershed.

		Total Future Load					Projected Load Increase			
	N	Р	BOD	Sediment	Ν	Р	BOD	Sediment		
Watershed	lb/yr	lb/yr	lb/yr	t/yr	lb/yr	lb/yr	lb/yr	t∕yr		
Bolton Notch Pond (318 ac)	2384	416	8752	54	209	31	857	4		
Clarks Brook (647 ac)	4745	756	18205	103	588	87	2519	11		
Gages Brook (695 ac)	5538	921	21973	134	898	134	3888	19		
Gages Brook South Tributary (680 ac)	4559	793	16976	98	497	73	2099	9		
Lower Tankerhoosen River (306 ac)	2410	374	8916	53	401	31	1929	7		
Middle Tankerhoosen River (1570 ac)	10357	1585	39700	229	993	112	4936	13		
Railroad Brook (1203 ac)	2964	432	12652	59	1074	73	5201	19		
Tucker Brook (934 ac)	5111	736	20084	129	630	37	3071	11		
Upper Tankerhoosen River (1472 ac)	4228	759	16194	87	360	76	1632	5		
Walker Reservoir (322 ac)	2909	481	10718	66	598	91	2754	12		
Total (8149 ac)	45207	7252	174172	1011	6248	743	28886	109		

# Table 14. Projected Future Pollutant Loads and Load Increases

<u>Table 15</u> presents the projected future pollutant loads in terms of the projected load increase based on existing loads (percent increase) and loading rate increase for each subwatershed. These criteria were selected to determine the most significant changes in watershed loadings since they control for the existing load quantities (percent increase) and watershed size (rate increase). The highlighting in <u>Table 15</u> identifies areas with the high (orange), moderate (yellow), and low (green) pollutant loadings or loading rates in the Tankerhoosen River watershed.

Table 15. Projected Pollutant Loading Rate Increases and Load Increases

	Projecte	ed Future Lo	ading Rate	Projected Load Increase				
	Ν	Р	BOD	Sediment	Ν	Р	BOD	Sediment
Watershed	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	lb/yr	t/yr
Bolton Notch Pond (318 ac)	0.66	0.10	2.7	0.012	9.6%	8.0%	10.9%	7.7%
Clarks Brook (647 ac)	0.91	0.13	3.9	0.017	14.1%	12.9%	16.1%	11.7%
Gages Brook (695 ac)	1.29	0.19	5.6	0.027	19.4%	17.0%	21.5%	16.7%
Gages Brook South Tributary (680 ac)	0.73	0.11	3.1	0.014	12.2%	10.2%	14.1%	10.5%
Lower Tankerhoosen River (306 ac)	1.31	0.10	6.3	0.022	20.0%	8.9%	27.6%	14.7%
Middle Tankerhoosen River (1570 ac)	0.63	0.07	3.1	0.008	10.6%	7.6%	14.2%	5.8%
Railroad Brook (1203 ac)	0.89	0.06	4.3	0.015	56.8%	20.3%	69.8%	46.4%
Tucker Brook (934 ac)	0.67	0.04	3.3	0.012	14.1%	5.3%	18.0%	9.4%



	Projecte	ed Future Lo	Projected Load Increase					
	N	N P BOD Sediment			Ν	Р	BOD	Sediment
Watershed	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	lb/yr	t/yr
Upper Tankerhoosen River (1472 ac)	0.24	0.05	1.1	0.003	9.3%	11.1%	11.2%	6.0%
Walker Reservoir (322 ac)	1.86	0.28	8.6	0.036	25.8%	23.3%	34.6%	21.6%
Total (8149 ac)	0.77	0.09	3.5	0.013	16.0%	11.4%	19.9%	12.0%

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include:

- *Gages Brook.* The existing conditions pollutant load model indicates that this subwatershed is characterized by both relatively high total pollutant loads and pollutant loading rates, with approximately 70% urban land use, the largest amount of industrial land use, and the second-highest commercial land use composition in the entire watershed. The buildout condition of this watershed is projected to result in a 19% increase in urban land use with a corresponding decrease in forest; and the new urban land is likely to consist of new residential and industrial development. As such, relatively large loads and loading rate increases may occur.
- Lower Tankerhoosen River. The existing conditions pollutant load model for this subwatershed predicts relatively small loads (since the watershed area is small) and moderate loading rates. Under a buildout scenario, this subwatershed is projected to result in more than a 20% increase in nitrogen and BOD loads. The resulting loading rates for these parameters are projected to be the second highest of the Tankerhoosen River subwatersheds.
- *Railroad Brook.* The projected buildout pollutant loadings in this subwatershed for nitrogen and BOD are anticipated to increase by approximately 57% and 70%, respectively. Significant increases are also anticipated in phosphorus and sediment loads. Currently, the Railroad Brook sub watershed is heavily forested, with comparatively little development. Several large tracts of land within this subwatershed are potentially available for future development, especially in Bolton and South Vernon, which makes this watershed vulnerable to potentially significant pollutant load increases.
- *Walker Reservoir.* The existing conditions pollutant loading model suggests that this subwatershed has some of the highest levels of pollutant loads within the overall Tankerhoosen River watershed. Potential land use changes in this subwatershed include significant areas of new residential and mixed-use development, much of which is located adjacent to Walker Reservoir. These changes are predicted to result in the greatest increases in pollutant loading rates for all of the parameters evaluated.

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Watershed Field Inventories and Land Use Regulatory Review Tankerhoosen River Watershed

> Friends of the Hockanum River Linear Park of Vernon, Inc.

> > In Association With:

Town of Vernon North Central Conservation District Rivers Alliance of Connecticut Hockanum River Watershed Association Belding Wildlife Management Area

Vernon, CT

October 2008



Fuss & O'Neill, Inc. 78 Interstate Drive West Springfield, MA 01089



## WATERSHED FIELD INVENTORIES AND LAND USE REGULATORY REVIEW Tankerhoosen River Watershed

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- В Upland Assessment Field Forms
- С Photographs on CD
- D Vernon Regulatory Review Memorandum



# 1.0 INTRODUCTION

The Friends of the Hockanum River Linear Park of Vernon, Inc. (the "Friends") has retained Fuss & O'Neill to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The Watershed Management Plan will be developed through a collaborative effort with a Technical Advisory Committee consisting of the Friends, the Town of Vernon (Planning Department and Conservation Commission), the North Central Conservation District, the Hockanum River Watershed Association, Rivers Alliance of Connecticut, and the Belding Wildlife Trust. The Plan will identify action items to be implemented by the municipalities and private groups which will protect and improve the health of the Tankerhoosen River watershed.

There are two key reports that provide the basis for recommendations in the Watershed Management Plan: 1) Baseline Watershed Assessment and 2) Watershed Field Inventories and Regulatory Review. The Baseline Watershed Assessment (Fuss & O'Neill, May 2008) evaluates the existing conditions of natural resources and pollutant sources in the watershed to prioritize watershed protection and restoration strategies. This report, the Watershed Field Inventories and Land Use Regulatory Review, describes the stream corridor and upland assessments conducted by Fuss & O'Neill to identify and evaluate pollutant sources in the watershed, as well as, review of local zoning and land use regulations for selected towns within the Tankerhoosen River watershed. Findings of the Baseline Watershed Assessment and the Watershed Field Assessment and Land Use Regulatory Review will serve as the basis for development of a watershed management plan for the Tankerhoosen River.

# 2.0 WATERSHED FIELD INVENTORIES

Field inventories were performed during summer 2008 to further assess existing watershed conditions and potential sources of pollution. The field inventories are screening level tools for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. The field inventories included selected stream corridors and upland areas within priority subwatersheds, which were identified in the Baseline Watershed Assessment report based on a comparative subwatershed evaluation that considered vulnerability to future development impacts and restoration potential to improve upon existing conditions. Field inventories were performed within the following priority subwatersheds (<u>Figure 1</u>):

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.



Figure 1. Tankerhoosen River Watershed

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The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (CWP, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (CWP, 2005). The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to the streams. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land.

During the field inventories, crews assessed approximately 8.7 miles of stream corridors, six potential hotspot locations, five representative residential neighborhoods, and a number of streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses. Field inventory nomenclature used throughout this report is summarized in <u>Table 1</u>. Copies of completed field assessment forms are provided in <u>Appendix A</u> (stream corridor assessments) and <u>Appendix B</u> (upland assessments). Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are included on a CD in <u>Appendix C</u>.

Subwatershed	Abbreviation	
Clarks Brook	СВ	
Lower Tankerhoosen River	LTR	
Middle Tankerhoosen River	MTR	
Walker Reservoir	WR	
Gages Brook	GB	
Gages Brook South Tributary	GBST	
Tucker Brook	ТВ	
Stream Corridor Assessment	Abbreviation	
Reach Level Assessment	RCH	
Channel Modification	CM	
Severe Bank Erosion	ER	
Impacted Buffer	IB	
Stormwater Outfall	OT	
Stream Crossing	SC	
Trash & Debris	ТВ	
Utilities	UT	
Upland Assessment	Abbreviation	
Hotspot Investigation	HSI	
Neighborhood Site Assessment	NSA	
Streets and Storm Drains	SSD	

			-
Table 1: Fi	ield Inven	itory Nom	enclature

## 2.1 <u>Summary of Findings</u>

A variety of common issues and problems were identified during the field inventories. Some prevalent issues throughout the watershed are described below. These findings will be used to develop recommendations for the Watershed Management Plan.

- Overall in-stream habitat in the assessed reaches was mixed. Some of the assessed reaches have high quality habitat, with riparian cover, good floodplain connection, varied substrate, and significant stream shading. In other segments, in-stream habitat is marginal to poor due to bank erosion, buffer encroachment, trash and debris, lack of shading, and in-stream sedimentation. However, the majority of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities. Many potential barriers to fish passage were observed throughout the watershed, including perched culverts, culverts with very shallow flow, and natural and manmade dams. Therefore, the impact of potential fish barriers and the feasibility of fish barrier removal efforts should be investigated further.
- Stream buffer encroachments are prevalent along stream corridors in or near areas of
  residential and commercial development. Residential lawns and some commercial lawns
  extend down to the banks of the stream in many areas, particularly in residential back
  yards. Yard waste such as grass clippings, leaves, and brush and waste materials were
  also common occurrences in and near these areas where easy access exists to the
  streams. Education, signage, stream buffer regulations, and stream cleanups are
  potential approaches for improving buffer management.
- Residential areas appear to contribute significant quantities of rooftop runoff to the storm drainage system, particularly in medium and high-density residential neighborhoods with smaller yards. Many small outfall pipes were observed from the backyards of residential areas, which are presumably associated with foundation drains, yard drains, or roof downspouts. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.
- Numerous outfalls were observed from virtually all of the land uses encountered during the stream assessments. Many appear to be associated with sources having low potential for water quality impacts (i.e., residential foundation drains), while others were of unknown origin and should be the focus of future investigation. A watershed-wide illicit discharge investigation is recommended in targeted areas and land uses.
- Invasive species (phragmites, cattails, reed canary grass, etc.) were observed in stream corridors in many areas of the watershed. Invasive species management should be incorporated into stream corridor restoration activities.
- Parking lots associated with apartment complexes, institutional land uses (schools), and commuter lots are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other small-scale LID approaches.


- The field assessments identified very little evidence of storm drain stenciling or watershed stewardship signage, with the exception of a residential subdivision in the Tucker Brook subwatershed.
- Most of the developed areas surveyed have inadequate stormwater quality controls. Many of the residential developments were constructed prior to the advent of modern stormwater quality regulations and design requirements. Therefore, most of the development observed in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond detention basins for peak flow control. In most cases, the stormwater management controls that were observed at newer developments were not being maintained.
- No Low Impact Development (LID) design practices were observed in the watershed. With the recent shift toward LID site design and stormwater management requirements, as demonstrated by the Town of Tolland's new LID regulations and design manual, the watershed is an ideal candidate to showcase LID practices for both new development and retrofit applications. Local LID demonstration sites are a valuable tool for public education and promoting the widespread use of such practices. Incorporating LID into town projects, including roadway projects, can also serve as a proactive model for private development.
- Stormwater runoff from Interstate 84, other state roads such as Route 30 and 31, and local roads typically receives little or no treatment prior to discharge. Such discharges are a source of sediment and other pollutants to the receiving water bodies.
   Opportunities exist for stormwater retrofits at roadway stormwater outfalls
- Relatively isolated areas of moderate to severe streambank erosion were observed throughout the assessed portions of the watershed. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Access to many of these areas is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility.
- Very few active construction sites were observed in the watershed. However, a large
  amount of developable land exists in the watershed, and future construction activity is a
  major potential source of polluted runoff. Approaches for stronger soil erosion and
  sedimentation controls include regulating building envelopes, encouraging property
  owners to minimize clearing for other purposes, and requiring drainage review for
  activities that disturb less than ½ acre.
- Due to limited project funding, not all stream segments in the priority subwatersheds were assessed, and other subwatersheds (Railroad Brook, Bolton Notch Pond, and Upper Tankerhoosen River) were not assessed as they were determined to be less vulnerable to future development impacts. A schedule should be established for assessing the remaining stream segments and subwatersheds.

The following sections present a more detailed discussion of the stream corridor and upland assessment methods and findings.

# 2.2 <u>Stream Corridor Assessment</u>

Stream corridors within the Tankerhoosen River watershed were assessed during June 3 through 6, 2008, and on July 2 and 10, 2008. The weather on these days was sunny, overcast or partly cloudy and not raining, with the exception of June 4, which had intermittent and heavy rain at times. Field crews consisted of staff from Fuss & O'Neill, the North Central Conservation District, and volunteers with Friends of the Hockanum River Linear Park of Vernon. Stream corridors were assessed along selected reaches within priority subwatersheds using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005).

The stream assessment method used in this study is a continuous stream walk method that identifies and evaluates the following impact conditions for each reach:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, culverts, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified;
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

The stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Field data forms were completed for each stream reach assessed (<u>Appendix A</u>). The information was entered into a database and used to quantify the overall condition of stream corridors in the watershed, compare subwatersheds within the watershed to each other, and prioritize areas for restoration, stormwater retrofit, land preservation, and other stewardship opportunities.

Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from downstream to upstream when in series and west to east upstream from confluences. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally less than one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach. Impact conditions within each reach were numbered sequentially with an abbreviation followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02.

Forty-one stream reaches were evaluated in the Tankerhoosen River watershed using this stream assessment protocol. <u>Table 2</u> summarizes the number of impact conditions identified and reach level assessments that were performed within each subwatershed.

Table 2: Number of Reach Level Assessments Performed and Impact Conditions Identified

Subwatershed	RCH	СМ	ER	IB	OT	SC	TD	UT
Clarks Brook	5		2		10	8	2	
Lower Tankerhoosen River	1				1	1		
Middle Tankerhoosen River	5		1		14	5	7	
Walker Reservoir	5				6	6		
Gages Brook	12	1	8	5	21	12	3	1
Gages Brook South Trib.	7	1	1	1	3	8		
Tucker Brook	6		2	4	9	9	3	

Reach level assessment scores were assigned by field crews based upon the overall stream, buffer, and floodplain conditions. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 relating to poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points.

Streams were assessed relative to a base condition, which for this study, is the highest scoring stream reach in the Tankerhoosen River watershed (153 points). All other assessed stream reaches were assigned a numerical score and categorized relative to the base score of 153 points (<u>Table 3</u>). Reaches scoring greater than 90% of the base condition (138 points) are considered "excellent", between 75% and 90% of the base condition are categorized as "good", between 55% and 75% of the base condition are categorized as "fair", between 35% and 55% of the base condition are categorized as "poor", and less than 35% of the base condition are categorized as "very poor". <u>Table 4</u> summarizes stream reach assessment scores and classifications for the assessed stream reaches.

D		
		Point
Category	Percentile	Threshold
Excellent	90%	≥138
Good	75%	≥115
Fair	55%	≥84
Poor	35%	≥54
Very Poor	<35%	<54

Table 3: Stream Reach Classifications

Excellent		Good		Fair		Poor		Very Poor	
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
MTR-08	153	GBST-02	127	GB-09	114	TB-04B	83	GB-05B	53
GB-10	146	GB-02	120	GBST-03	111	MTR-01	82	WR-01	35
GBST-04A	146	GBST-09B	120	LTR-03	111	GB-04	80		
GBST-01	145	TB-02	119	GB-07	105	WR-02	80		
MTR-07	139	GBST-04B	117	CB-03	104	WR-04	76		
CB-04	138	TB-01	116	GB-01	102	GB-03B	72		
		GB-08	115	GB-03A	97	GBST-09A	59		
				MTR-09	94				
				GB-05A	93				
				CB-02	93				
				TB-03	92				
				TB-04A	92				
				WR-03	91				
				GB-06	88				
				MTR-02	87				
		CB-01	85						
				WR-05	84				
Note: TB04C and CB-05 were not scored during the reach level assessment									

# Table 4: Stream Reach Assessment Scores and Classifications

As depicted in <u>Figure 2</u>, MTR-08 is the highest rated stream reach due to good riparian cover and bed material. WR-03 is considered fair due to the presence of invasive species within the riparian corridor. TB-04B and GB-05B are poor and very poor, respectively, because of poor channel characteristics, outfalls, stream crossings, trash and debris and lack of stream buffer and stream bank erosion in the case of GB-05B.

The following sections summarize the major issues identified during the stream corridor assessments for each priority subwatershed. Specific locations are identified according to the stream reach and impact condition IDs described previously. Identification of "right" and "left" stream banks is from the observer's perspective facing downstream.



Figure 2: Examples of Stream Reaches in Various Classification Categories

# 2.2.1 Clarks Brook

Clarks Brook is a tributary of the Tankerhoosen River that flows into the Middle Tankerhoosen River subwatershed. Clarks Brook is divided into five stream segments, labeled CB-01 through CB-05 (Figure 3). All five stream segments were assessed. Segments CB-01 through CB-03 were inventoried on July 2, 2008, while segments CB-04 and CB-05 were assessed on July 10, 2008. Land use in this subwatershed includes residential, commercial/industrial, retail, and some undeveloped land. Interstate 84 crosses Clarks Brook in the southern portion of the watershed.

# CB-01

Stream segment CB-01 begins at the mouth of Clarks Brook and continues upstream to Bolton Road. The surrounding land use is primarily forested and open fields, with one residence along the left bank.

 RCH — The overall stream conditions are optimal to suboptimal with the exception of bank vegetative protection which is rated as poor due to lack of stream buffer along portions of the left bank. The dominant bed substrate is cobble; there are no attached or floating plants in the stream; wildlife such as fish, frogs, and birds are present; and the stream is approximately 50 percent shaded. The reach has good accessibility.



Figure 3. Clarks Brook Subwatershed Field Assessment Locations



- OT The reach contains several outfall pipes, including several 4-inch plastic pipes which are believed to be connected to residential foundation drains or roof downspouts (no dry weather flows observed) and two 18-inch outfalls conveying roadway drainage (no dry weather flows observed). None of the observed outfall pipes appears to be contributing dry weather discharges or causing stream bank erosion.
- SC Clarks Brook crosses under Bolton Road within a 5.5-foot circular concrete culvert. The upstream side of the culvert was partially blocked by brush and debris, and the concrete on the inside of the culvert is deteriorating. The sharp drop in elevation immediately downstream of the culvert creates a "perched" condition and a physical barrier to fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet and cleaning/repair.

### CB-02

Stream segment CB-02 flows along a baseball field and industrial properties, from Bolton Road to Industrial Park Road. The stream enters a culvert prior to Industrial Park Road and reemerges on the other side of the road.

- RCH The stream conditions are generally suboptimal to marginal. The instream habitat is considered optimal while the floodplain connection, vegetated buffer width, floodplain habitat and floodplain encroachment received a marginal rating. Clarks Brook flows at 100 percent of the channel width in this section, with clear water and some attached plants in the stream. The dominant substrate is sand and cobble and there is evidence of sediment deposition.
- OT There are three outfalls along this reach. The first, OT-01, is a plastic pipe on the right bank originating from the parking lot of an adjacent industrial facility, was observed to have a trickle of discharge and brown benthic growth on the pipe. Outfall OT-02 is an earthen open channel approximately 4 feet deep and 5 feet wide. A trickle of discharge was also observed in the channel. The final outfall, OT-03, is a 4-inch diameter plastic pipe on the right back. No flow or microbial growth/discoloration was observed from the pipe.
- ER Some moderate, isolated bank erosion was observed on the left bank. This area is a potential candidate for bank stabilization.
- SC An approximately 400-foot long circular culvert conveys Clarks Brook under a parking lot. The triple barrel metal culverts are 2 feet in diameter. The outlets of the culverts are perched slightly above elevation of the stream bottom. This culvert is a potential candidate for fish barrier removal to address the perched outlet.
- TR Significant quantities of trash and debris (an estimated 1 pickup truck load) were
  observed including tires, automotive waste, appliances and a closed 55-gallon drum of
  unknown contents. The debris and waste materials should be removed and
  disposed in accordance with applicable local, state, and federal regulations.



Trash and debris along reach CB-02

# СВ-03

Reach CB-03 begins on the north side of Industrial Park Road, continues through the underpass of Bamforth and Baker Roads, and ends at Interstate 84. The stream passes through mostly forested areas, although the stream also flows along an industrial park for a short distance and then under the two roads.

- RCH The stream conditions are generally rated suboptimal. The in-stream habitat
  and floodplain vegetation are rated optimal. The vegetative protection, bank erosion,
  floodplain connection, habitat and encroachment are considered suboptimal. The bank
  erosion on the left bank and buffer width on the right bank are considered marginal.
  The stream flows at 75-100% of the channel width, which is dominated by boulder
  substrate. The water is clear with no aquatic plants in the stream, and the stream
  surface is mostly shaded. Access to the reach is rated fair or difficult.
- OT There are two outfalls along this reach. OT-01 is a drainage channel, originating from a wooded area adjacent to Interstate 84, approximately 1 foot deep and 2 feet wide. OT-02 is an 18-inch concrete drainage outfall pipe with moderate flow.
- ER An approximately 30-foot long area of severe bank erosion was observed on the left bank downstream of a wooden foot bridge. The area has good access for construction equipment for potential restoration of the bank. This area is a potential candidate for bank stabilization.
- SC —Stream crossing SC-01 is a wooden foot bridge over Clarks Brook. Debris under the bridge is causing partial blockage of the stream. Removal of the debris is recommended. Crossing SC-02 is a circular culvert below Bamforth Road. The double metal barrels are approximately 4.5 feet in diameter and 60 feet long. The culvert outlet is elevated above the elevation of the stream bed, restricting fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet. The third stream crossing in this segment is SC-03, which conveys flow underneath



Baker Road inside a circular double barrel metal culvert. The culverts are 4 feet in diameter and approximately 100 feet in length.



Bamforth Road crossing (perched culvert) along reach CB-03

• TR – Automotive debris was observed along the stream near a residential area, and should be removed as part of a stream cleanup in this reach.

# СВ-04

Stream segment CB-04 extends from the wetlands on the northern side of Interstate 84 through a forested area and ending at the edge of a residential neighborhood at Rockledge Drive.

- RCH This segment is rated as optimal using the stream assessment criteria in every category except floodplain habitat, which is rated suboptimal. The dominant substrate is cobble, the water is clear and there are no aquatic plants in the stream. There is evidence of fish, frogs and songbirds and the stream is mostly shaded. There is some evidence of sediment deposition in the stream channel.
- OT —A 12-inch concrete outfall pipe is located on the right bank near Rockledge Drive. The pipe is surrounded by dense knotweed and appears to originate from the adjacent residential area. A trickle of flow was observed, and the flow appeared to be cloudy and orange in color.
- SC There are several stream crossings along Clarks Brook in this segment. The first
  two crossings consist of a low-head concrete dam located immediately upstream of an
  approximately 4-foot diameter concrete culvert, which is located below a forested dirt
  road. The concrete dam and forest road culvert (perched approximately 3 to 4 inches
  above the elevation of the streambed at the culvert outlet, and having very shallow
  flow) are potential barriers to fish passage. Both are potential candidates for fish
  barrier removal. The third crossing is a concrete culvert below Rockledge Drive. Both
  culverts identified in this reach showed evidence of cracking and deterioration, and
  should be evaluated for potential repair or replacement.



# CB-05

The most upland reach in Clarks Brook, CB-05, could not be visually assessed because the segment flows entirely belowground in a culvert system. The flow is directed below a commercial building occupied by Superior Energy Propane and continues to flow through the culvert for approximately 650 feet, parallel to Route 30 until re-emerging on the north side of Middle Terrace. Historical filling of the Superior Propane site appears to have occurred, as evidenced by water seepage from the ground surface at the southeast corner of the site and the presence of a significant stand of phragmites adjacent to the site. A storm drain exists on the site. Representatives from Superior Propane indicated a desire to pave additional areas of the site and/or divert the water on the site to alleviate the wet soil conditions. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.

# 2.2.2 Lower Tankerhoosen River

The Lower Tankerhoosen River subwatershed is the outlet for the main stem of the Tankerhoosen River prior to its confluence with the Hockanum River and is fed directly by Tucker Brook and the Middle Tankerhoosen River (Figure 4). Only stream segment LTR-03 was assessed in this subwatershed (on June 5, 2008) due to limited time and staff availability.

# LTR-03

Stream segment LTR-03 is approximately 0.5 mile long and extends east to west, parallel to Interstate 84, from the inlet to Talcottville Pond through a forested area to the Dobsonville Pond dam and Dobson Road. The width of the stream varies from 20 feet to 50 feet and the upstream end of the segment near the dam has very steep banks.



The upstream side of Dobsonville Pond dam at the upstream limit of reach LTR-03. The photograph is taken near the confluence with reach TB-01.







Figure 4. Lower Tankerhoosen River Subwatershed Field Assessment Locations



- RCH The reach level assessment characterized this segment as generally suboptimal. The vegetated buffer width and floodplain vegetation is rated as optimal. The surrounding forested land provides good stream habitat. The beginning and end of the stream segment are altered by the manmade impoundments at both ends. The stream flows at 75 to 100% of the channel width and the substrate is dominated by cobble. The water is somewhat cloudy and has a naturally stained color. There are no plants in the stream and the surface is mostly shaded. The most significant issue observed along this reach is a stormwater detention basin associated with runoff from Interstate 84.
- OT —A stormwater outfall pipe conveys stormwater runoff from Interstate 84 to a
  detention basin located adjacent to the stream. The inside of the outfall pipe was
  observed to have an orange, rusty color, and an oily stain. A rusty, oily sludge was
  observed in the bottom of the detention basin. No standing water or discharge from
  the basin was observed at the time of the inspection. A discharge investigation is
  recommended to observe the basin function during wet weather and assess possible
  pollutant contribution to the stream. The basin and stormwater discharge is a
  potential stormwater retrofit candidate.
- SC The dams that impound Dobsonville Pond and Talcotville Pond are potential barriers to fish passage. According to the CTDEP Inland Fisheries Division, there are currently no diadromous fish (herring, shad) passage plans for these dams (Murphy, personal communication, September 24, 2008). There has been an effort in recent years to provide American eel passage at inland dams when there is a need and opportunity. An assessment of the lower reaches of the Tankerhoosen River is recommended to evaluate the presence of American eel and other resident fish populations, as well as the potential benefit of providing fish passage for these dams. Based on the assessment findings, fish passage for the resident fish population in the lower Tankerhoosen River could be incorporated into future dam repair projects.

# 2.2.3 Middle Tankerhoosen River

Reaches in this subwatershed are labeled MTR-01 through MTR-12. Stream assessments were conducted on representative reaches including MTR-01, MTR-02, MTR-07, MTR-08 and MTR-09 (Figure 5). Segments MTR-01, MTR-02 and portions of MTR-09 were inventoried on June 4, 2008, while the remaining segments were assessed on June 5, 2008. Residential use is the dominant land use in the subwatershed, and Interstate 84 traverses the northern portion of the subwatershed. The Upper Tankerhoosen River and Clarks Brook drain to the Middle Tankerhoosen River, which feeds the Lower Tankerhoosen River.

# MTR-01

This stream segment begins at the inlet to Tankerhoosen Lake and ends at the confluence of segments MTR-02 and MTR-09. The stream flows parallel to the back yards of a residential neighborhood

• RCH — The reach level assessment indicates suboptimal in-stream habitat, vegetative protection, bank erosion and floodplain connection. The overall buffer and floodplain conditions are generally marginal, with limited vegetative buffer width, floodplain



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Figure 5. Middle Tankerhoosen River Subwatershed Ffield Aassessment Locations



vegetation and habitat and moderate floodplain encroachment. The dominant in-stream substrate is gravel and cobble, and 50 percent of the stream surface is shaded.



Stream segment MRT-01 has areas with little or no vegetative buffer.

- OT —Four outfalls were observed along the left bank of the stream. Three of the
  outfalls are storm drainage pipes that convey stormwater runoff from the adjacent
  residential development. Sediment accumulation was observed at the outlets of several
  of the outfalls. An ABS outfall pipe was observed behind a residence. The pipe was
  submerged below the stream water surface at the time of the inspection. The source of
  this pipe and the nature of the potential discharge from the pipe should be
  investigated further.
- TR Three instances of trash and/or debris were observed along this segment. TR-01 is a commercial-grade 55-gallon plastic drum located within the stream. The contents of the drum could not be determined. TR-02 consists of brush and debris stockpiled along the bank of the stream. The material was placed by the Town of Vernon following removal of a beaver dam, but never removed. TR-03 consists of approximately 16 plastic buckets that are submerged or partially submerged below the water surface of the stream. The contents of the buckets are unknown. Both areas should be the focus of stream cleanup efforts.
- IB The left bank along much of the stream segment consists of residential lawns immediately adjacent to the stream, with little or no stream buffer. Stream bank erosion was observed in some areas along the left bank, including evidence of animal burrows in the stream bank below the exposed roots of the lawn.

# MTR-02

Reach MTR-02 begins at the confluence with MTR-09 and ends at Tunnel Road. This braided stream segment also flows adjacent to residential properties.

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- RCH The right bank consists primarily of residential lawns with little or no buffer, while the left bank has a modest vegetated buffer consisting of shrubs and mature forest. The in-stream flow fills the channel, and the substrate is dominated by gravel. There are no aquatic plants in the stream, and the water surface is approximately 50 percent shaded. Sediment deposits were observed in areas of the stream channel. Generally, the stream ranges from suboptimal to marginal for overall stream conditions and buffer and floodplain conditions. The left bank is characterized as optimal for bank erosion and vegetated buffer width. The right bank has poor vegetative protection.
- OT A 14-inch diameter concrete pipe conveys stormwater runoff from Tunnel Road. No dry-weather flow or other visible evidence of pollution was observed.
- SC Twin box culverts carry flow below Tunnel Road. The culverts are concrete, approximately 4 feet in diameter and 13 feet in length.

# MTR-07

This segment begins at Tunnel Road and ends at the confluence of the Tankerhoosen River and Clarks Brook. The primary land use along stream segment MTR-07 is forested and agricultural land, with a small area of adjoining residential land near Tunnel Road.

• RCH — The reach level assessment identifies this segment as generally optimal, with high ratings for overall stream conditions and buffer and floodplain conditions. The reach is dominated by gravel and cobble substrate, clear water, no in-stream vegetation, observed fish and terrestrial wildlife, and a mostly shaded stream.

#### MTR-08

Segment MTR-08 begins at the confluence of Clarks Brook and the Tankerhoosen River and ends at the confluence of Railroad Brook and the Tankerhoosen River. The surrounding land use is forest or cleared fields.

• RCH — This segment is characterized by gravel and cobble substrate, no attached or floating aquatic plants, wildlife including fish, deer, raccoon, and songbirds, and the stream is mostly shaded. Some evidence of channel widening was observed. The overall stream, buffer and floodplain conditions are rated as optimal.

# MTR-09

Stream segment MTR-09 is a tributary of the Tankerhoosen River that begins at the main stem of the Tankerhoosen River and extends upstream, crossing Warren Avenue and ultimately ending at Tunnel Road. The surrounding land uses are residential, forested, and wetlands, including a section of the Rails to Trails.

 RCH — The reach level assessment rates this segment as suboptimal to marginal. Bank erosion and floodplain connection for the reach is rated as marginal. The floodplain habitat and encroachment are also at a marginal level. The dominant substrates are sand, gravel and cobble. There are no aquatic plants in the stream, and the water surface is mostly shaded. There is evidence of bank scour along the reach. Issues identified along this reach include stormwater outfalls, severe bank erosion, stream crossings, and trash and debris.



- OT A total of 10 stormwater outfalls were identified along this reach. A majority of the outfall pipes are smaller than 8 inches in diameter, appear to be residential foundation drains, and do not warrant further investigation. Several of the outfall pipes are associated with the roadway drainage system. There are two 2-foot diameter pipes along the left bank which do not have dry-weather discharge and are clean and not submerged. A black ABS pipe observed in the stream appeared to originate from a residence along Warren Avenue. A trickle of flow was observed from the pipe, and brown sediment accumulation was observed in the stream near the outfall. The source of this pipe and the nature of the potential discharge from the pipe should be investigated further.
- ER An area of bank erosion was observed along the left bank, measuring approximately 20 feet in length and 6 feet high. The erosion severity is moderate and there is good access to the bank from the residential areas north of Warren Avenue. This area is a potential candidate for bank stabilization.
- SC There are two road crossings and a rail crossing along this reach. The stone blocks on the outside of the Rails to Trails culvert crossing are partially dislodged and in need of repair. The Tunnel Road stream crossing has debris partially blocking the outlet of the culvert. The outlet of a concrete box culvert located north of Warren Avenue is perched approximately 14 inches above the elevation of the stream bed and is a potential barrier to fish passage. This culvert is a potential candidate for fish barrier removal to address the perched outlet.



The Tunnel Road stream crossing (A) and the Rails to Trails crossing (B).

TR — Four instances of trash and debris were noted along this stream segment. Three consist of minor quantities of yard waste, while the fourth consists of approximately 2 to 3 pickup truckloads of leaves, logs, tree stumps and tires. This stream segment is a potential candidate for a stream cleanup.

# 2.2.4 Walker Reservoir

Reaches assessed in this watershed include WR-01 through WR-05 (Figure 6). Land use in this watershed includes a former outdoor sports complex, a Connecticut Department of



Transportation (ConnDOT) commuter parking lot, the Interstate 84 and Route 31 interchange, and several residential areas. The water bodies along the stream reaches in this subwatershed, including Walker Reservoir East and West, receive upstream flow Gages Brook and the Gages Brook South Tributary, as well as runoff from Interstate 84, Route 31, and residential developments. Segments WR-03 and WR-05 were assessed on June 3, 2008, while the remaining segments were inventoried on June 4, 2008.

## WR-01

This reach is located between Walker Reservoir West and Interstate 84, and receives flow from an upstream pond and the highway. The stream is braided and is surrounded primarily by forested land.

- RCH The reach is generally braided with a sandy bottom and a mostly-shaded stream surface. Channel widths were variable due to the braided nature of the stream, with the flow containing less than 25 percent of the channel width. Stream condition metrics in this reach are extremely poor with little habitat potential. Buffer metrics were somewhat better, with suboptimal (25-50 feet) width and mature forest vegetation. No notable floodplain was present.
- OT A drainage ditch outfall originating from Interstate 84 is present near the upstream end of the reach. The channel contained excessive debris that should be removed. There was no flow when it was observed.
- SC A stream crossing is present below Route 84. The 24-inch, steeply-sloped, corrugated metal pipe conveys flow from an upstream pond and reach WR-02 located north of the highway. The culvert is acting as grade control and has significant accumulated debris near its outlet. This reach also includes a chain link fence associated with the highway that has significant accumulated debris on the upstream side of the stream. The debris should be removed.

#### WR-02

This reach is located immediately upstream of the Interstate 84 culvert crossing and downstream of a pond, and situated at the southern end of the Mount Vernon Apartments.

- RCH This reach is mostly shaded with a variable bottom of gravel, sand, and cobble. In stream habitat and vegetative protection was generally marginal, with suboptimal bank stability and floodplain connection. Buffer and floodplain condition was generally suboptimal to marginal, with significant impacts from human activities and little habitat diversity.
- SC The Interstate 84 stream crossing described above is located at the downstream end of this reach. Generally, stream crossings separating reaches were considered to be associated with the downstream reach. However, the characteristics of the culvert inlet differ from the outlet; the upstream inlet is a 4-foot diameter pipe while the outlet is a 2-foot diameter pipe. A transition is suspected to occur at some point within the crossing.



Figure 6. Walker Reservoir Subwatershed Field Aassessment Locations



# WR-03

This stream reach connects Walker Reservoir East with reaches WR-04 and WR-05 and runs parallel to the east side of Reservoir Road, opposite the former outdoor sports complex.

- RCH This reach is mostly shaded and includes a bottom of fine material including silts, clays, and sand. The reach is variable in width and depth, but is generally well shaded. A variety of wildlife was observed, including fish, beaver, deer, snails, and birds. Evidence of channel widening and sediment deposition was observed. The overall stream condition is generally suboptimal, with the in-stream habitat, vegetated buffer width on the right bank and floodplain encroachment rated as marginal.
- SC A 4.5-foot diameter circular metal pipe is located on the right bank near the upstream end of the reach. The culvert appears to originate from stream reach WR-04 and crosses under Reservoir Road.

### WR-04

The stream reach WR-04 begins on the south side of Reservoir Road at the confluence of segments WR-03 and WR-05. WR-04 is a drainage ditch that flows parallel to the commuter parking lot between the Interstate 84 off-ramp at Exit 67 and Reservoir Road.

- RCH —Stormwater runoff from the commuter parking lot discharges directly into the stream through an outfall. The channel near the commuter lot contains significant invasive wetland vegetation (cattails and reed canary grass). The stream assessment rated this segment as generally suboptimal to marginal. The channel substrate is fine material including silt/clay and sands (sediment deposition). The water is observed to be turbid and there are some aquatic plants in the stream, which is partially shaded. The stream segment is readily accessible from the adjacent commuter parking lot.
- OT The outfall that drains the commuter parking lot discharges to the stream through a 3-foot diameter concrete pipe. This outfall is a potential stormwater retrofit candidate to treat runoff from the parking lot.
- SC —Stream crossing SC-01 conveys flow below Reservoir Road and consists of a circular 4.5-foot diameter circular metal pipe. The pipe inlet is partially clogged with autumn olive and maintenance should be performed to remove the blockage. The second stream crossing in this segment, SC-02, is at the upstream end of the segment and crossed underneath the off-ramp for Exit 67 on Interstate 84. The culvert is circular with a diameter of 4 feet. There is evidence of sediment deposition, but otherwise the culvert is in good condition.

# WR-05

Segment WR-05 is located between the confluence of WR-04 and WR-03 on the south side of Reservoir Road and the on-ramp for Exit 67 on Interstate 84. The stream flows in a southwesterly direction along this reach, crossing under Route 31 (Mile Hill Road).

• RCH – This segment is rated as suboptimal in the categories of in-stream habitat, vegetative protection and bank erosion, and rated as poor floodplain connection. The buffer conditions are generally marginal and there is extensive floodplain

encroachment. The surrounding land use includes public roads (Interstate 84 and Route 31) and a portion of the commuter parking lot. There is a small vegetated buffer along the stream corridor on the upstream portion of the stream segment, although beyond the buffer are cleared fields. The dominant substrates are sand and gravel, with limited cobble. There is evidence of fish, raccoon, great blue heron and Canada geese in the stream corridor. The stream has evidence of sediment deposition and portions have been channelized.

• OT – Stormwater outfall OT-01 is an earthen channel located on the left bank upstream of the Route 31 crossing. The channel originates from an adjacent residential property and was observed to have significant (3 to 4 feet deep) headcutting (erosion of the channel progressing upstream). A moderate flow of clear water was discharging from the channel at the time of the inspection. The property owner indicated that the source of the flow is groundwater seepage and surface runoff from upgradient areas. A discharge investigation is recommended, and this channel is a potential candidate for stream bank stabilization. The second outfall, OT-02, is a paved asphalt channel on the right bank, 8-inches deep and approximately 3 feet wide. The channel conveys road runoff.



Eroded channel and discharge from a residential property.

SC — Two stream crossings were identified along this reach. SC-01 is the stream crossing underneath Route 31 (Mile Hill Road), and SC-02 is the culvert underneath the on-ramp for I-84. Both crossings consist of twin concrete box culverts approximately 6 feet wide and 9 feet in height. Both have embedded bottoms. Sediment deposition was observed in the stream channel at both locations, which is believed to originate from Interstate 84 and channel erosion described above.



Twin box culvert along reach WR-05 underneath the onramp for I-84.

# 2.2.5 Gages Brook

A total of 2.2 stream miles were assessed in Gages Brook (Figure 7), including segments GB-01 through GB-10, during June 3 through 5, 2008. The primary land uses in this subwatershed include commercial development along Route 30, industrial uses associated with the Tolland Industrial Park, and residential and forested areas in the eastern portions of the watershed. The Gages Brook stream assessments performed for this study augment previous stream surveys performed by the North Central Conservation District in October 2007 between the Tolland Agricultural Center footbridge and Industrial Park Road West.

# GB-01

This primarily forested reach of approximately 0.18 miles is the downstream-most reach of Gages Brook and extends from the Interstate 84 culvert crossing to the footbridge behind the Tolland Agricultural Center (TAC).

- RCH The reach was mostly shaded, with optimal habitat, and vegetation and floodplain characteristics ranging between suboptimal and marginal.
- OT Two outfalls were identified, both of which are believed to be drainage ditches associated with Interstate 84 located just upstream of the highway. Little discharge was present despite intermittent rain over the previous 1 to 2 days. The drainage ditches are potential candidates for stormwater quality retrofits.
- ER Two areas of severe bank erosion were identified. ER-01 included a 300-ft length of severe bank scour downstream of one of the outfalls described above. In a small section (30-40 feet), the stream was flowing mostly within an undercut section of the back, such that the channel bottom was mostly dry. ER-01 appeared to be located on private property and would be difficult to access. ER-02 included a 150-ft section of

undercut bank at a 90-degree bend where the stream enters CM-01. ER-01 may be located on State property but may also be difficult to access. While both areas of erosion are in need of restoration, limited site access may make bank stabilization impractical.

- CM An approximately 200-foot long section of stream immediately upstream of the Interstate 84 crossing appeared to be straightened, disconnected from the floodplain, and modified to create a riprap-lined channel with trapezoidal cross section.
- TR A deposit of brush, logs, and disassembled fencing was observed immediately adjacent to the stream less than 100 feet downstream of the footbridge at the TAC grounds. The material should be removed during a stream cleanup.

#### GB-02

This reach of approximately 0.17 miles continues upstream from the TAC footbridge northeast to a transition from forest to old field. The reach is generally wooded with significant wetlands located in the floodplain.

- RCH The stream is mostly shaded with some evidence of sediment deposition. Instream habitat was marginal, with other in-stream metrics ranging from suboptimal to optimal. The reach includes a high-quality buffer and good floodplain connection, with associated metrics ranging from suboptimal to optimal.
- TR A small quantity of automotive debris was observed and should be removed. Access is difficult, although cleanup would be straightforward.



Trash and debris in stream segment GB-02



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Figure 7. Gages Brook Ssubwatershed Field Assessment Locations



# GB-03A

This reach begins where GB-02 emerges from the forest and extends east, with the forest to the south and the old field to the north, ending at Gerber Drive in the Tolland Industrial Park.

- RCH The reach is mostly shaded with old field to the right and forest to the left. Bed scour and bank scour were observed in some areas. Most stream, buffer, and watershed condition metrics were in the marginal to suboptimal range, with low-end marginal habitat and marginal floodplain connection. However, there was little floodplain encroachment, and the vegetated buffer was high-end suboptimal to optimal in condition.
- OT A wet stormwater basin associated with the industrial park discharges to the stream at the upstream end of the reach. Dense vegetation was growing in the riprap and erosion was present on the adjacent downstream bank in GB-03A
- ER An approximately 100-foot long area of bank scour was observed in a straight section of the right bank. The severity of the erosion was relatively minor and appeared to originate downstream of OT-01. Access to this area is fair, although it is likely in private ownership.
- SC A stream crossing is present below Gerber Drive and consists of two elliptical corrugated metal culverts. Fish passage may be difficult through these culverts due to shallow depth of flow during low-flow conditions.

# GB-03B

This reach of approximately 0.14 miles runs parallel and adjacent to Gerber Drive between the crossings at Gerber Drive and Industrial Park Road West. The reach is located in a narrow, modified channel between the road/retaining wall and the parking lot of an adjacent industrial facility.

- RCH Stream condition metrics in this reach were generally suboptimal. Buffer and floodplain metrics were marginal to poor since significant encroachment is present on both sides of the stream. Artificial fish habitats (lunkers) were found along the stream banks, and fish were observed in the stream as well as evidence of raccoons and songbirds in the stream corridor.
- OT Four outfalls were present in this reach, including two paved asphalt swales ("leakoffs") directing surface runoff to the stream from adjacent parking lots, a 12-inch concrete pipe originating from the parking lot of an adjacent industrial facility, and a 24-inch concrete pipe suspected to be associated with the roadway drainage system. Significant trash was present at the outlet of one of the leakoffs.
- IB The majority of the stream reach has limited and highly impacted stream buffers. At the downstream end of the reach, a retaining wall is located along the top of the right bank, and industrial parking lots are located close to the left bank. Due to the limited area on both sides of the stream, there is low potential for stream restoration along this reach.



Concrete retaining wall adjacent to Gerber Drive along segment GB-03B

• SC - The reach terminates at the Industrial Park Road West stream crossing, which consists of three 72-inch corrugated metal pipe culverts. The left barrel was slightly out of round. The majority of flow was through the left barrel; the bottom of the center barrel was dry, and the right barrel appeared to have some backflow. The flow depth in these culverts may be insufficient for effective fish passage during low-flow conditions. This crossing is a potential candidate for fish barrier removal. The inlet of the culverts was partially obstructed by brush and debris, which should be removed.

# GB-04

Reach GB-04 is located between Industrial Park Road West and Industrial Park Road East. The reach includes numerous outfalls and significant sedimentation.

- RCH The reach is mostly shaded, although the buffer is significantly impacted on both sides. Stream condition metrics were generally within the suboptimal range, although poor floodplain connection was observed. The vegetated buffer width is suboptimal on the left and marginal on the right, and the vegetation quality is at the lower limit of the suboptimal range. Both the floodplain habitat and floodplain encroachment metrics were poor.
- OT Six outfalls were observed in this reach, originating from the industrial areas or associated roadways. These included an 8-inch corrugated metal pipe, a 6-inch plastic pipe, a 7-inch plastic pipe (OT-03) with some sediment deposition immediately downstream, a 12-inch concrete pipe draining a parking lot, a double 42-inch culvert that conveys roadway storm drainage, and a 24-inch concrete pipe conveying roadway drainage to the stream. The source of the sedimentation at OT-03 should be investigated.



• SC - This crossing includes triple 72-inch culverts below Industrial Park Road East. The depth in one pipe was approximately 6-12 inches, while the other two barrels were blocked with leaves, branches and sediment. The blockage should be cleared by removing the material.

# GB-05A

This reach continues upstream from GB-04 to GB-05B. The reach GB-05 was subdivided into two separate reaches because the confluence of GB-09 and GB-04 occurred a few hundred feet upstream of the location shown in the original mapping (the figure shows the updated reach segments).

- RCH This reach is mostly shaded with a gravel and cobble bottom, with some sedimentation and bank scour observed. In-stream habitat was optimal, with a mix of stable and naturally occurring substrate and habitat conditions. The majority of the remaining stream, floodplain, and buffer condition metrics were in the suboptimal range, although with marginal floodplain connection and encroachment.
- OT One outfall pipe was observed on the left bank just upstream of Industrial Park Road East and appeared to originate from an adjacent industrial area.

# GB-05B

This reach extends from the confluence of GB-05A and GB-09 upstream to Old Post Road. The stream passes through the landscaped grounds of a technology company and much of the reach is unshaded. This reach may provide an opportunity for bank stabilization and stream buffer restoration, since it appears to be located on land owned by a single (although private) owner. Community garden plots were observed adjacent to the stream, and solar panels were being constructed on-site, indicating that the owner may be environmentally-motivated. A wet stormwater basin is located on the property between an on-site parking lot and the stream.

- RCH Stream condition metrics in this reach are generally suboptimal to poor, with little or no vegetative buffers, significant erosion problems, and little floodplain or floodplain connection. Water from the stream appears to be diverted through the onsite stormwater basin via a catch basin diversion structure. Buffer and floodplain condition metrics were marginal to poor, with narrow vegetated buffer width (10-25 feet) floodplain vegetation consisting of turf, little or no wetland habitat, and significant floodplain encroachment.
- OT An 8-inch PVC outfall was observed originating from the on-site stormwater basin. Bank erosion and riprap was observed at the outfall. Some debris was present at the outfall, including pieces of plastic pipe.
- ER A significant area of bank erosion was observed in a bend in the stream. The erosive cut was approximately 5.5 feet in height and greater than 100 feet in length. This area is a potential candidate for stream bank stabilization.





Stream segment GB-05B showing limited vegetative buffer and a small footbridge crossing the stream.

• IB – Little or no vegetative buffer exists along the stream through the commercial/office building site. Mowed lawn borders much of the stream on both sides, and several footbridges have been constructed over the stream. This stream segment is a potential candidate for stream buffer restoration.



Stream segment GB-05B showing area of stream bank erosion.

• SC - Two stream crossings were observed, including a 36-inch culvert below the facility access road and a 50-inch culvert below Old Post Road. Both culverts are perched on the downstream side approximately 2 to 4 inches above the bottom of the stream, and both have very shallow flow (less than 1 inch), which presents a barrier to fish passage.



The former appeared to be in good condition and the latter appeared to have been recently slip-lined. These culverts are potential candidates for fish barrier removal.

#### GB-06

This reach of approximately 0.4 miles in length continues from Old Post Road to a former pond located south of a residential subdivision on Valley View Drive.

- RCH The reach was mostly shaded with a bottom of gravel, cobbles, and boulders. Evidence of downcutting was present along much of the reach since many of the boulders were sharp-edged. In general, stream condition metrics were marginal or poor, with significant erosion, marginal vegetative protection, and marginal floodplain connection due to downcutting. Overall buffer and floodplain characteristics were generally suboptimal, with a relatively wide buffer of young forest and a mix of wetland and upland habitat.
- OT Three outfalls were present at the downstream terminus of the reach. These included 12-inch and 15-inch storm lines and a paved asphalt leakoff conveying stormwater runoff to the stream.
- ER Numerous areas of significant erosion were identified along this stream segment. Three areas of bank scour on the outside banks of bends were observed. One area included a low-head concrete dam where the stream eroded the abutment, creating a bypass channel around the structure. The last area included active downcutting ending at a nick point behind several residences at the terminus of the reach. These areas are potential candidates for stream bank stabilization.



Stream segment GB-06 showing area of stream bank erosion.



- IB An impacted buffer was observed at the terminus of GB-06 near a footbridge on private property. Residential landscape vegetation (pachysandra) was observed growing up to the bank's edge.
- SC Three stream crossings were present in this reach, each of which likely prevents upstream fish passage. The first is located adjacent to Old Post Road at the downstream end of the reach. This crossing consists of an embankment such as a dam or railroad grade that does not include a culvert or opening. The stream appeared to be flowing through interstices in the embankment. The second crossing consisted of a dam with a total hydraulic drop of approximately 9 feet. The third crossing is a former road with a corrugated metal pipe culvert and a drop at the culvert outlet of approximately 5 inches. These crossings are potential candidates for dam removal and/or fish barrier removal.

# GB-07

This reach of approximately 0.2 miles in length continues upstream to the east from GB-06 to Andrew Way. The stream corridor is generally forested, surrounded by residential development along Valley View Drive, Andrew Way, and Old Post Road.

- RCH The reach is mostly shaded with a bottom of cobbles and boulders. Typical channel dynamics include downcutting and bed scour. The reach is mostly shaded. Stream conditions were generally within the suboptimal to marginal range, while buffer and floodplain characteristics were generally optimal to the high end of suboptimal.
- IB Similar to the residential encroachment observed in reach GB-06, an isolated area of pachysandra and lawn were present on both sides of the stream where the stream enters SC-01.
- SC This crossing includes an approximately 200-foot long, 24-inch concrete culvert below Andrew Way. A series of small drops (approximately 24 inches) were present downstream of the outlet. These drops were resulting from the boulders lining the channel. These drops and shallow flow in the culvert under low-flow conditions would likely limit upstream fish passage. This culvert is a potential candidate for fish barrier removal.

# GB-08

This reach of 0.15 miles is the uppermost stream segment on Gages Brook, which is located between Andrew Way and a privately-owned pond situated north of Mountain Spring Road. The stream segment flows primarily through residential and forested areas.

- RCH This reach is mostly shaded with a sand and gravel bottom and a stable channel with little noticeable erosion. Stream condition metrics are within the suboptimal range in this reach, while buffer and floodplain connection generally are within the optimal and suboptimal ranges.
- OT An outfall was identified adjacent to a residence near the downstream limit of this reach. The outfall consisted of a 2.5-inch diameter PVC pipe with a screen projecting



over the water surface by approximately 6 inches. The pipe may be the outlet of a foundation or yard drain.

- IB Residences and lawn are located adjacent to the stream for approximately 300 feet on both sides of the stream near the downstream end of the reach.
- SC The upstream limit of this reach consists of a low-head dam with an outlet weir discharging directly to an 18-inch concrete culvert below Mountain Spring Road.
- TR An area of trash and debris was observed in the stream and buffer (right side) near the outlet of SC-01. Observed debris consisted of a tire, two 55-gallon drums (partially crushed with holes) and a bathtub. This debris should be removed and disposed of properly.

### GB-09

This 0.15 mile reach parallels an access road and industrial facility located at the end of Industrial Park Road East.

- RCH This reach has a gravel and cobble bottom, is mostly shaded, and has evidence of downcutting, bed scour, and bank failure. In-stream habitat is generally optimal to the high end of suboptimal. Buffer and floodplain characteristics are generally suboptimal to marginal due to the reach's incised nature and industrial land use along the left side.
- OT This reach includes two outfalls. The first is a paved asphalt leakoff from a parking lot paired with a 6-inch PVC outfall causing slight bank erosion. The other outfall, OT-02, is an 18-inch plastic pipe discharging from the direction of the industrial facility. There was significant iron staining around this outfall. The source of the discoloration should be investigated.
- SC A small dam is present in this reach, consisting of a weir with a drop of approximately 32 inches. Immediately downstream of the weir an area of soil has been undercut by the stream, forming a natural culvert, although one that is unlikely to significantly alter passage during low flow conditions.

#### GB-10

This reach of approximately 0.43 miles extends from the upstream limit of GB-09 into an extensive wetland complex where the stream originates in an area of groundwater seeps. This reach passes through a recently-constructed subdivision off of Old Post Road that does not appear on the aerial photos in the project mapping.

• RCH - This reach is mostly shaded with a gravel and cobble bottom and included some evidence of downcutting and sedimentation. The overall stream, buffer, and floodplain conditions were in the optimal range for every metric. The majority of the stream is surrounded by an extensive old-forest/wetland complex that is well connected to the stream channel. There is little evidence of encroachment except at the subdivision crossing.



- OT One stormwater outfall to the stream was identified. The outfall originates from a new subdivision road and discharges to a stormwater basin/constructed wetland. The basin contained a significant quantity of leaves and other sediment. Stormwater discharged to the buffer of the stream via overland flow and continued to the stream. There appeared to be potential for future erosion where overland flow is occurring. Two other stormwater basins associated with this subdivision were observed, but the outfall locations could not be identified.
- SC A new stream crossing was observed under the subdivision road, consisting of a 24-inch concrete pipe. A boulder was present below the flared-end outlet. The culvert outlet is perched several inches above the stream bed, and the depth of flow in the pipe was approximately 1-inch. Due to the headwater location of the culvert, upstream fish passage is unlikely to be an issue in this portion of the watershed.



New stream crossing on segment GB-10.

# 2.2.6 Gages Brook South Tributary

An unnamed tributary to Gages Brook (referred to as the Gages Brook South Tributary in this study) drains an area located south of the Gages Brook subwatershed. Reaches GBST-01 through GBST-04B and GBST-09A and GBST-09B were assessed on June 5, 2008, totaling approximately 1.3 stream miles (Figure 8). The subwatershed is bisected by Interstate 84 and contains forested and residential land uses.

# GBST-01

This reach is approximately 0.5 mile in length and extends along Interstate 84 in an area that is otherwise relatively undeveloped.

• RCH - The stream is well-shaded, has a cobble and gravel bottom, and was found to be in optimal condition in terms of both overall stream, buffer, and floodplain characteristics. Evidence of downcutting, sedimentation, and scour were observed in some areas, but in general the reach is well-connected to the floodplain and appeared



to provide optimal wildlife habitat and vegetation conditions. Moss was observed on portions of the stream banks where erosion had occurred, indicating that the banks have since stabilized.

#### GBST-02

This reach of approximately 0.26 miles begins at its confluence of GBST-03 and continues upstream to the east generally running parallel to Interstate 84. The upstream end is a pair of culverts, one of which conveys the stream below Interstate 84 and the other which parallels the highway.

- RCH This reach includes a bottom of gravel, cobbles, and boulders and has portions that are downcut and channelized. This reach is mostly shaded and was evaluated to be in the suboptimal range for most stream condition metrics. However, vegetative protection of the banks was generally optimal, as was the vegetated buffer width, floodplain vegetation, and floodplain habitat in most areas. Encroachments on the stream's buffer and floodplain were limited to an area where the stream was channelized along Interstate 84.
- OT Several outfalls were identified along this reach. Each appeared to be associated with drainage from Interstate 84. Discharges were observed from both OT-02 and OT-03, and although rain fell the previous day. Significant sediment accumulation was observed at the outlet of OT-03 and SC-01. No discharge was present from OT-01, although significant erosion was present downstream of this outfall, which discharges approximately 300 feet from the wetland surrounding the reach. Minor bank erosion was observed downstream of OT-02.
- SC This stream crossing conveys the tributary below Interstate 84. The crossing is a concrete culvert several hundred feet long. The crossing is partially blocked by accumulated sediment.



Stream crossing (SC-01) below I-84 and outfall (OT-03) along reach GBST-02.



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Figure 8. Gages Brook South Tributary Subwatershed Field Assessment Locations



 CM - The channel of GBST-02 has been modified significantly at the upstream end of the reach, which is channelized parallel to Interstate 84 for a length of approximately 700 feet. The channel is a uniform trapezoidal cross-section disconnected from a floodplain and lined with stone riprap.

# GBST-03

This is a short reach located between GBST-01 and GBST-04A, which flows below Interstate 84.

- RCH The reach has a relatively steep bottom of boulders, cobble, and sand, and is well-shaded. Stream condition metrics are generally in the suboptimal range since some bank erosion was observed, and the area was generally well vegetated, although modification of the banks was evident. Buffer and floodplain condition metrics were generally suboptimal as well, although the floodplain appeared to be an even mix of wetland and non-wetland habitats with evidence of standing water (optimal) and to have significant encroachment (marginal).
- SC The stream crossing below Route 84 is a significant restriction to the upstream passage of fish. The 48-inch diameter concrete pipe has drop of approximately 4 feet at its outlet, and a series of boulders located downstream yield an additional stepped drop of approximately 10 feet. Additionally, the flow of water in the pipe was shallow. Despite these fish passage restrictions, this crossing is an unlikely restoration candidate since the pipe is below Interstate 84.

# GBST-04A

This reach continues upstream from the Interstate 84 crossing to a small dam behind a residence. The field team observed a definitive break in stream and floodplain characteristics at this dam. The reach passes through an area of residential land use. Some evidence of downcutting was observed.

- RCH This reach is generally well-shaded and has a variable bottom with some silt and clay along the downstream portion and with cobbles and boulders upstream. The downstream portion appeared to be a pond that has filled with sediment. Stream condition metrics were all within the optimal range. Overall buffer and floodplain conditions were also optimal, although floodplain was only present in a limited area.
- OT A riprap drainage ditch along Route 84 discharges to the stream near its southern end.
- SC A low-head dam crossing the stream was defined as the upstream limit of this reach. The dam includes a drop of approximately 42 inches.

# GBST-04B

This reach continues from GBST-04A to the downstream limit of GBST-06 and GBST-09. The reach passes behind several residences and includes a pond filled with sediment at its lower limit.

 RCH - This reach is mostly shaded with a variable bottom of generally fine material (silt/clay, sand, and gravel). In-stream habitat was marginal, and dense invasive vegetation was present on both banks. Floodplain connection was optimal, however, since the stream was not deeply incised and high flows could easily enter the floodplain.



View of reach GBST-04B

- IB Impacted buffer was present near the downstream end of this reach. In this area, the left bank is forested, although the right bank is vegetated with turf, lawn, and shrubs. A single-family home was also located near the stream.
- SC The upstream limit of this reach is located at Loehr Road. The stream flows below the road through a 60-inch corrugated metal pipe. The pipe was deformed at the downstream end, but the invert was inundated by tailwater, indicating that fish passage may be possible.

# GBST-09A

The downstream end of this reach is located at its confluence with GBST-06 prior to entering the culvert GBST-04B SC-01. The reach is short in length, receiving the discharge from a small privately-owned pond.

- RCH This reach includes a bottom of cobbles and boulders and appeared to be channelized. The reach is partially-shaded. Stream metrics were generally in the suboptimal to marginal range, although poor floodplain connection was observed. The channel has a buffer consisting of shrubs and brush. Little floodplain is present with poor habitat and connection to the stream.
- SC Two stream crossings are present in this reach. One (SC-01) includes double 16inch HDPE culverts below an unpaved road. The culvert slope is relatively flat but has a shallow water depth that would be unlikely to allow fish passage. SC-02 includes the



dam for a small pond. The discharge of the pond could not be viewed, but is likely to be a significant barrier to fish passage.

#### GBST-09B

This reach begins from the inlet of the pond at the upstream end of GBST-09A and continues upstream to another pond located at the Tolland Farms Road residential subdivision.

- RCH The reach is mostly shaded with a bottom of gravel, cobbles, and boulders. The stream is downcut and has areas of bank failure and bank scour. As a result, stream condition metrics were generally within the suboptimal range, although floodplain connection was poor. The majority of the buffer and floodplain metrics were found in the optimal range, with ideal vegetated buffer of mature forest and very little floodplain encroachment, although floodplain habitat consisted of a mix of wetland and upland without ponded water (suboptimal).
- OT No outfalls were observed along this reach. However, stormwater runoff from the residential subdivisions on Tolland Farms Road, Deer Meadow and Reed Road is believed to ultimately drain to this reach of the Gages Brook South Tributary. The pond located upstream of Tolland Farms Road may provide some attenuation of peak flows and stormwater quality renovation for this upstream drainage area.
- ER Significant bank erosion was observed on the outside bank of two adjacent bends, each section of erosion being approximately 80 feet in length and 6 to 7 feet in height. This area is a potential candidate for bank stabilization, although site access is difficult in this area.
- SC Two stream crossings were observed along this reach. SC-01 included three 15inch concrete pipes below an unpaved, likely privately-owned, road. The slope of the pipes is moderate, and a drop of approximately 5 inches is present on the downstream end, which is a barrier to fish passage. Limited access, private property ownership, and headwater location make this culvert a poor candidate for fish barrier removal. SC-02 is a 24-inch culvert below Tolland Farms Road. This culvert receives discharge from the control structure of the upstream pond.

# 2.2.7 Tucker Brook

Tucker Brook is a tributary of the lower Tankerhoosen River. The Tucker Brook subwatershed includes portions of Vernon and Manchester. The predominant land uses in the Tucker Brook subwatershed are residential and forested land. Reaches assessed in this subwatershed include TB-01, TB-02, TB-03, and TB-04 (Figure 9).

# TB-01

This lower reach extends from the confluence with the Tankerhoosen River upstream to Brookview Drive. Partially demolished cement building foundations and stream crossings from demolished industrial-era infrastructure remain along the downstream portion of the stream. The upper portion of the reach has significant stream buffers, native vegetation, stream shading and flood plains.


Examples of impacted buffers along reach TB-01. A cement retaining wall (A) for the street and bridge on the right bank near the confluence with the Tankerhoosen River and partially demolished cement infrastructure along the banks (B).

- RCH The reach is mostly shaded with native vegetation, has no attached or floating
  plants in the stream, and has a sand and cobble substrate bed. There is evidence of bed
  scour, bank failure and sedimentation along the reach. The overall stream, buffer and
  floodplain conditions are rated in the suboptimal range.
- OT A 12-inch circular outfall pipe was observed on the right bank, although was not submerged and did not have flow. A possible earthen-type stormwater outfall was identified on the left bank which could collect storm drainage from the highway, but was not flowing during the assessment.
- ER Bank failure and scour is present on the right bank along an approximately 50foot meandering portion of the stream. The bank is currently stabilized by tree roots and other hanging woody debris. The bank appears to be stable.
- IB There is a bridge abutment on the right bank of Tucker Brook at the confluence with the lower Tankhoosen River. The Dobson Road overpass abutment extends approximately 40 feet upstream and is approximately 10 feet from the stream bank. The stream banks and riparian area along the downstream end of the reach at the confluence with the Tankerhoosen River lack a tree canopy; the stream is unshaded in this area. This area is a potential candidate for reforestation.



Figure 9. Tucker Brook Subwatershed Field Assessment Locations



The left and right streambanks along the lower portion of Tucker Brook (foreground) at the confluence with the Tankerhoosen River (background) are potential candidates for reforestation.

 SC — Four stream crossings exist along this reach. SC-01 is an abandoned concrete abutment which was formally a road crossing. The stream crossing has a natural bed so is not an impediment to fish passage, although is a floodplain encroachment concern. SC-02 is a large arch-shaped railroad crossing constructed of stone which is approximately 125 feet long. The archway is in good condition but creates a barrier to fish passage and is suffering from downstream scour. SC-03 is an open-bottom box culvert with some evidence of downstream scour. The final stream crossing, SC-04, is at the upstream end of the reach and consists of a double barrel 6-foot concrete culvert below Brookview Drive. The circular culverts are in good condition although there is downstream pooling and scouring. The boulders placed in the stream for energy dissipation may serve as a barrier to fish passage. Crossings SC-03 and SC-04 are potential candidates for fish barrier removal.

# TB-02

A reach level assessment was conducted for this section by examining characteristics of the downstream end, and not traversing the entire reach. The land use around this reach is forested, the stream is mostly shaded, the dominant bed substrate is sand and cobble, and the base flow is less than 25% of the channel width. The overall stream conditions are optimal for bank erosion and floodplain and suboptimal for instream habitat and vegetative protection. There is optimal buffer width along the stream and suboptimal floodplain characteristics.





Arch-type railroad crossing (SC-02) constructed of stone and extending approximately 125 feet. The crossing may prevent fish passage and is suffering from downstream scour evidenced by the large pool shown in the photograph.

# TB-03

This stream segment is adjacent to a residential neighborhood (on Ironwood Drive) along the right bank and a gas pipeline corridor along the left bank.

- RCH Overall stream conditions in this section are rated marginal to suboptimal. The vegetative buffer limited due to the close proximity of private residential properties. The stream is flowing at almost 100% of the channel width, is mostly shaded, and has a variable bed substrate consisting of silt, sand, gravel and cobble. There is evidence of downcutting, aggrading, bank failure and scour.
- OT A drainage outfall conveying roadway runoff is located at the upstream end of the reach near Phoenix Street. No dry weather flow was observed.
- ER Bank failure and scour were observed in several meanders along the right stream bank, totaling approximately 125 feet in length. A privately owned shed is located approximately 3 feet from the edge of the bank and is in danger of being damaged by further erosion. This site is a potential candidate for bank stabilization.
- IB Three areas of buffer impacts were noted along this reach. IB-01 is on the right bank and approximately 50 feet long. Dense non-native vegetation associated with a residential backyard is growing on the stream bank. IB-02 and IB-03 are areas along the left stream bank with a reduced buffer resulting from vegetation clearing in the gas pipeline right-of-way.



This section of river is abutted by residential properties along the right bank and has an impacted buffer on this side of the stream from lawn vegetation and items such as this shed.

• SC — The first stream crossing, SC-01, consists of a small manmade dam constructed of boulders and cinder blocks. The dam is approximately 1 foot high and spans the width of the stream. SC-02 is a 48-inch concrete culvert below Phoenix Street. The crossing is in good condition and not a barrier to fish passage.

# TB-04A

Stream segment TB-04 was further subdivided into three smaller segments based on field conditions at the time of the surveys. Segment TB-04A begins at the Phoenix Street crossing and ends approximately 500 feet upstream at a beaver dam.

 RCH — The reach level assessment revealed invasive species along the stream, a silt and sand-dominated bed substrate, and mostly shaded stream. There is marginal in-stream habitat, vegetative protection and floodplain characteristics. The bank erosion and floodplain characteristics are optimal due to low banks and wide floodplain. The buffer width is suboptimal because a pumping station and Phoenix Street are in close proximity to the stream.

# TB-04B

Stream segment TB-04B is a short segment which begins at the boundary of the Meadowbrook Drive neighborhood and flows to the inlet of the pond created by the beaver dam. This stream segment is characterized by significant growth of invasive species. A stormwater basin associated with the adjacent residential subdivision discharges to this section of the stream.

 RCH — The reach level assessment characterized the stream conditions in this section as suboptimal to marginal due to a lack of vegetative protection along the banks, little in-stream habitat and some bank erosion. The overall buffer and floodplain condition ranges from poor floodplain habitat to suboptimal floodplain vegetation. There is some floodplain encroachment along the reach. The dominant substrate is silt/clay and gravel, and the water is naturally stained. The largest issue observed in the stream segment is the presence of invasive species which are growing over the stream.

- OT —Stormwater outfall OT-01 flows from the stormwater basin that serves the upland residential neighborhood. The outfall is a circular concrete pipe, 18 inches in diameter. Dry weather flow was observed, although the pipe is partially submerged in the stream. There is evidence of bank erosion at the outlet of the pipe and the basin appears to be in need of regular maintenance, including detailed inspection to further assess the condition of the basin.
- TR A small amount of yard waste (TR-01) was observed along the right bank. The debris consists of grass and brush clippings.

#### TB-04C

Stream segment TB-04C continues through the Meadowbrook Drive subdivision, ending at a system of 6 culverts which cross under Meadowbrook Drive.

- RCH The stream segment flows behind houses, often adjacent to the property line. The close proximity of the stream to these residences has resulted in numerous stormwater outfalls, impacted buffers, stream crossings, and occurrences of trash and debris in the stream.
- OT There are five stormwater outfalls along this reach, ranging in size from 4 to 8inch diameter pipes. The outfalls appear to be associated with residential yard drains, foundation drains, or roof downspouts. All but one outfall pipe had dry weather flow at the time of inspection. The flowing outfall, OT-04, had a trickle of orange discharge, which may be naturally-occurring iron precipitate associated with groundwater discharge. A discharge investigation is recommended nevertheless to confirm the source of the discharge.



Outfall pipe originating from a residential property on the left bank of segment TB-04C.

• IB — There are two areas of stream buffer impacts along this stream segment. Both consist of residential lawn or scrub/shrub vegetation adjacent to the stream. Stream buffer restoration potential is limited due to private land ownership.

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- SC There are two manmade dams and one road crossing along this segment. The
  road crossing forms the upstream end of this segment, and consists of 6 metal arch
  culverts approximately 13 feet in diameter and 5 feet in height. The culverts extend
  approximately 70 feet in length under Meadowbrook Drive. The other two stream
  crossings are manmade dams; one is a stone dam that creates a pool and cascade
  downstream. The second dam creates a waterfall and redirects the stream sharply. Both
  dams are physical barriers to upstream fish passage and should be considered
  potential candidates for removal, although private land ownership may limit this
  potential.
- TR There are two instances of trash and debris along this segment. Both are piles of yard waste, including a tree that has been cut into logs and a pile of leaves and yard clippings.

# 2.3 Upland Assessment

Fuss and O'Neill conducted upland assessments in the Tankerhoosen watershed on July 16, 2008. The field observations assist in identifying pollution prevention and potential restoration opportunities at hotspot land uses and residential neighborhoods in the watershed. Factors that were considered when determining which hotspots and neighborhood areas to prioritize for assessment include:

- Stream condition (assessed during stream corridor inventory),
- Site proximity to the stream,
- Land use type and development density,
- Land ownership,
- Restoration potential.

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a "windshield survey" evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the Tankerhoosen watershed are: hotspots, residential neighborhoods, and streets and storm drains. Field data forms that were completed during the assessments are provided in <u>Appendix B</u>.

# 2.3.1 Hotspot Site Investigation

Hotspot site investigations were conducted for six representative sites with a high potential to contribute polluted stormwater runoff to the storm drain system and receiving streams. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transport-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.

The hotspots examined in the field were located within the Lower Tankerhoosen River, Walker Reservoir, Clarks Brook, and Gages Brook subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including three industrial sites, one commercial site, one transportation-related site, and one state/municipal site. Sites are identified by the watershed abbreviation, followed by "HSI" and a numeric identifier. <u>Table 5</u> summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.

Site ID (Watershed)	Land Use Category	Description of Site Operations
GB-HSI-01 (Gages Brook)	Industrial	Industrial Park – Gerber Technologies Office Building
GB-HSI-02 (Gages Brook)	Industrial	Dari Farms Ice Cream Distribution Center
WR-HIS-01 (Walker Reservoir)	Transport-related	ConnDOT Commuter Lot
CB-HIS-01 (Clarks Brook)	Commercial	Superior Energy – Propane
CB-HIS-02 (Clarks Brook)	Industrial	Sand, gravel, construction storage/processing facility
LTR-HIS-01 (Lower Tankerhoosen River)	State/Municipal	ConnDOT Maintenance and Service Center

# Table 5: Hotspot Site Investigation Summary

# Gerber Technologies Office Building

The Gerber Technologies office building is located in the Tolland Industrial on Industrial Park Road West. The site is located adjacent to Gages Brook (see stream assessment discussion in <u>Section 2.2.5</u>). The office building has landscaped areas around the building with shrubs and turf lawn. The site is characterized by a large amount of impervious cover, consisting of building roof areas and parking lots. Approximately 100 vehicles were parked in the employee parking lots at the time of the inspection. Stormwater runoff from the site appears to discharge to the stormwater basin located near the southern limit of the site. The stormwater basin is a wet pond design containing a permanent pool of water and is approximately 70 feet wide by 140 feet long. The basin contained accumulated sediment captured from the site runoff. The basin outfall discharges to Gages Brook via a riprap spillway.

The stormwater basin that receives runoff from the Gerber Technologies facility incorporates many of the recommended elements to meet current stormwater quantity and quality design criteria. However, the basin is also in need of maintenance as demonstrated by the sediment accumulation near the center of the basin and the overgrown woody vegetation at the overflow spillway. Existing stormwater basins such as this one may also be good retrofit candidate to improve treatment effectiveness by incorporating a sediment forebay at the basin inlet, which may also facilitate routine sediment removal.



Stormwater basin at the Gerber Technologies facility on Industrial Park Road West. Sediment has built up near the center of the basin (A) and the basin overflow spillway is overgrown with vegetation (B).

# Dari Farms Ice Cream Distribution Facility

The Dari Farms distribution facility is also located in the Tolland Industrial Park on Research Way/Gerber Drive near the divide between the Gages Brook and Gages Brook South Tributary subwatersheds. The facility is estimated to be less than 5 years old, as evidenced by the facility's modern pollution prevention site design elements including a covered fueling station, no visible outdoor storage of materials, and well maintained landscaping on the grounds. Possible pollution sources to the storm drainage system are the runoff from the large impervious areas on the site (the roof and parking areas) and potential vehicle fluids from truck fueling activities and employee vehicles. It could not be determined whether stormwater is managed on-site, by the downgradient stormwater basin near the Gerber Technologies facility, or both. The site did not appear to incorporate Low Impact Development (LID) design features such as vegetated swales or parking lot bioretention. New commercial/industrial facilities with significant impervious area, such as this one, are potential candidates for on-site LID and stormwater treatment practices to reduce runoff volume and pollutant loads.



The Dari Farms Ice Cream Distribution Facility has a covered fueling station and landscaped grounds (shown in the foreground).



#### ConnDOT Commuter Parking Lot

The hotspot investigation included the Connecticut Department of Transportation commuter parking lot at exit 67 of Interstate-84, which is located in the Walker Reservoir subwatershed (see stream assessment discussion in <u>Section 2.2.4</u>). Approximately 150 vehicles were parked at the lot during the site visit, which occurred on a weekday during mid-day. The site is contains significant impervious cover and high-intensity vehicle usage and is therefore a source of automobile-related stormwater pollutants including hydrocarbons, sediment, and metals. The entire parking lot drains to a double catch basin located on the southeastern side of the lot. The catch basin discharges through a short wetland corridor and subsequently to the stream segment located upstream of Reservoir Road and Walker Reservoir East. An easily accessible grass strip exists between the paved lot and the adjacent wetland and stream corridor. This site is a potential stormwater retrofit candidate (bioretention or water quality swale) to encourage infiltration and provide additional treatment for the parking lot runoff.



The southeastern side of the Interstate 86 Exit 67 commuter parking lot showing the edge of the lot on the left side of the photograph and the wetland corridor on the right side. The center of the photograph shows the easily accessible and open area for a potential stormwater retrofit.

#### Superior Energy

Superior Energy is a propane gas and related equipment distributor located on Hartford Turnpike (Route 30) in Vernon. The site is located within the Clarks Brook subwatershed (see stream assessment discussion in <u>Section 2.2.1</u>) near the headwaters of Clarks Brook. The property consists of a retail store, a paved parking lot for delivery trucks, and outdoor storage of propane tanks. It is unknown if vehicle maintenance or fueling occurs on-site. As described previously, the site appears to have been modified in the past through grading/filling based on an inspection of the existing site drainage and discussions with facility personnel. This site should be further investigated to better define potential impacts of the historical filling, current drainage issues, and plans for additional site development.



Sand & Gravel Facility The facility is located on Clark Road at the western end of Industrial Park Road and near the western limit of the Clarks Brook subwatershed. Facility operations appear to include storage and processing of sand, gravel and other construction materials. The site contains one building, which is assumed to be an office and/or maintenance area. The majority of the site consists of an unpaved yard used for the storage of sand and gravel piles and equipment to process the materials and load transport vehicles. The site contains numerous potential sources of sediment and other pollutants associated with the sand and gravel stockpiles, heavy equipment and vehicles, waste construction materials stored outdoors, and pipes and debris in the yard. Sand and gravel operations such as this should employ stormwater pollution prevention practices and source controls as required by the DEP *General Permit for Stormwater Discharges Associated with Industrial Activity*, in addition to stormwater treatment practices to reduce sediment and hydrocarbon loadings in site stormwater runoff.

#### DOT Maintenance Service Center

The State of Connecticut operates a Department of Transportation Maintenance Service Center for District #1 located on Campbell Avenue in Vernon, which is located in the Lower Tankerhoosen River subwatershed. The facility has an office building, garages for vehicle storage and maintenance, a small parking lot, outdoor storage of sand, salt, gravel and mulch, and an uncovered outdoor fueling station. Vehicle maintenance activities and outdoor vehicle fueling are potential sources of stormwater pollution, in addition to the outdoor stockpile storage. A rolloff dumpster was observed to be overflowing and uncovered at the time of the windshield survey. Municipal and state-operated highway maintenance facilities such as this should employ source controls, pollution prevention, and stormwater treatment practices as necessary in accordance with the DEP *General Permit for Stormwater Discharges Associated with Industrial Activity*.



ConnDOT District #1 Maintenance Service Center, Campbell Avenue



#### 2.3.2 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods and future residential development in the watershed is an important consideration for this study, since approximately 40 percent of the Tankerhoosen River watershed consists of residential land use and future buildout of the watershed could result in conversion of an additional 10 percent of the watershed to residential land use. Neighborhood source assessments were conducted on July 16, 2008 to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that contribute to stormwater quality were assessed by considering the following source areas for "average" neighborhoods throughout the subwatershed:

- Yards and Lawns;
- Driveways, Sidewalks, and Curbs;
- Rooftops;
- Common Areas.

Neighborhoods were selected for assessment based on their proximity to stream corridors and their overall potential to contribute pollutants to the stream. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments and condos). One field sheet was completed for each neighborhood assessed. The selected neighborhoods are located in the Tucker Brook, Lower Tankerhoosen River, Clarks Brook, Walker Reservoir, and Gages Brook subwatersheds, as summarized in Table 6.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on easily observable features such as lawn care practices, drainage patterns, oil stains, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.

Neighborhood/Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Mount Vernon Apartments	Walker Reservoir	Multi-family	Moderate	Moderate
Campbell Avenue	Lower Tankerhoosen River	High-density, single- family	Moderate	Low
Valley View Drive/Andrew Way	Gages Brook	Medium-density, single-family	None	Low
High Manor Mobile Home Park	Clarks Brook	High-density, single- family	Moderate	Moderate
Meadowbrook Drive	Tucker Brook	Medium-density, single-family with open space areas	None	Low

# Table 6: Neighborhood Source Assessments Conducted in the Tankerhoosen River Watershed



#### Mount. Vernon Apartments

The Mount Vernon apartments are a 33-acre multi-family housing complex situated between Hartford Turnpike (Route 30) and Interstate 84 in the Walker Reservoir subwatershed. The apartments are served by outdoor surface parking lots in front of each building. Site imperviousness is estimated at approximately 50 percent. Runoff downspouts are connected directly to the site stormwater drainage system, and parking areas are served by traditional curb and gutter drainage. The complex is generally well-maintained, with generally clean gutters, catch basins, and parking areas. Some oil staining was observed on the pavement within individual parking stalls. The overall pollution severity is rated as moderate due to the large amount of directly connected impervious area and potential pollutant sources from parking areas. This site is a potential retrofit candidate to reduce stormwater runoff from the site, including disconnecting downspouts from the storm drainage system and redirecting them to pervious grass areas, rain barrels/cisterns, and rain gardens. Multi-family parking lots, such as the parking lots at this complex, may also be good candidates for stormwater retrofits. The following photograph depicts an existing landscaped area adjacent to the parking lot that could potentially function as a bioretention/rain garden.



The Mount Vernon apartment complex buildings showing clean and well-maintained parking areas and landscaping (A) and a landscaped area that has the potential to be used as a rain garden (B).

#### Campbell Avenue

The Campbell Avenue residential development is a 13-acre neighborhood of single family homes on approximately ¼ acre lots. The neighborhood is located off of Dobson Avenue and is situated between Interstate 84 and the ConnDOT Maintenance Service Center to the north and Dobsonville Pond to the south. The age of the neighborhood is estimated as approximately 50 years. Almost none of the homes has a garage, and nearly all have impervious driveways connected to the street curb and gutter drainage system. No on-site or centralized stormwater management practices were observed, other than curb and gutter drainage. Most of the homes have downspouts that are directed to pervious lawn areas near the house. Landscaping practices were minimal. This type of older, high density single family residential neighborhood has limited potential for stormwater retrofits due to limited land area.

#### Valley View Drive/Andrew Way

The Valley View Drive/Andrew Way neighborhood is approximately 55 acres in size and located near the headwaters of Gages Brook. The neighborhood is approximately 25 years old

and consists of single family homes occupying approximately 1-acre lots. Most of the homes have garages and a high percentage of the lots are covered by lawn (60%) and landscaped areas (20%). The subdivision is served by traditional curb and gutter drainage. No centralized stormwater management measures were observed. Approximately three quarters of the roof downspouts are connected to adjacent pervious areas. Overall, the neighborhood was rated as having low pollution potential and limited potential for stormwater retrofits.



A typical lot in the Valley View Drive/Andrew Way neighborhood.

# High Manor Mobile Home Park

High Manor Mobile Home Park is an approximately 28-acre neighborhood located in the Clarks Brook subwatershed, situated between Route 30 and Interstate 84. The park is believed to have been developed in the 1970s. The average lot in the neighborhood has approximately 40 percent impervious cover, including the home and driveway, 40 percent grass cover, and 20 percent landscaped area. Approximately 90 percent of the homes have roof downspouts that discharge to lawns. The streets have traditional curb and gutter drainage, and storm drain inlets were observed to be clean. No centralized stormwater management measures were observed.



A street view of the High Manor Mobile Home Park showing turf lawns with some mature trees on the properties.



#### Meadowbrook Drive

The Meadowbrook Drive neighborhood is an approximately 100-acre residential neighborhood in the northeast corner of Manchester. The neighborhood is situated in the central portion of the Tucker Brook subwatershed, and Tucker Brook flows partially through and along the north and west sides of the development (see stream assessment discussion in <u>Section 2.2.7</u>). The subdivision is estimated as approximately 10 years old, and the average lot size for the single family homes in the subdivision is approximately ½ acre. All of the homes have garages. The driveway, sidewalks and curb areas are clean and dry. A majority of the homes have roof downspouts that discharge to pervious lawn areas. The street storm drains are stenciled. An approximately 1-acre wet stormwater basin near the corner of Yale and Chatham Drives receives runoff from the subdivision storm drainage system. The basin outlet discharges to Tucker Brook. At the time of the inspection the stormwater basin outlet was observed to be overgrown with vegetation, and stream bank erosion was observed at the outfall to the stream. As noted in <u>Section 2.2.7</u>, the basin appears to be in need of regular maintenance. Buffer encroachment, stream crossings, residential drain outfalls, and yard waste dumping were common in residential areas along the stream corridors in this subdivision.



Typical conditions in the Meadowbrook Drive neighborhood showing landscaping, lot sizes, and general cleanliness.

# 2.3.3 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be assessed to determine if existing maintenance practice could reduce pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted on July 16, 2008. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. Findings of the street and storm drain assessment are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as <u>Table 7</u>, and the completed field forms are included in <u>Appendix B</u>.



Location	Storm	Drains	Streets
Campbell Avenue			
Mount Vernon Apartments			
Valley View Drive/Andrew Way			
High Manor Mobile Home Park			
Gerber Technologies			
Clark Road Industrial Park			[No photo]



Most of the streets were clean, free of sediment and debris, and in good condition. The one exception is Industrial Park Road in the Clark Road Industrial Park where roads were observed to be in poor condition (cracked, broken, and sediment accumulation). Storm drains along Industrial Park Road were also partially obstructed with sediment, leaves, trash, and one of the catch basins had standing water above the elevation of the stream water surface, indicating blockage of the outlet pipe. Many of the inspected catch basins had varying degrees of sediment accumulation and nearly all could benefit from increased clean-out and street sweeping. With the exception of the Meadowbrook Drive subdivision in the Tucker Brook subwatershed, none of the storm drains observed during the field assessments were stenciled.

# 3.0 LAND USE REGULATORY REVIEW

# 3.1 Introduction

Municipal land use regulations control patterns of new development and redevelopment and can play a significant role in protecting water quality and other natural resources in a watershed. These commonly include local plans of conservation and development, zoning regulations, subdivision regulations, inland wetland regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by town within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors.

A key element in the development of a Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to strengthen existing land use controls and better protect natural resources within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the watershed towns to develop revised and/or new regulatory mechanism to satisfy Phase II stormwater requirements, while also protecting water quality and other natural resources in the Tankerhoosen River watershed.

This section summarizes the following information:

- 1. Existing municipal land use planning entities and regulations for each of the watershed communities based on information obtained from a land use questionnaire conducted by the North Central Conservation District in 2005 as part of the *Hockanum River State of the Watershed Report* (Fuss & O'Neill, 2005). The information was updated where necessary to reflect current conditions.
- 2. Existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater

management, including LID concepts and opportunities to reduce impervious cover, into the local land use regulations. The regulatory review was performed for the towns of Tolland and Vernon because they comprise the majority of the land area in the Tankerhoosen River watershed and have the greatest potential for future development.

# 3.2 Summary of Municipal Land Use Planning Entities and Regulations

The 2005 land use questionnaire provided information from the watershed municipalities on the current land use regulations in each town, including information on wetlands and watercourses regulations, zoning regulations, plans of development, open space planning, and stormwater regulations. The following paragraphs summarize information obtained from the questionnaire.

Local land use regulations are administered by various Town commissions, boards, and agencies. Land use commissions in the Tankerhoosen River watershed communities are summarized below (<u>Table 8</u>).

Town	Land Use Commissions
Manchester	<ul> <li>Planning and Zoning Commission (acts as Inland Wetlands and Watercourses Agency)</li> <li>Zoning Board of Appeals</li> </ul>
Vernon	<ul> <li>Planning and Zoning Commission</li> <li>Inland Wetlands and Watercourses Agency</li> <li>Conservation Commission</li> <li>Design Review Board</li> <li>Open Space Task Force</li> </ul>
Tolland	<ul> <li>Planning and Zoning Commission</li> <li>Inland Wetlands and Watercourses Commission</li> <li>Conservation Commission</li> <li>Design Advisory Board</li> </ul>
Bolton	<ul> <li>Planning and Zoning Commission</li> <li>Inland Wetlands Commission</li> <li>Conservation Commission</li> <li>Open Space Preservation, Acquisition, and Conservation Committee</li> </ul>

Table 8: Tankerhoosen River Watershed Land Use Commissions

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

<u>Table 9</u> summarizes the current plan of development, subdivision, inland wetlands, zoning, floodplain management, and stormwater regulations for the watershed towns. The table lists the last revision date for the applicable land use regulations.

Regulation	Manchester	Vernon	Tolland	Bolton
Plan of Development	2004	2001	1999	1990
Subdivision Regulations	2005	2007	2008	2004
Wetlands Regulations	tlands Regulations 2007		2007	2006
Zoning Regulations	2008	2006	2008	2005
Floodplain Management	1994	In Zoning Regs.	None	2005
Stormwater2004 ConnecticutRegulationsStormwater QualityManual		In Zoning Regs.	2008 (LID)	2004

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

#### Inland Wetlands & Watercourses

Regulating activity with the potential to affect wetlands and watercourses is an essential component in preserving or improving the water quality and overall health of the Tankerhoosen River. In Connecticut, the Inland Wetlands and Watercourses Act requires that each municipality establish an Inland Wetlands and Watercourses Agency or Commission and local regulations regulating private and municipal work located in or affecting wetlands or watercourses. Each of the surveyed watershed towns has an inland wetlands agency, and each town has defined an upland review area, or distance from wetlands and watercourses that is subject to review. Three of the four watershed towns indicated that they have identified wetlands or watercourses that are impaired or that require restoration or require special protection. <u>Table 10</u> summarizes the regulating agencies, upland review areas, and identified wetlands and watercourses of special significance for the surveyed watershed towns.

# Table 10: Inland Wetlands and Watercourses Regulations

Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance
Manchester	Planning & Zoning Commission	50' wetlands and watercourses	None identified
Vernon	Inland Wetlands & Watercourses Agency	100' wetlands 200' designated watercourses	<ul> <li>Vernal pools on Box Mountain Road</li> <li>Tankerhoosen River</li> <li>Hockanum River</li> <li>Belding Preserve and Wildlife Management Areas</li> </ul>
Tolland	Inland Wetlands & Watercourses Commission	50' wetlands 100' watercourses	Preliminary*

Town	Regulating Agency	Upland Review Area	Wetlands and Watercourses of Special Significance	
Bolton	Inland Wetlands Commission, Conservation Commission	100' wetlands and watercourses	Yes*	

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

\*Information available from the individual towns.

#### Stormwater Management and Soil Erosion and Sediment Control

Development of the landscape with impervious surfaces can alter the hydrology of a watershed and has the potential to adversely affect water quality and aquatic habitat. As a result of development, vegetated and forested land that consists of pervious surfaces is largely replaced by land uses with impervious surfaces. This transformation increases the amount of stormwater runoff from a site, decreases infiltration and groundwater recharge, and alters natural drainage patterns. Natural pollutant removal mechanisms provided by on-site vegetation and soils have less opportunity to remove pollutants from stormwater runoff. During construction, soils are also exposed to rainfall, which increases the potential for erosion and sedimentation. Development can also introduce new sources of pollutants from everyday activities associated with residential, commercial, and industrial land uses.

Stormwater runoff both during construction and following completion of construction for new development and redevelopment projects is regulated at the local and state levels. All of the watershed towns have erosion and sediment control regulations as mandated by the Soil Erosion and Sediment Control Act. Most Connecticut municipalities have adopted regulations requiring that a soil erosion and sediment control plan be submitted with any application for development within the municipality when the disturbed area of such development is more than one-half acre. Projects that disturb greater than 5 acres of land are subject to regulation under the DEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities. This permit applies to discharges of stormwater and dewatering wastewaters from construction activities including, but not limited to, clearing, grading, and excavation that result in the disturbance of 5 or more acres of total land area on a site. Pursuant to Phase II of the NPDES Stormwater Program, construction activities disturbing between 1 and 5 acres have been delegated by DEP to the municipalities provided that the erosion and sediment control plan is reviewed and receives approval from the town, under the Soil Erosion and Sedimentation Control Act.

Post-construction stormwater quantity and quality are also regulated by the watershed municipalities through municipal planning and zoning and inland wetlands and watercourses regulations. All of the watershed towns are subject to the requirements of the NPDES Phase II stormwater program, which is regulated under the DEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 General Permit). The MS4 General Permit regulates the quality of municipal stormwater discharges and requires the creation of a Stormwater Management Plan that addresses the following six minimum control measures:

1. Public education and outreach on storm water impacts required throughout the entire municipality;



- 2. Public involvement/participation required throughout the entire municipality;
- 3. Illicit discharge detection and elimination required throughout the entire municipality including mapping all storm water discharges from a pipe or conduit with a diameter of 15 inches or greater (or equivalent cross-sectional area) owned or operated by the municipality;
- 4. Construction site storm water runoff control required throughout the entire municipality;
- 5. Post-construction storm water management in new development and redevelopment; and
- 6. Pollution prevention/good housekeeping for municipal operations.

The DEP *Connecticut Stormwater Quality Manual* provides guidance on the measures necessary to protect the waters of the State of Connecticut from the adverse impacts of post-construction stormwater runoff. It is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management in Connecticut. The manual provides uniform guidance for developers, engineers, and review agencies on the selection, design, and application of stormwater control measures. All of the watershed towns in the Tankerhoosen River watershed have indicated that they use the stormwater manual in reviewing development proposals for stormwater management issues.

The Town of Tolland recently (February 2008) amended its zoning and subdivision regulations to require that Low Impact Development (LID) techniques be implemented on all development to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and nonpoint sources of stormwater due to land development projects. Tolland also developed a companion LID design manual.

#### **Open Space**

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds. While approximately 40 percent of the Tankerhoosen River watershed consists of undeveloped land uses, much of this land is not considered open space because it may be privately owned and ultimately developed. Protected open space areas include deeded open space that is privately owned, parcels owned by land trusts, state and federally-owned land, land owned by water companies, and municipal park land. Such land is protected against future development. Each of the watershed towns has prepared an open space plan for their respective communities (Table 11).

Town	Open Space Plan	
Manchester	2004	
Vernon	2002	
Tolland	2006	
Bolton	2004	

# Table 11. Status of Municipal Open Space Plans in the Tankerhoosen River Watershed

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005

In addition to the designation of protected open space through donation, purchase of land by a town, conservation or land trusts, or other private and/or public agencies, towns also require that some land be dedicated as open space with the development of new subdivisions. The subdivision regulations of all of the towns in the Tankerhoosen River watershed require the set aside of a percentage of new subdivisions as open space, and all but Manchester have provisions for fee-in-lieu-of open space. <u>Table 12</u> summarizes responses from the surveyed watershed communities regarding their current open space regulations.

A majority of the surveyed watershed towns also allow "cluster development" and "open space subdivisions" in their subdivision regulations. These are compact forms of development that concentrate density in one portion of the site in exchange for reduced density elsewhere, thereby reducing overall site imperviousness and associated stormwater impacts and potentially avoiding development in sensitive areas of a site.

Томп	Fown Allow 'Cluster' Allow 'Open Space' Development Subdivisions	Allow 'Open Space'	Subdivision Open Space	
TOWIT		Required	Fee in lieu of	
Manchester	Yes	No	Yes, 6%	No
Vernon	Yes	No	Yes	Yes
Tolland	Yes	Yes	Yes, 10%	Yes
Bolton	Yes	Yes	Yes	Yes

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005



# 3.3 <u>Summary of Existing Regulations and Preliminary Recommendations</u>

The following policy, regulatory and planning documents were reviewed for the towns of Vernon and Tolland relative to stormwater management and natural resource protection:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development/Open Space Plan.

# 3.3.1 Town of Vernon

The Town of Vernon has a number of land use regulations that regulate construction and post-construction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

This section contains preliminary recommendations for the town of Vernon based on the review of the existing land use regulations and planning documents. The recommendations in this section are a summary of the more detailed regulatory review, which is provided in a technical memorandum dated June 9, 2008 (Appendix D).

# 1. Town Design Manual

- Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
- Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
- Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.

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#### 2. Stormwater Management Standards

- Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included with the full memorandum in <u>Appendix D</u>.
- 3. New or Modified Stormwater Regulations
  - Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified –1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
  - Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
    - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
    - Which projects and activities will the new ordinance apply to (i.e., applicability)?
    - o How will applications be received and reviewed?
    - Who will be responsible for inspections and enforcement?
    - Will additional staff be required to handle the increased workload to review and process applications?

# 3.3.2 Town of Tolland

#### Zoning and Subdivision Regulations

The Town of Tolland recently amended its zoning and subdivision regulations to:

- 1. Incorporate Low Impact Development (LID) principles. The Town also developed a companion LID Design Manual that provides recommendations for site design, road design, and stormwater management.
- 2. Create a natural Resource and Wildlife Protection Overlay Zone around sensitive habitat areas and steep slopes throughout the town.
- 3. Adopt density-based zoning to replace the minimum lot size requirements.

Tolland is one of the first towns in Connecticut to adopt comprehensive LID regulations. The regulations are a good model for the other watershed communities to require the use of LID practices. The regulations are currently in the early stages of implementation. The Town should continue to monitor the effectiveness of the LID regulations as development projects subject to the new regulations are designed, reviewed, and constructed.

Consistent with the recommendations for the Town of Vernon, Tolland should also consider adopting a River Protection Overlay District for the Tankerhoosen River (Gages Brook). Such a district would establish a contiguous and parallel buffer strip on either side of the river and would supplement the underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

#### Inland Wetlands and Watercourses Regulations

The Inland Wetlands and Watercourses regulations were amended in 2007, and are in accordance with the Connecticut General Statues. The regulations define an Upland Review Area extending a minimum 50 feet from the edge of a wetlands and/or watercourse and a extending a minimum of one hundred 100 feet from any watercourse, including intermittent watercourses. The width of the Upland Review Area may be doubled in cases where the slopes bordering the wetland and/or watercourse are in excess of 15%, the presence of highly erodible soils, or unique and/or easily damaged wetland ecosystems exist.

Permit application requirements include documentation that proposed stormwater quality management systems, at a minimum, conform to the "2004 Connecticut Stormwater Quality Manual", as amended. The Inland Wetlands and Watercourses Regulations should be revised to require that projects also meet the design requirements contained in the Tolland LID Design Manual, for consistency with the zoning and subdivision regulations and to promote the use of LID. The town should also consider incorporating more explicit watercourse buffer requirements, including minimum buffer widths, similar to the watercourse buffer provisions in the Town of Vernon Inland Wetlands and Watercourses Regulations.

#### Plan of Conservation and Development

The Tolland Planning & Zoning Commission is in the process of updating the 1999 Plan of Conservation & Development (POCD) in accordance with the Connecticut General Statutes which requires the plan to be updated every ten years. The plan will establish a common vision for the future of the community and determine policies that will help attain that vision. The plan will address a range of themes, including natural resources, open space, utility infrastructure, and community development.

The Town's planning consultant has prepared draft recommendations related to conservation issues as part of the POCD update process. The recommendations address surface and groundwater quality, important habitat areas, drainage issues, green infrastructure, and open space protection. Some of the key recommendations for natural resource protection that also apply within the Tankerhoosen River watershed include (Planimetrics, 2008):

• Future development should occur in a manner and in locations that are environmentally sustainable,

• Impacts from existing development should be minimized through education, incentives, and town leadership.

# Open Space and Conservation Plan

The 2006 Tolland Open Space and Conservation Plan inventoried natural resources throughout the town, including wetlands, rivers and streams, lakes and ponds, vernal pools, water supply watersheds, forest resources, and wildlife resources. In addition to the Open Space and Conservation Plan, the town has also completed or is implementing the following open space preservation activities (Planimetrics, 2008):

- Establishing an Open Space Acquisition Fund,
- Setting up a structured process for open space procurement and management,
- Promoting the use of open space, with trail maps and programmed activities,
- Tapping into a volunteer group for maintenance (Tolland Conservation Corps).



# 4.0 REFERENCES

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# APPENDIX A

# Stream Corridor Assessment Field Forms and Data

SURVEY REACH I	D: <u>CBO</u> WTF	shd/Subshd: C\0	rks Brook	DATE: 7/2	108 ASSI	essed by: rilnds
START TIM	e: <u>9:38</u> AM/PM	LMK:	END TIME:	AM/PM	LMK:	GI
$\begin{array}{c} LAT_{2/1}^{2} \\ DESCRIPTION: \end{array}$	Long <u>/ 6</u>	<u> </u>	DESCRIPTION: 2	<u>115</u> " LONG <u>/0</u>	<u> </u>	# <u>}</u>
			12	1 DM j.K.d	<u>CUDSS04</u>	
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain □ Trace	PRESENT CONDITIONS	□ Heavy rain □ Trace	□ Steady rair ☑ Overcast	Intermitte
SURROUNDING LAN	D USE:  Industrial Golf court	□ Commercial se □ Park	☐ Crop I	□ Suburban/Res □ Pasture	☑ Forested □ Other:	□ Institution
Average	CONDITIONS (chec	k applicable)	REACH S	KETCH AND SI	ГЕ ІМРАСТ ТІ	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	☑ 50%-75% □ 75-100%	Simple planar sketch o within the survey rea features a	f survey reach. Trac ch (OT, ER, IB,SC, leemed appropriate	ck locations and . UT, TR, MI) as w Indicate direction	IDs for all site in well as any addition on of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick)	bble (2.5 –10") 1lder (>10") 1 rock				
WATER CLARITY	☑ Clear □Turbid aturally colored) □ ( dyes)	(suspended matter) )paque (milky)				
AQUATIC PLANTS IN STREAM	Attached: ☑ none Floating: ☑ none	□ some □ lots □ some □ lots				
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish □ Beave □ Snails □ Other:	r □Deer Erog + Birds				
STREAM SHADING (water surface)	☐ Mostly shaded (2 ☑ Halfway (≥50%) ☐ Partially shaded ☐ Unshaded (< 25%	275% coverage) (≥25% ) %)			Bolton	Road
CHANNEL DYNAMICS	<ul> <li>Downcutting</li> <li>Widening</li> <li>Headcutting</li> <li>Aggrading</li> <li>Sed. deposition</li> </ul>	<ul> <li>Bed scour</li> <li>Bank failure</li> <li>Bank scour</li> <li>Slope failure</li> <li>Channelized</li> </ul>			50	T S S S S S S S S S S S S S S S S S S S
CHANNEL DIMENSIONS	Height: LT bank RT bank	<u>3</u> (ft) <u>3</u> (ft)		a demonstration of the second se	ŝ. (	$\Box$
(Facing downstreaM)	Width: Bottom	(ft)				
R	EACH ACCESSIBILIT	(II)(II)		1		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.			Ć	A Store
5 4	<u>3</u> 2	1		,		$\langle \zeta_{A} \rangle$

IN-STREAM Habitat	Greater than 70% of substrate	40-70% mix of stable babitat: well-	iviai ginai	roor
IN-STREAM Habitat	Greater than 70% of substrate	40-70% mix of stable habitat well-		•
'May modify criteria based on appropriate habitat regime)	favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION Score each Sank, determine Sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambanl surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	$\begin{pmatrix} 2 \end{pmatrix} \cdot 1 = 0$
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION facing lownstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
-	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
7LOODPLAIN Connection	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) n <b>ot</b> able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
I	20 19 18 17 16	ALL BUFFFR AND FLOODRI AT	<u>10 9 8 7 6</u>	5 4 3 2 1 0
	Ontimal	Subartinal	M	
/egetated 3uffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
LOODPLAIN GETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<sup>7</sup> loodplain Iabitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
'LOODPLAIN 'NCROACH- IENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
Г	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

				Storm Water (	Outfalls	ΟΤ
WATERSHED/SUBSH	ED: Clarly	Brook	DATE: _7 / 8	/ <u> </u>	SED BY: F	riends
SURVEY REACH ID:	CBON TI	ME: 10 :48 AM/PM	4 <b>Рното ID</b> : (Са	amera-Pic #)	, /#_17	(2403)
SITE ID (Condition-#):	от- <u>03</u> L	AT 41 . 49 . 57.	2" LONG 72-072	<u>2012"</u> LMK_	Gl	<b>PS:</b> (Unit ID)
BANK: DLT RT Head FLOW: None Trickle	TYPE:	MATERIAL:	SHAPE:     □       Metal     √Circular     □       Brick     □ Elliptical     □       □ Other:     □	Single <b>DIMENSI</b> ] Double   Triple Diameter:	ONS: 18 (in)	SUBMERGED:
Substantial	Dpen channel	Concrete Ea	arthen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	(in) (in) (in)	NOT APPEICABLE
CONDITION: Chip/Cracked  Chip/Cracked	ODOR: M No Gas Sewage	<b>DEPOSITS/STAINS D</b> IV None OIly Flow Line	S: VEGGIE DENSI	ITY: PIPE BENT	THIC GROW	TH: 🗹 None 🗌 Green
Corrosion	Sulfide	Paint Other:	Infinited     Excessive     Other:	POOL QUA           □ Good □           □ Suds □           □ Other:	ALITY: 21 Odors 00 Algae 11	No pool Colors □Oils Floatables
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						r: 
POTENTIAL RESTOR	ATION CANDIDAT	E Discharge inves	stigation 🗌 Stream daylig ofit 🔹 🗌 Other:	ghting 🗌 Local strea	am repair/out	fall stabilization
If yes for daylighting.				······································		
Length of vegetative co	ver from outfall:	ft Type of	of existing vegetation:		Slope:	°
If yes for stormwater. Is stormwater currently Yes No No	controlled? ot investigated	Land U Area a	Use description: vailable:			
OUTFALL     H       SEVERITY:     si       (circle #)     si	eavy discharge with a dis trong smell. The amount of ompared to the amount of tream; discharge appears gnificant impact downstre	tinct color and/or a of discharge is significant normal flow in receiving to be having a am.	Small discharge; flow mostly of discharge has a color and/or of discharge is very small compar flow and any impact appears to	clear and odorless. If the dor, the amount of red to the stream's base o be minor / localized.	Outfall does not discharge; stain of causing any e	have dry weather ing; or appearance erosion problems.
SKETCH/NOTES:		4	r <u>3</u>	<u></u>		
)				REPORTED TO	AUTHORITIES	S: 🗌 YES 🗌 NO

			Sto	rm Water Outfalls	OT
WATERSHED/SUBSH	ED: Carles	Brook	DATE:/ 2 / 0	8 ASSESSED BY:	Friends
SURVEY REACH ID:	CBO T	IME: 10:50 AM/PI	M PHOTO ID: (Camera-Pi	ic#) /# //	(2404)
SITE ID (Condition-#):	<u> 0T- 0</u> 부 L	AT 49 .57,	1 "LONG 72° 27 , 20.2.	" LMK G	<b>PS:</b> (Unit ID)
BANK: LT MRT Head FLOW: None Trickl	e TYPE:	MATERIAL:	SHAPE: Single Metal Circular Double Brick Elliptical Triple	DIMENSIONS: Diameter: / 🦉 (in)	SUBMERGED
Moderate Substantial Other:	Open channel	Concrete E	arthen Trapezoid D Parabolic W Other:	Depth: <u>(in)</u> Vidth (Top): <u>(in)</u> " (Bottom): <u>(in)</u>	NOT APPEICABLI
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAIN None Oily Flow Line Paint Other:	S: VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROW         Brown       Orange         Other:         POOL QUALITY:         Good       Odors         Suds       Algae	VTH: Mone Green No pool Colors Oi Floatables
OTHER LEE CONCERNS: N POTENTIAL RESTOR no If yes for daylighting	ccess Trash (paper/p eeds Regular Mainte CATION CANDIDAT	lastic bags) nance B E Discharge inve Storm water ret	umping (bulk)	Sedimentation	tfall stabilizatio
Length of vegetative of <i>If yes for stormwater</i> Is stormwater currently	over from outfall: : controlled? ot investigated	ft Type Land Area	of existing vegetation: Use description: available:	Slope:	0
OUTFALL SEVERITY: (circle #)	leavy discharge with a di trong smell. The amount compared to the amount c tream; discharge appears ignificant impact downstr	stinct color and/or a of discharge is significant f normal flow in receiving s to be having a eam.	Small discharge; flow mostly clear and o discharge has a color and/or odor, the an discharge is very small compared to the s flow and any impact appears to be minor	dorless. If the nount of stream's base / localized.	ot have dry weather ning; or appearance erosion problems.
Skepou /Norma	5		4 3	2	1
			F	REPORTED TO AUTHORITIF	.s: □ yes □ N
			1	,	<u>ло. — тео — N</u>

SURVEY REACH ID: CBON       TIME: D: 3 AM/PM       PHOTO ID: (Camera-Pic #)       # Z (240)         STIE ID (Condition: #): OT       LAT U1° U1° 49 ' 586 " LONG -12° 2 ? 2.9.4"       LMK       GPS: (Unit         BANK:		: Clarks	Brook	DATE: 7 / 02 /08	ASSESSED BY: Prie	ends
SITE ID (Condition-#): OT       LAT1 ° 49 ' 536 " LONG -12 ° 2 7 ' 20.4" LMK       GPS: (Unit         BANK:	SURVEY REACH ID: 🤇	BOI TH	ME: 10 : 37 AM/PM	<b>РНОТО ID:</b> (Camera-P.	ric#) 1# 8 (2"	toi)
BANK:       TYPE:       MATERIAL:       SHAPE:       Single       DIMENSIONS:       SUBMER         LT RT Head       Closed       Oncrete       Matterial       Concrete       Matterial       No         Prow:       Other:       Other:       Other:       Date       Dimensions:       Submather         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Partial         Other:       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Nor Apedia         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Nor Apedia         Other:       Ober:       Ober:       Other:       Width (Top):       (in)       Nor Apedia         Other:       Ober:       Ober:       None       Brown       Brown       Brown       Orange       Groder       Other:         Pool Quality:       Paint       Brown       Greey       Yellow       Green       Other:	SITE ID (Condition-#): O	<u>F</u> LA	T <u>41° 49' 69.6</u>	"Long-12 ° 27 ' 20.4	" LMK GPS:	: (Unit ID)
Moderate       Open       Concrete       Earthen       Trapezoid       Depth::	BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete M PVC/Plastic Br Other:	SHAPE: Single etal Circular Double rick Elliptical Triple	DIMENSIONS: SU Diameter: <u></u>	BMERGEI No Partially
CONDITION:       ODOR: No       DEPOSITS/STAINS:       VEGGIE DENSITY:       PIPE BENTHIC GROWTH: No         Point       Gas       None       None       None       Brown Orange Green         Peeling Paint       Rancid/Sour       Flow Line       Inhibited       Pool QUALITY: No pool         Corrosion       Sulfide       Paint       Rancid/Sour       Paint       Root Good Other:         Other:       Other:       Other:       Other:       Other:       Pool Other:         Flow Wing       Other:       Other:       Other:       Other:       Orange Red Other:         FlowWing       TURBIDITY:       None       Slight Cloudiness       Cloudy Opaque	Moderate Substantial Other:	Open Concrete Earthen channel Other:		hen Trapezoid D Parabolic y Other:	Depth:         (in)           Width (Top):         (in)           " (Bottom):         (in)	T APPEICABL
Corrosion       Sulfide       Paint       Excessive       Good       Good       Colors       Colors       Colors       Good       Good       Colors       Colors       Sulfide         Other:       Other:       Other:       Other:       Other:       Good       Odors       Colors       Good       Colors       Colors       Colors       Colors       Suds       Algae       Floatables         For       CoLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque       Other:         ONLY       FLOATABLES:       None       Slight Cloudiness       Cloudy       Opaque       Other:       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation       Other:         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:       Other:       Other:         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Slope:       Slope:       If         If yes for stormwater:       Is stormwater currently controlled?       Land Use descr	CONDITION: None Chip/Cracked Peeling Paint	<b>ODOR:</b> No Gas Sewage Rancid/Sour	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH Brown Orange Other: POOL ON MUTTY	Green
For       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilizing         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Slope:       Slope:         If yes for stormwater:       Is stormwater:       Land Lise description:       Slope:       Slope:       Slope:	Corrosion Other:	Sulfide	Paint Other:	Excessive Other:	Good Odors Cold Suds Algae Flor	pool ors DO atables
Length of vegetative cover from outfall:ft Type of existing vegetation:Slope: If yes for stormwater: Is stormwater currently controlled? Land Use description:	CONCERNS.   D Need	Domilan Mainten			Sedimentation	
If yes for stormwater: Is stormwater currently controlled?	POTENTIAL RESTORAT	TION CANDIDATE	ance 🗌 Banl	ation Stream daylighting	Local stream repair/outfall	stabilizatio
Yes     No     Not investigated     Area available:	POTENTIAL RESTORAT	TION CANDIDATE	ance 🗌 Banl	ation Stream daylighting Stream daylighting Stream daylighting t Other:	Local stream repair/outfall	stabilizatio
OUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge; flow mostly clear and odorless. If the discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.       Outfall does not have dry were discharge; staining; or appear of causing any erosion problem.	POTENTIAL RESTORAT         Image: Incomparison of the second sec	TON CANDIDATE	ance 🗌 Banl Banl Banl Banl Banl Banl Banl Banl	apping (burk)       Excessive         k Erosion       Other:         gation       Stream daylighting         it       Other:         existing vegetation:	Local stream repair/outfall	stabilizatio
	POTENTIAL RESTORAT            ☐ no             [f yes for daylighting:          Length of vegetative cover            [f yes for stormwater:             [s stormwater currently co             [ Yes ] No ] Not i             OUTFALL             Severity:             circle #)	TION CANDIDATE TION CANDIDATE r from outfall: ntrolled? nvestigated /y discharge with a disti g smell. The amount of pared to the amount of n im; discharge appears t ficant impact downstrea	ance Bank	apping (burk)       D Excessive         k Erosion       Other:         gation       Stream daylighting         it       Other:         existing vegetation:	Dedorless. If the nount of stream's base i / localized.	stabilizatic o ve dry weather or appearanc ion problems.

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Storm Water Outfalls

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WATERSHED/SUBSHE	D: Clarks	Broch	DATE: 7 / 2 / 03	ASSESSED BY: Friends
SURVEY REACH ID:(	1801 TH	ME: <u>10:40</u> AM/PM	Рното ID: (Camera-Pi	c#) /# 9 (2402)
SITE ID (Condition-#): (	)T- <u>-</u> La	т <u>Ч[°Ч9 '55,55</u> " Le	DNG -72 ° 27 ' 20.5"	' LMK GPS: (Unit ID)
BANK:	TYPE:	MATERIAL:	SHAPE: Single	DIMENSIONS: SUBMERGED
FLOW: None Trickle Moderate Substantial	pipe	Concrete Earthen	Other:     Trapezoid D	epth:(in) Partially
Other:	channel	Other:	Parabolic W Other:	/idth (Top):         (in)         NOT APDE CABLE           ' (Bottom):         (in)
CONDITION:	ODOR: \[] No Gas Sewage Rancid/Sour	DEPOSITS/STAINS:	VEGGIE DENSITY: None Normal Inhibited	PIPE BENTHIC GROWTH: None
Corrosion	Sulfide	☐ Paint ☐Other:	Excessive Other:	Good Odors Colors Oil Suds Algae Floatables
FOR COLOR	: 🗌 Clear	· 🗌 Brown 🔲 Grey	Yellow Green	Orange Red Other:
FLOWING TURBIN ONLY FLOAT	ABLES: None	<ul> <li>Slight Cloudiness</li> <li>Sewage (toilet paper, or several s</li></ul>	Cloudy Opaque	(oil sheen) Other:
OTHER Exc CONCERNS: Nee	ess Trash (paper/pla ds Regular Mainten	stic bags) 🗌 Dumping ance 🗌 Bank Ero	(bulk) Excessive sion Other:	Sedimentation
<b>POTENTIAL RESTORA</b>	TION CANDIDATE	Discharge investigatio	n 🗌 Stream daylighting [	Local stream repair/outfall stabilization
no		Storm water retrofit	Other:	
If yes for daylighting:	6			
Length of vegetative cov	er from outfall:	ft Type of exist	ing vegetation:	Slope:°
If yes for stormwater:				
Is stormwater currently c	ontrolled?	Land Use des	cription:	
	Investigated	Area availabl	e:	
SEVERITY: stro (circle #) stre sign	ong smell. The amount of npared to the amount of nam; discharge appears to nificant impact downstrea	discharge is significant normal flow in receiving o be having a m. Small d discharg discharg flow and flow and	ischarge; flow mostly clear and oc ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor /	dorless. If the ount of tream's base / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4	3	2 (1)
SKETCH/NOTES:				~
)			R	EPORTED TO AUTHORITIES: YES IN NO

Stream Crossing

r							
WATERSHED	Isubshed: Clarks B	non		DATE: 7	12 108	ASSE	SSED BY: Frilnels
URVEY REA	CHID: CBOV	TIME: 11 :00	_AM/PM	РНОТО II	<b>):</b> (Camera-Pic	#)	1# 12 (2405)
SITE ID: (Con	dition-#) SC- <u>O</u> L LAT	41049.51	$\underline{/}$ " Long $\underline{/}$	2027.	<u>20.2"</u> LN	ИК	GPS (Unit ID)
						-	
TYPE: 📈 Roa	d Crossing 🔲 Railroad Crossin	ng 🗌 Manmade	Dam 🗌 Beav	er Dam	Geological Form	nation	Other:
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIG Flo No Do	NMENT: ow-aligned of flow-aligned onot know	DIMENSI Barrel dia	<b>IONS:</b> (if variable, sketch) meter: $5 \cdot 5$ (ft) Height:(ft)
CROSSINGS ONLY	CONDITION: (Evidence of)	Downstream	n scour hole ankment	CULV Fla	TERT SLOPE: at $(2^{\circ} - 5^{\circ})$ avious (>5°)	Culvert le	Image: second
	Uther ( <i>describe</i> ):					Roadway	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗹 Culv	vert repair/rej	placement 🔲 U	lpstream st	orage retrofit
IS SC ACTING	CAS GRADE CONTROL			nown	MARTE W	<u>NATUA</u>	19 Willing
15 SC ACTING	EVERYTRANE OF BUNGLOUN BLOC				CKACE SEVED	TTV: (aire	1 - ++>
If yes for fish barrier	EXTENT OF PHYSICAL BLOG         Total       Partial         Temporary       Unknow         CAUSE:       Drop too high         Water Drop       Flow too shallow         Water De       Ochar	vn op: (in) pth: (in)	A structure such road culvert on a greater stream bl upstream moven anadromous fish passage device p	as a dam or 3rd order or ocking the ent of no fish oresent.	A total fish blockag tributary that would significant reach o or partial blockage interfere with the n anadromous fish.	ge on a d isolate a f stream, that may higration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
<u>)</u>			5	4	4 3		2 (1)
r)					REPORT	ED TO AIT	
					ANDI UNI	20 10 401	



	n - RAD				ASSE	SSED BY:
JOURVEY REACH I		RSHD/SUBSHD: C	Arks Brook	DATE: <u>/</u> /		riends
START TIM	E: <u>11 : Ø V</u> AM/PN	1 LMK:	END TIME:_	:AM/PM	LMK:	GPS ID:
LAT <u>CON ° 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>	$\geq \delta_1 \circ$ " Long	12°27 '202"	LAT <u>1 ° 56 '</u>	$0.7$ "Long $\frac{7}{2}$	<u>+ ° 27 123</u>	
DESCRIPTION:			DESCRIPTION:			
PAIN IN LAST 24 HO		C Stoody min				
$\square$ None		$\Box$ Steady rain	Clear	$\Box$ Heavy rain	□ Steady rain	Partly cloudy
SURROUNDING LAN	DUSE: Industria	1	Urban/Residential	□ Suburban/Res	Forested	
	□ Golf cou	rse 🗆 Park	Crop	$\square$ Pasture	□ Other:	
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SI	FE IMPACT TH	LACKING
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ck locations and	IDs for all site impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%	within the survey re features	each (OT, ER, IB,SC, e deemed appropriate.	UT, TR, MI) as w Indicate directio	vell as any additional on of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) C B ") DB	obble (2.5 –10") oulder (>10") ed rock				
WATER CLARITY	Clear Turbic aturally colored) dyes)	d (suspended matter) Opaque (milky)				
AQUATIC PLANTS	Attached: non	e $\square$ some $\square$ lots				
IN OIKEAN	Floating: L none	e ⊔ some ⊔ lots				
WILDLIFE IN OR AROUND STREAM	☐ Fish ☐ Beav ☐ Snails ☐ Othe	er 🗌 Deer r:	_			
STREAM SHADING (water surface)	<ul> <li>✓ Mostly shaded</li> <li>□ Halfway (≥50%</li> <li>□ Partially shaded</li> <li>□ Unshaded (&lt; 25</li> </ul>	(≥75% coverage) b) 1 (≥25% ) 5%)	5			
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading	Bed scour Bank failure Bank scour Slope failure	Bund	TR-01		
	M Sed. deposition	n Channelized	S.			- •
	DT hank	(II)	Te in 1		and the second se	
(FACING	Width: Bottom		5.8		···-	
DOWNSTREAM)	Ton	(ft)	1			
R	EACH ACCESSIBILI	(II)		1256-1		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available	878 -013 878	210 <sup>5, 61</sup>		
access for heavy	landscaped areas. Stockpile areas	and/or located a great	0	Drai	- 100 ·	
equipment using existing roads or trails.	small or distant from	Specialized heavy			07-1	
5 4	stream.	equipment required.	- Boi	TON RO	AD	1910
NOTES: (biggest prob	lem you see in survey	reach)				
)						
				REPOR	TED TO AUTHOR	
		OVERALL STREAM COND	ITION			
--	---	---	---	---	--	
	Optimal	Suboptimal	Marginal	Poor		
)IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
<b>T</b>	Kight Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0		
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0		
Jub Total In-str	ream: $\frac{5^{2}}{80}$ + B	uffer/Floodplain: <u>40</u> /80	= Total Survey	Reach <u>93</u> /160		

	Storm Water	Outfalls				
WATERSHED/SUBSH	IED: Clarks	Brook	DATE: 7/2	/ <u>0</u> 8 Asse	SSED BY: Fr	iends
SURVEY REACH ID:	CBOL TH	ME: <u>//_:/5_</u> (M/Pr	м <b>Рното ID:</b> (Са	ımera-Pic #)	1# 16	17/2409
SITE ID (Condition-#):	0T- <u>Ø</u> L LA	<u>T41049.58</u>	<u>3" LONG72 • 27 '</u>	<u>'20.)</u> " LMK	G	<b>PS:</b> (Unit ID)
BANK: / LT RT Head FLOW: None Trickl	I TYPE: Closed pipe	MATERIAL:	SHAPE: Metal Circular Brick Elliptical Other:	Single <b>DIMENS</b> Double Triple Diamete	sions: r: <u>6 (in)</u>	SUBMERGED:
Substantial Other:	Open channel	Concrete E	arthen Trapezoid	Depth: Width (Top):_ " (Bottom):_	(in) (in) (in)	NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint	<b>ODOR:</b> No Gas Sewage	<b>DEPOSITS/STAIN</b> None Oily Flow Line	S: VEGGIE DENSI	TY: PIPE BEI	NTHIC GROW	/ <b>TH:</b>   None   Green
Corrosion Other:	Sulfide	☐ Paint ☐Other:	Infinited     Excessive     Other:	POOL QU Good Suds Other:	UALITY: Odors Algae	No pool Colors □Oils Floatables
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
POTENTIAL RESTOR	RATION CANDIDATE	E Discharge inve	estigation 🗌 Stream daylig rofit 🛛 Other:	ghting 🔲 Local str	eam repair/out	fall stabilization
Length of vegetative co	g: over from outfall:	ft Type	of existing vegetation:		Slope:	0
If yes for stormwater Is stormwater currently	r: y controlled? lot investigated	Land Area	Use description:available:			
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstrea	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	Small discharge; flow mostly c discharge has a color and/or or discharge is very small compar flow and any impact appears to	clear and odorless. If the dor, the amount of red to the stream's base b be minor / localized.	Outfall does no discharge; stair of causing any	t have dry weather ning; or appearance erosion problems.
Suppour/Norma	5		4 3		2	. 1
)		PARKS - 11		REPORTED T	O AUTHORITIE	S: YES NO

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Storm Water Outfalls								
WATERSHED/SUBSH	ED: Clark	s Brook	I	DATE: $7/2/08$ Assessed by:				
SURVEY REACH ID:	CB02	TIME: 11 : 52 AM/P	M I	<b>PHOTO ID:</b> (Camera-Pic#) $/# \rightarrow 0$ (2413)				
SITE ID (Condition-#):	ОТ	LAT 41 ° 50 '01.	8 " Lon	G72 0 27 121.	S" LMK	GI	<b>S:</b> (Unit ID)	
	<u></u>							
BANK: LT RT Head FLOW: None Trickl	Type:       LT     RT       Head       LOW:       None       Trickle		S]Metal [ ]Brick [ ]	SHAPE: Singl Circular Dou Elliptical Trip Other:	le <b>DIMENSIO</b> Ible Ie Diameter:_	ONS: (in)	SUBMERGED:	
Moderate Substantial Other:	Open channel	Concrete E E	Carthen	☐ Trapezoid ☐ Parabolic ☐ Other:	Depth: <u>4</u> Width (Top): <u>(</u> " (Bottom):	<u>∑ (in)</u> <u>○ (in)</u> (in)	NOT APPEICABLE	
CONDITION: None Chip/Cracked Peeling Paint	ONDITION:       ODOR: Inclusion       DEPOSITS/STAINS:         None       Inclusion       Inclusion         Chip/Cracked       Inclusion       Inclusion         Peeling Paint       Inclusion       Inclusion         Corrosion       Inclusion       Inclusion         Other:       Inclusion       Inclusion         Other:       Inclusion       Inclusion		s: V	VEGGIE DENSITY: None Normal Inhibited	PIPE BENT	HIC GROW	<b>FH:</b> None	
Other:				_ Excessive _ Other:	Good Suds	Good Odors Colors Oils Suds Algae Floatables		
FOR       COLOR:       Image: Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       Image: None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       Image: None       Sewage (toilet paper, etc.)       Image: Petroleum (oil sheen)       Other:								
$\begin{array}{c c} \textbf{OTHER} & \Box \textbf{E} \\ \textbf{CONCERNS:} & \Box \textbf{N} \\ \hline \end{array}$	eeds Regular Mai	ntenance B	ank Erosio	on Other:	ive Sedimentation			
POTENTIAL RESTOR	ATION CANDID	ATE Discharge inve	estigation [ rofit [	Stream daylighting	g 🗌 Local stream	m repair/outf	all stabilization	
If yes for daylighting	•							
Length of vegetative co	over from outfall:	ft Type	of existing	g vegetation:		_ Slope:	o	
If yes for stormwater Is stormwater currently $\Box$ Yes $\Box$ No. $\Box$ N	controlled?	Land	Use descri	ption:				
OUTFALL H SEVERITY: (circle #)	leavy discharge with a trong smell. The amou ompared to the amou tream; discharge appoint ignificant impact dowr	a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a istream.	Small disch discharge h discharge is flow and an	harge; flow mostly clear an has a color and/or odor, th s very small compared to hy impact appears to be m	nd odorless. If the e amount of the stream's base inor / localized.	Outfall does not discharge; staini of causing any e	have dry weather ng; or appearance rosion problems.	
SKETCH/NOTES:					L		I	
					Dupover -			
) <u></u>				•	REPORTED TO A	NUTHORITIES	. U YES U NO	

Ctown	Matan	M. Manua
SIOUU	vvalei	Quialis

## ΟΤ

WATERSHED/SUBSHED	: Clarks			DATE: 7/2 108 ASSESSED BY: Friends				
SURVEY REACH ID: C	BOX TI	IME: <u> } :08</u> АМ/Р́М	a	Рното ID: ( <i>Camera-Pic</i> #) /# 2				
SITE ID (Condition-#): O	r- <u>03</u>   L/	AT <u>41 ° 50 '03,</u>	<u>-</u> " Lo	LONG72 • 27 123,3 " LMK GPS: (Unit ID)				
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL:	Metal Brick	SHAPE:   Single     Circular   Double     Elliptical   Triple     Other:	DIMENSIONS:	SUBMERGED: → No (in) Partially → Fully		
Moderate Substantial Other:	Open channel	Concrete Ea	arthen	Trapezoid   D     Parabolic   W     Other:   0	Pepth: <u>(i</u> /idth (Top): <u>(i</u> " (Bottom): <u>(i</u>	n) n) NOT APPESCABLE n)		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: 🗹 No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS	s:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC         Brown       C         Other:         POOL QUALITY         Good       Odor         Suds       Alga         Other:	GROWTH: None range Green ': No pool rs Colors Oils ae Floatables		
FLOWING     TURBIDI       ONLY     FLOATAN       OTHER     Excess       CONCERNS:     Needs       POTENTIAL RESTORAT     no       If yes for daylighting:     Length of vegetative cover	TY: Non BLES: Non SS Trash (paper/pl S Regular Mainter NON CANDIDAT)	r Grown G Brown G Brown G Slight Cloudine astic bags) D nance Ba E Discharge inves Storm water retr	rey [ ess [ paper, e umping ank Eros stigatior stigatior of evicti	Yellow       Green         Cloudy       Opaque         tc.)       Petroleum         (bulk)       Excessive         sion       Other:         Other:       Other:	Orange       Red         (oil sheen)       [         Sedimentation       [         Description       [         Local stream rep       [	] Other: ] Other: air/outfall stabilization		
If yes for stormwater:         Is stormwater currently col         Yes       No         OUTFALL       Heaved stron comp.         SEVERITY:       comp.         (circle #)       strea	Length of vegetative cover from outfall:      ft       Type of existing vegetation:							
	5	4	1	3	(2)	1		
SKETCH/NOTES:				R	Reported to Autho	DRITIES: 🗌 YES 🗌 NO		

				S	Severe B	ank Erc	osion	ER
WATERSHED/SUBS	SHED: Clarks	Brook		DATE: 7 / 2	108	ASSES	SED BY:	Friends
SURVEY REACH:	CB02	TIME: 1) :	30 (AM/PM	PHOTO ID (CAN	4ERA-PIC	¥)·	/# 19	(2412)
SITE ID: (Condition-	#) START LAT	11 . 50 101.2	" LONG 72 02	7:20.4	LMK		$\frac{\mathbf{GPS}_{t}}{\mathbf{GPS}_{t}}$	Init ID)
ER0	END LAT_	0 1	" LONG °	1 11			0101(0	
		1						
PROCESS:	Currently unknown	BANK OF CO	DNCERN: 🗹 LT 🛽	RTBoth (.	looking dow	vnstream)		1.0.1
	Bed scour	DIMENSIONS		Straight section		slope/valle	ey wall [_	] Other:
	Bank failure	Length (if no.		and/an DT	م	D . //	. 1.1	0
Headcutting	Bank scour	Bank Ht	UT #	and/or RI	T	Bottor	n width _	ft
Aggrading	Slope failure	Bank Angle		and/or PT	îi	TOP W	-10th	n
						w ette	a wiath _	Π
LAND OWNERSHIP	Private Public	c ∐ Unknown	LAND COVER:		Field/Ag	Devel	oped:	
<b>POTENTIAL RESTO</b>	PRATION CANDIDATE	C: Grade	e control	Bank stabilizatio	n			
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🛛 No	Yes (Describ	e):				
EXISTING RIPARIA	n Width:	□ ≤25 ft	25 - 50 ft	] 50-75ft 🗌 75	-100ft	□ >100fi	t	
EROSION	Active downcutting; tall ban	ks on both sides	Pat downcutting evide	at active stream				
SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo	ast rate; erosion unt of sediment to	widening, banks active	ely eroding at a	Grade and	width stable	e; isolated ar	eas of bank
	stream; obvious threat to pr	operty or	moderate rate; no thre infrastructure	eat to property or	scour, imp	aired riparia	n vegetation	or adjacent use.
	5		4 3		2		1	
ACCESS:	Good access: Open area in ownership, sufficient room t	n public o stockpile	Fair access: Forestec	l or developed area	Difficult a other sens	ccess. Must itive areas to	t cross wetla o access stre	nd, steep slope or eam. Minimal
	heavy equipment using exis trails.	ting roads or	removal or impact to landscaped areas. Stockpile areas small or distant from stream. Stockpile areas small or distant from stream.					
	5	2	4 3	)	2		1	
NOTES/CROSS SEC	TION SKETCH:							
1					REPORTE	D TO AUTI	HORITIES	Yes 🗌 No

					Termer'				
WATERSHED	/SUBSHED: CLOCKS		~~~~	DAT	E: 7	12 108	ASSE	SSED BY: Frily	ds
URVEY REA	<u>CHD: (50)</u>	<u>  TIME: 12:15</u>	_AM/PM)	Рно	TO ID	: (Camera-Pie	: #)		2415
SITE ID: (Con	dition-#) SC- <u>01</u>   LAT	<u>71°50'W.</u>	Long	<u> ~ ° </u>	<u>/ '</u>	<u>22.7</u> " L	МК	GPS (Unit ID	)
TYPE: Roa	d Crossing 🔲 Railroad Cross	ing 🔲 Manmade	Dam 🗌 Beav	er Dar	n 🗆	Geological For	nation 🗖	Other: Parkin	107
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIGNMI     Flow-a     √Not flo     Do not		NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, sk ameter: Height:	ketch) (ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosio Sediment deposition Other (describe):	n scour hole ankment	CULVERT SLOPE: $\Box$ Flat $\Box$ Slight (2° – 5°) $\Box$ Obvious (>5°)		Culvert length: <u>400</u> (ft) Width:(ft) Roadway elevation: <u>13</u> (ft)				
POTENTIAL F	<b>RESTORATION CANDIDATE</b>	Fish barrier re	moval 🗌 Culv	vert rep	oair/rer	lacement $\Box$ (	Jpstream st	torage retrofit	
no no		Local stream	repair Oth	er:	r			0	
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unk	nown		3" 8"	18"		
	EXTENT OF PHYSICAL BLC	OCKAGE:	ſ		BLO	CKAGE SEVEF	RITY: (circ	le #) 孝	
If yes for fish barrier	Total       Partial         Temporary       Unknown         fyes for       Drop too high         Water Drop:       (in)         Flow too shallow       Water Depth:         O       O		A structure such as a dam of road culvert on a 3rd order of greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		am or A total fish blockage o der or tributary that would isc significant reach of str or partial blockage tha interfere with the migra t. anadromous fish.		ge on a d isolate a of stream, e that may migration of	e on a isolate a stream, hat may gration of A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
Norra/Supr			5		4	3		2 1	
)						<b>R</b> EPOR'	FED TO AUT	THORITIES 🗌 YES	□ No

Trash and Debris

WATERSHED/SUB	shed: Clark		DATE: 7 / 2	-108	ASSESSED BY: Friends		
JURVEY REACH I	D: CBOR	TIME: 12:35 AM/PM	Рното ID: (Ca	mera-Pic #)	1# 24 (2417)		
SITE ID: (Condition	-#) TR- <u>01</u> LAT <u>4</u>	1 . 50 107.5" LON	G <u>72°27 '</u> 22."	'' LMK	<b>GPS</b> : (Unit ID)		
TYPE: ✓ Industrial ☐ Commercial ✓ Residential	MATERIAL:         □ Plastic       □ Pa         ☑ Tires       □ Co         □ Appliances       □ Ya         ☑ Automotive       □ Ot	per ☐ Metal onstruction ☐ Medical ard Waste appliana ther: 55 gal drum	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads):		
POTENTIAL REST	POTENTIAL RESTORATION CANDIDATE       Stream cleanup       Stream adoption segment       Removal/prevention of dumping         no       Other:						
If yes for trash or debris removal	EQUIPMENT NEEDED : Who can do it:	Heavy equipment 1	rash bags ⊡ Unkno Gov □ Hazmat Te	own	DUMPSTER WITHIN 100 FT:		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) loc inside a park with easy access	A large amount of trash, with easy access. Trash a long period of time but few days, possibly with a s	or bulk items, in a small a may have been dumped o it could be cleaned up i small backhoe.	rea Ver area, where ac or indications o	t of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials		
NOTES:	(5)	4	3	2	1		
) <u> </u>	www			Reported	D TO AUTHORITIES 🗌 YES 🗌 NO		

TR



SURVEY REACH	D: (303 w	rrshd/Subshd: 🔍	arks Brook	DATE: 7/2	<u>107</u> Asse	SSED BY: FILMOLS
START TIM	е: <u>12</u> : <u>45_</u> АМ/РА	1) LMK:	END TIME:_	:AM/PM	LMK:	GPS ID:
Lat <u>4 ° 50 '</u>	<u>0.7</u> " Long <u>7</u>	2027 123.9 "	LAT''	" Long		
DESCRIPTION:			DESCRIPTION:			
					• • • • • • • • • • • • • • • • • • •	
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	□ Heavy rain	□ Steady rain	
						Partly cloudy
SURROUNDING LAN	DUSE: M Industria	$\square$ $\square$ Commercial rse $\square$ Park	□ Urban/Residential	□ Suburban/Res	I Other:	□ Institutional
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	TE IMPACT TR	ACKING
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ck locations and I	IDs for all site impacts
CHANNEL WIDTH	□25-50 %	₽ 75-100%	within the survey re features	each (OT, ER, IB,SC, deemed anpropriate.	UT, TR, MI) as w Indicate directio	ell as any additional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) □ C 12 B (") □ Be	obble (2.5 –10") oulder (>10") ed rock		ucontes appropriate.	marcule un cene	<i>n 0j jiuw</i>
WATER CLARITY	Clear DTurbie aturally colored) D dyes)	d (suspended matter) Opaque (milky)	-			
AQUATIC PLANTS	Attached: Inon	e $\Box$ some $\Box$ lots				
IN STREAM	Floating: I none	e 🗆 some 🗆 lots				
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish □ Beav □ Snails □ Othe	er □Deer n: striders				
STREAM SHADING (water surface)	<ul> <li>✓ Mostly shaded</li> <li>□ Halfway (≥50%</li> <li>□ Partially shaded</li> <li>□ Unshaded (&lt; 25</li> </ul>	(≥75% coverage) 5) 1 (≥25% ) 5%)				Bolinersc 03
CHANNEL	Downcutting	Bed scour				
DYNAMICS	Widening	Bank failure				J.
_	Aggrading	Slope failure				
Unknown	Sed. deposition	h Channelized			1-1-	3-3002
	Height: IT bank	(ft)				103
	RT bank	(ft)	for the second		A.01 - 1	
(FACING	Width: Bottom	(ft)		en de J	V	
DOWNSTREAM)	Ton	$\frac{15}{15}$ (ft)		1. 1.		$\langle \cdot \rangle$
p	TOP			1 - 1 - <del>1</del>	and the second s	N N
Good: Open area in	Fair: Forested or	Difficult. Must cross	U C	/ /+- 0`	10	
public ownership,	developed area	wetland, steep slope, or				
sufficient room to	Access requires tree	stream. Few areas to	t the			
easy stream channel	removal or impact to	stockpile available	0° / /			
access for heavy	Stockpile areas	distance from stream.				
existing roads or trails.	small or distant from	Specialized heavy				
5 4	3 (2		19 10 10 10 10 10 10 10 10 10 10 10 10 10			
NOTES: (biggest prob	olem you see in survey	reach)	(M) A			
)						
	·····			REPOR	FED TO AUTHOR	RITIES YES NO

		OVERALL STREAM CONDI	ITION		
	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
~	Right Bank 10 9	8 7 6	<u>5</u> 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
Jub Total In-st	ream: $\frac{5}{80} + B$	uffer/Floodplain: <u>5</u> 3_/ <b>80</b>	= Total Survey	Reach 104 /160	

				Storm	Water Outfalls	ΟΤ	
WATERSHED/SU	BSHED: Cla	rhs Broch	DATE:	712108	ASSESSED BY:	Frinds	
SURVEY REACH	ID: CB03	TIME:/2 :55 AM	/́РМ Рното І		) /#	27/2421	
SITE ID (Conditio	n-#): OT- 0	LAT41 0 50 111	3 "LONG72 °	27 123.4 11		GPS: (Unit ID)	
BANK: LT RT 1 FLOW: None T	Head TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: Metal Circul Brick Ellipti Other:	Single ar Double cal Triple	DIMENSIONS: Diameter: <u>(in</u> )	SUBMERGED:	
Substantial Other:	Open channe	Concrete 😡	Earthen Trapez	coid Dept lic Widt '(I	h: <u>3 - 12 (in)</u> h (Top): <u>24 (in)</u> Bottom): <u>(o (in)</u>	NOT APPRICABLE	
CONDITION:	ODOR:	NO <b>DEPOSITS/STA</b>	INS: VEGGIE	DENSITY: F	PIPE BENTHIC GRO	<b>)WTH:</b> None ge Green	
Corrosion	Peeling Paint		Inhibit Excess Other:	ed P ive [ [	POOL QUALITY:       No pool         □ Good       □Odors       □ Colors       □         □ Suds       □ Algae       □ Floatables         □ Other:       □		
FOR C FLOWING 7 ONLY 1 OTHER C CONCERNS: [	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
POTENTIAL RES	TORATION CAND	IDATE Discharge in Storm water 1	nvestigation 🗌 Stream retrofit 🛛 Other:	a daylighting	Local stream repair/	outfall stabilization	
Length of vegetati	nting: ve cover from outfa	all:ft Ty	pe of existing vegetati	on:	Slope:	0	
If yes for stormw Is stormwater curr Yes No	ently controlled?	Lar Are	nd Use description: ea available:				
OUTFALL SEVERITY: (circle #)	Heavy discharge wi strong smell. The a compared to the arr stream; discharge a significant impact de	ith a distinct color and/or a mount of discharge is significan nount of normal flow in receiving appears to be having a ownstream.	t discharge has a color discharge is very smal flow and any impact a	mostly clear and odorle and/or odor, the amoun compared to the strea opears to be minor / loc	ess. If the t of m's base alized. Outfall does discharge; s of causing a	not have dry weather taining; or appearance iny erosion problems.	
Que en com / * * -	 ,	5	4	3	2	1	
SKEICH/INUTES							

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	Storm Water Outfalls OT							
WATERSHED/SUBS	HED: Clark	s Brook		DATE: 71 2 108 ASSESSED BY: Fridnols				
SURVEY REACH ID	: CB03	TIME: 1 :06_AM/	PM	Рното ID: (Camera-F	Pic #)	/#	8	
SITE ID (Condition-#	от- <u>02</u>	LAT 41 ° 50 12	2.0_" Loi	NG 72027 17.2	" LMK		GPS: (Unit ID)	
BANK:           LT         RT         Heat           FLOW:         None         Trick	BANK: TYPE: LT RT Head FLOW: Closed pipe Moderate		Metal Brick	SHAPE:     ☑ Single     DIMENSION       □ Circular     □ Double       □ Elliptical     □ Triple     Diameter:       □ Other:		SIONS: :: (in)	SUBMERGED: No Partially Fully	
Moderate Substantial	Dpen channel	Concrete D Other:	Earthen	Trapezoid     Depth:       Parabolic     Width (T       Other:     " (Botte		(in) (in) (in)	NOT APOSICABLE	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ☐Gas ☐ Sewage ☐Rancid/S ☐ Sulfide ☐ Other:	No <b>DEPOSITS/STAI</b>	INS:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BEN Brown Other: POOL QU Good Suds Other:	JALITY: [] Odors [] Algae []	WTH: Mone e Green No pool Colors Oils Floatables	
For       Color:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:								
POTENTIAL RESTO	RATION CANDII	DATE Discharge in Storm water r	vestigation etrofit	Stream daylighting	Local stre	eam repair/c	utfall stabilization	
If yes for daylightin Length of vegetative of If yes for stormwate Is stormwater current	g: cover from outfall cr: y controlled? Not investigated	l:ft Typ Lan Area	be of existin d Use desc a available	ng vegetation: ription:		Slope: _	٥	
OUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Small and a value of the amount of a strong smell. The amount of a strong smell. The amount of normal flow in receiving discontent of the amount of normal flow in receiving a significant impact downstream.       Small and a value of the amount of a strong smell. The amount of normal flow in receiving a significant impact downstream.       Small and a value of the amount of th		Small dis discharge discharge flow and a	nall discharge; flow mostly clear and odorless. If the scharge has a color and/or odor, the amount of scharge is very small compared to the stream's base w and any impact appears to be minor / localized.			not have dry weather aining; or appearance ny erosion problems.		
SKETCH/NOTES:		<u></u>		<u> </u>		<u>L</u>	1	
1					Reported to	) AUTHORIT	ies: 🗌 yes 🗌 no	

				\$	Severe B	ank Erosio	n	ER
WATERSHED/SUBS	HED: Clarks 1	Brook		DATE: 7/2	108	ASSESSED	BY:	Friends
SURVEY REACH:	CB03	TIME:	3 AM/PM	Рното ID (CA	MERA-PIC 7	#): /:	# ~	19 2424
SITE ID: (Condition-	#) START LAT	1 050 13.1	" LONG 72 ° 2	7124"	LMK	GP	<b>PS:</b> (U	nit ID)
<u>ER- 2 </u>	END LAT	<u> </u>	" Long°	1 11	LMK			, 
PROCESS:	Currently unknown	BANK OF CO LOCATION: DIMENSION	DNCERN: Meander bend S:	RT Both	looking dov	<i>vnstream)</i> slope/valley w	all 🗌	] Other:
Headcutting	Bank scour	Length (if no	<i>GPS)</i> <u>LTft</u>	and/or RT	ft	Bottom wi	dth _	ft
Aggrading	Slope failure	Bank Ht	LT <u> </u>	and/or RT	ft	Top width		ft
Sed. deposition	Channelized	Bank Angle	CT	° and/or RT	°	Wetted Wi	idth _	ft
LAND OWNERSHIP	: Private Public	C Unknown	LAND COVER	Forest	Field/Ag	Developed	:vua	r ind pk.
POTENTIAL RESTO	DRATION CANDIDATE	C: Grado	e control [	Bank stabilizatio	'n		<u></u>	
THREAT TO PROPI	ERTY/INFRASTRUCTU	URE: 🗌 No	🗌 Yes (Describ	pe): 2				
EXISTING RIPARIA	N WIDTH:	⊠ <u>≤</u> 25 ft	□ 25 - 50 ft [	] 50-75ft [] 7:	5-100ft	□ >100ft		
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall band of the stream eroding at a fa contributing significant amou stream; obvious threat to pre infrastructure.	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thre infrastructure	ent, active stream ely eroding at a eat to property or	Grade and failure/ero scour, imp	d width stable; isol sion; likely caused paired riparian veg	ated an 1 by a p etation	eas of bank ipe outfall, local or adjacent use.
ACCESS:	5 Good access: Open area in ownership, sufficient room to materials, easy stream char heavy equipment using exis trails.	n public o stockpile nnel access for ting roads or	4 3 Fair access: Forester adjacent to stream. Ar removal or impact to I Stockpile areas small	d or developed area ccess requires tree andscaped areas. or distant from stream.	2 Difficult a other sens stockpile a distance fr equipment	(1) ccess. Must cross sitive areas to acce areas available an rom stream section t required.	s wetlar ess stre d/or loc n. Spec	nd, steep slope or am. Minimal ated a great sialized heavy
NOTES/CROSS SEG			4 3		2	<u>l</u>		
)"					Reporte	D TO AUTHOR	ITIES [	Yes 🗌 No

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WATERSHED	/SUBSHED: Clarks (3	snok		DAT	'E:	12/08	ASSE	SSED BY: Frill	1015
URVEY REA	<u>сн ID: 7803</u>	<b>TIME:</b> :55	_AM/PM	Рно	TO ID	: (Camera-Pic	: #)	<u>/# 31(2</u>	426)
SITE ID: (Con	dition-#) SC LAT	no osignal	''LONG	°	<u> </u>	" LI	MK	GPS (Unit IL	))
TYPE: 🗌 Roa	d Crossing 🔲 Railroad Cross	ing 🔲 Manmade I	Dam 🗌 Beav	er Dan	n 🔲	Geological Form	nation 🗌	Other:	cidge_
FOR ROAD/ RAILROAD	SHAPE:         Arch       Bottomless         Box       Elliptical         Circular       Other:	# BARRELS: Single Double Triple Other:	MATERIAL:	od	ALIGN Flo Not	MENT: w-aligned flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, s ameter: Height:	<i>ketch)</i> (ft) (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosic Sediment deposition Other (describe):	on 🗌 Downstrean 🗌 Failing emb	n scour hole ankment		CULV Flav Slig Obv	ERT SLOPE: t ght $(2^\circ - 5^\circ)$ vious (>5°)	Roadway	width:	(ft) (ft)
BOTENTIAL I					• /	1 T T	т.,	. ~.	· · · · · · · · · · · · · · · · · · ·
	CESTORATION CANDIDATE	Local stream 1	repair Othe	ert rep er:	CLW	ove de	bris	torage retrofit	
IS SC ACTING	G AS GRADE CONTROL	No Ye	es 🗌 Unk	nown					
	EXTENT OF PHYSICAL BL	OCKAGE:	F		BLO	CKAGE SEVER	ITY: (circ	le #)	
If yes for fish barrier	CAUSE: Drop too high Water E Flow too shallow Water E Others	own Drop: (in) Depth: (in)	A structure such road culvert on a greater stream bl upstream movern anadromous fish, passage device p	as a dar 3rd orde ocking to nent of no fish present.	m or er or he	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the anadromous fish.	ge on a d isolate a of stream, e that may migration of	A temporary barrier s beaver dam or a bloc the very head of a str very little viable fish h above it; natural barri as waterfalls.	uch as a kage at eam with abitat ers such
<u>)</u>	U Other:		5		4	3		2) 1	
NOTES/SKET	CH:								
ť			······			REPOR	FED TO AU	THORITIES 🗌 YES	□ No

[	Made 6	solal.						L	
WATERSHED	SUBSHED: CRATES I.	mmm 1 50	(1) ((5) )	DAT	E: _/_	<u>/ 2 /08</u>		SSED BY:	Frilnes
URVEY REA			_AM/PM/	PHO	TOID	: (Camera-Pic	:#) 	/#	32 [272]
SITE ID: (Con	dition-#) SC-	<u>41° 30'1/</u>	LONG $$	<u>~~</u> ~	<u> </u>	<u>17:4</u> " Li	ик	GPS	(Unit ID)
TYPE: NRO	ad Crossing	ng 🗌 Manmade	Dam 🗌 Beau	er Dan	n 🗖 (	Geological For	nation 🗖	Other	
FOR ROAD/	SHAPE: Arch Bottomless Box Elliptical Circular	# BARRELS:	MATERIAL: Concrete Metal Other:		ALIGN	MENT: w-aligned flow-aligned not know	DIMENS Barrel dia	IONS: ( <i>if v</i> ameter: Height:	ariable, sketch) 4,5 (ft) (ft)
RAILROAD CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Downstrean	n scour hole ankment		CULVI Flat  Slig  Obv	E <b>RT SLOPE:</b> ht (2° – 5 <sup>0</sup> ) /ious (>5°)	Culvert le	ength: Width: elevation:	(ft) (ft) (ft
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culv repair 🔲 Oth	vert rep er:	air/rep	lacement 🔲 U	Jpstream st	torage retro	əfit
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unk	nown	61	ą			
	EXTENT OF PHYSICAL BLO	CKAGE:			BLOG	CKAGE SEVER	RITY: (circ	le #)	
If yes for fish barrier	Total Partial Temporary Unknow CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	wn rop: (in) epth: (in)	A structure such road culvert on a greater stream bi upstream moven anadromous fish passage device p	as a dan 3rd orde ocking th ent of ; no fish present.	n or er or he	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the anadromous fish.	ge on a d isolate a of stream, e that may migration of	A temporar beaver dan the very he very little vi above it; na as waterfal	y barrier such as a 1 or a blockage at ad of a stream with able fish habitat utural barriers such s.
NOTES/SKET	CH:		J			<u>&gt;</u>		2	I
r						REPOR	FED TO AU	THORITIES	Yes No

Stream Crossing

***	$\langle \rangle \rangle \rangle \rangle \langle \rangle \rangle \langle \rangle \rangle \langle \rangle \rangle \langle \rangle \langle \rangle \rangle \langle \rangle \langle \rangle \rangle \langle \rangle $				1.0.00		
WATERSHED	<u>/SUBSHED: CLUCKS D</u>	mar 2 Na	D	ATE:(	12/00	ASSE	SSED BY: Frilmos
URVEY REA	CHID: CD D D	<u> 11ME: ≪ :00</u>	_AM/PM <b>P</b>	HOTOIL	D: (Camera-Pie	c #)	1#33(2408)
SITE ID: (Con	dition-#) SC- <u>0</u> >   LAT <sup>*</sup>	<u>11° 50 '30</u>	<u></u>	<u></u> '	<u>04.1</u> " L	MK	GPS (Unit ID)
TYPE: TYPE: TYPE:	d Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🔲 Beaver I	Dam 🔲	Geological For	nation 🔲	Other:
For Road/ Railroad	SHAPE:         Arch       Bottomless         Box       Elliptical         Circular       Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIG	NMENT: ow-aligned of flow-aligned o not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter:(ft) Height:(ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🔲 Downstrear	n scour hole vankment	CULV Fla Sli	<b>TREET SLOPE:</b> at ght $(2^{\circ} - 5^{\circ})$ vvious (>5°)	Roadway	elevation: $25$ (ft) elevation: $25$ (ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culvert repair 🔲 Other:	repair/re	placement 🔲 I	Jpstream s	torage retrofit
IS SC ACTING	G AS GRADE CONTROL	MN₀ □Y	es 🗌 Unknov	vn			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVEI	RITY: (circ	le #)
If yes for fish barrier	CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	wn rop: (in) epth: (in)	A structure such as a road culvert on a 3rd greater stream blocki upstream movement anadromous fish; no passage device prese	dam or order or ng the of fish ent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	ige on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
	·						
1					Repor	TED TO AU	<b>THORITIES</b> YES NO

Trash and Debris

TR

WATERSHED/SUB	shed: Clarks (	Brook	DATE: _7/ 2	108	ASSESSED BY: Friends
JURVEY REACH I	D: (B03	TIME: <u>23</u> AM/PM	PHOTO ID: (Ca	mera-Pic #)	1# 30 (2425)
SITE ID: (Condition	#) TR-01_LAT4	<u>0 50 13.1</u> "LONG	372027 123	'' LMK	GPS: (Unit ID)
TYPE: Industrial Commercial Residential	MATERIAL:     Plastic     Tires     Co     Appliances     Automotive	per Metal Instruction Medical Medical her:	SOURCE: Unknown Flooding fllegal dump Local outfall	LOCATION: Stream Riparian Ar Lt bank Rt bank	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads):
POTENTIAL REST	ORATION CANDIDATE	Stream cleanup 🔲 Strea	um adoption segment	Removal/pr	evention of dumping
If yes for trash or	EQUIPMENT NEEDED :	Heavy equipment T	rash bags 🖵 Unkno	wn	DUMPSTER WITHIN 100 FT:
debris removal	WHO CAN DO IT:	Volunteers 🗌 Local G	Jov 🗌 Hazmat Te	am 🗌 Other	Yes 🗋 No 🗍 Unknown
CLEAN-UP POTENTIAL: ( <i>Circle</i> #)	A small amount of trash (i.e., than two pickup truck loads) loc inside a park with easy access	A large amount of trash, o with easy access. Trash n a long period of time but few days, possibly with a si	r bulk items, in a small ar hay have been dumped ov it could be cleaned up ir mall backhoe.	A large amour area, where ac or indications o	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials
Notes	5	4	3	2	1
NULES.					
)	******			Reported	D TO AUTHORITIES YES NO

R Reach Level Assessment SURVEY REACH ID: CB04 ASSESSED BY: Brook DATE: 7/10/08 WTRSHD/SUBSHD: Clarks Trance END TIME: /2 : O2 AM/PM TIME: 10 : 34 AM/PM START LMK: GPS ID: LMK: LAT 41050 132.1" LONG72027 10/2" LAT 4 050 153.9" LONG 72 026 158.6" DESCRIPTION: MUHLET TO Sodye DESCRIPTION: road avassing, knotweed m-f rose TUSSOck winterberry sensifice, Skunk i euce RAIN IN LAST 24 HOURS Heavy rain □ Steady rain PRESENT CONDITIONS □ Heavy rain □ Steady rain □ Intermittent □ None ☑ Intermittent □ Trace Clear □ Trace □ Overcast □ Partly cloudy SURROUNDING LAND USE: Urban/Residential Suburban/Res □ Commercial □ Forested □ Institutional  $\Box$  Golf course □ Park □ Crop □ Pasture Dother: 1-84 **AVERAGE CONDITIONS** (check applicable) **REACH SKETCH AND SITE IMPACT TRACKING** Simple planar sketch of survey reach. Track locations and IDs for all site impacts  $\Box 0-25\%$ □ 50%-75% **BASE FLOW AS %** within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional □25-50 % ☑ 75-100% CHANNEL WIDTH features deemed appropriate. Indicate direction of flow DOMINANT SUBSTRATE ☑ Cobble (2.5 –10") □ Silt/clay (fine or slick)  $\Box$  Boulder (>10") □ Sand (gritty) □ Gravel (0.1-2.5") □ Bed rock WATER CLARITY I Clear I Turbid (suspended matter) □ Stained (clear, naturally colored) □ Opaque (milky)  $\Box$  Other (chemicals, dyes) Rockledge Attached:  $\square$  none  $\square$  some  $\square$  lots AQUATIC PLANTS IN IN STREAM Floating:  $\square$  none  $\square$  some  $\square$  lots SCO2 07-01 (Evidence of) WILDLIFE IN OR Fish 🗆 Beaver 🗆 Deer AROUND STREAM Snails Other: Songbirds, Prog  $\square$  Mostly shaded ( $\geq$ 75% coverage) STREAM SHADING  $\Box$  Halfway (>50%) POIL-(water surface)  $\Box$  Partially shaded (>25%)  $\Box$  Unshaded (< 25%) Downcutting Bed scour CHANNEL Widening Bank failure DYNAMICS Headcutting Bank scour Aggrading Slope failure Unknown Sed. deposition Channelized Height: LT bank (ft) CHANNEL RT bank DIMENSIONS (ft) (FACING 4 Width: Bottom (ft) DOWNSTREAM) Top (ft) REACH ACCESSIBILITY Fair: Forested or Difficult. Must cross Good: Open area in developed area wetland, steep slope, or public ownership, adjacent to stream. sensitive areas to get to sufficient room to Access requires tree stream. Few areas to stockpile materials, stockpile available removal or impact to easy stream channel landscaped areas. and/or located a great access for heavy Stockpile areas distance from stream. equipment using small or distant from Specialized heavy existing roads or trails. equipment required. stream. 5 4 1 NOTES: (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES** YES NO

		OVERALL STREAM COND	ITION	
	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9).	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
<b>1</b> 77	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
······	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Jub Total In-str	ream: <u>72</u> / <b>80</b> + Bu	uffer/Floodplain: <u>56</u> /80	= Total Survey	Reach 128/160

C	
D	U

WATEDOUED	KURGUER, Madic B	vool (		D 1 7	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	110 105	1.00	Tre's	<u> </u>
UDVEN DEA	CUBSHED: CLAINS M	TIME			<u>E: /</u>	<u>170 108</u>		SSED BY: Frich	<u>()</u>
SEEF ID. (C		11ME. <u>11.20</u>		7 or		Ch 211 II	; #) /////		
SHE ID. (Con	amon-#) SC LAI	1 30 11	LONG /	<u> </u>	<u>× v</u>	<u> 20.7"</u> Li	VIK	GPS (Unit ID)	
TYPE: 🗹 Roa	d Crossing 🔲 Railroad Crossin	ng 🔲 Manmade I	Dam 🗌 Beav	er Da	m 🗌	Geological Forr	nation	Other: Forost R	load
	SHAPE:	<b>#BARRELS</b> :	MATERIAL:		ALIG	NMENT:	DIMENS	IONS: (if variable, ske	etch)
	Arch Bottomless	Single	Concrete		Flo	w-aligned	Barrel dia	ameter: <u>4</u>	_(ft)
FOR ROAD/	$\square$ Emptical $\square$ Circular	Triple	[_] Metal			t flow-aligned		Height:	_(ft)
RAILROAD	Other:	Other:						. 50	
CROSSINGS ONLY	<b>CONDITION:</b> (Evidence of)					ERT SLOPE:	Culvert le	$\frac{1}{2}$	_(ft)
	✓Cracking/chipping/corrosior	Downstrean	n scour hole			$(2^{\circ} - 5^{\circ})$		widui.	_(II)
	Other ( <i>describe</i> ):		ankment		ОЪ	vious (>5°)	Roadway	elevation: $0-3.5$	(ft)
						1			
POTENTIAL F	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv	ert re	pair/rej	olacement 🔲 U	Jpstream st	torage retrofit	
<u> </u>			repair 🗌 Othe	er:			· · · · · · · · · · · · · · · · · · ·		
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unk	nown	-	. <b>.</b>			
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVEF	<b>UTY:</b> (circ	le #)	
	Temporary Unknow	vn	A structure such	as a da	m or	A total fish blocka	ge on a	A temporary barrier suc	hasa
If yes for	CAUSE		greater stream bl	ocking	the	significant reach o	of stream,	the very head of a strea	im with
Jish Darrier	Drop too high Water Dr	op: <u>3,5</u> (in)	anadromous fish;	ient of ; no fish	ı	or partial blockage interfere with the	e that may migration of	very little viable fish hat above it; natural barrier	bitat s such
	Flow too shallow Water De	epth: (in)	passage device p	present.		anadromous fish.	-	as waterfalls.	
	U Other:		5		4	3		2 1	
NOTES/SKET	CH:								
<b>I</b>									
ر	· · · · · · · · · · · · · · · · · · ·					REPOR	<u>red to</u> au	THORITIES 🗌 YES [	]No

Stream Crossing SC

N/ CORDONIED	anna Alala Bal		7		-	
WATERSHED	CHED: CLARKS IN BOUL		DATE: /	$\frac{110108}{100}$		SED BY: Friends
URVEY REA	CHID: (604   11ME: <u>72</u> :02		PHOTO ID	Camera-Pu	c #)	/#
SITE ID: (Con	dition-#) SC- $\underline{D}$   LAT $\underline{4}$   $\underline{50}$   $\underline{55}$	$\sim 7$ " LONG <u>7</u>	<u>~~%</u>	<u>5016</u> " L	MK	GPS (Unit ID)
TYPE: Ros	ad Crossing Railroad Crossing Manmade	Dam 🗌 Beaver	Dam []	Geological For	nation $\Box$ (	Other:
	SHAPE: #BARRELS:	MATERIAL ·		NMENT.	DIMENSI	One: (if waviable sketch)
	$\square$ Arch $\square$ Bottomless $\bigvee$ Single	Concrete		w-aligned	Barrel diar	meter: $3$ (ff)
<b>T</b>	Box Elliptical Double	Metal		t flow-aligned	Lanter and	Height: (ft)
FOR ROAD	Other:	Other:	[⊿´Do	not know	-	(10)
CROSSINGS		1	CULV	EDT SLODE.	Culvert ler	ngth:(ft)
ONLY	Condition. (Evidence of)	m scour hole	⊡ Fla	t	٧	Width:(ft)
	Sediment deposition	oankment	🗌 🗌 Sli	ght $(2^{\circ} - 5^{\circ})$		
	Other ( <i>describe</i> ):		ОЪ	vious (>5°)	Roadway e	elevation:(ft)
POTENTIAL I	<b>RESTORATION CANDIDATE</b> Fish barrier r	emoval 📋 Culver	rt repair/rep	olacement 🔲 🛛	Jpstream sto	orage retrofit
		repair U Other:				
IS SC ACTING	G AS GRADE CONTROL MO Y	es 🗌 Unkno	own			
	EXTENT OF PHYSICAL BLOCKAGE:	<b></b>	BLO	CKAGE SEVEI	RITY: (circle	e #)
	Temporary $\sqrt{2}$ Temporary	A structure such as	a dam or	A total fish blocka	ige on a	A temporary barrier such as a
If yes for		greater stream block	d order or king the	tributary that wou significant reach	ld isolate a	beaver dam or a blockage at the verv head of a stream with
fish barrier	CAUSE:	upstream movemen	nt of	or partial blockag	e that may	very little viable fish habitat
	Flow too shallow Water Depth: (in)	passage device pres	sent.	anadromous fish.	Inigration of	as waterfalls.
· · · · · · · · · · · · · · · · · · ·	Other:	5		1 3		2 1
NOTES/SKET	сн:					
<u> </u>				Repor	TED TO AUT	HORITIES 🗌 YES 🗌 NO

Storm	Water	Outfalls

$\mathbf{\nabla}$

			Sto	rm Water Outfalls	<sup>5</sup> OT	
WATERSHED/SUBSHI	ED: Clarkes	Brook	DATE: 7 110 10	S ASSESSED BY:	Friends	
SURVEY REACH ID:	CB 04 TH	ме: <u>// 50 а</u> м/рм	<b>Рното ID:</b> (Camera-Pi	ic #) /#		
SITE ID (Condition-#):	0T- <u>0  </u> La	141050 153.51	LONG 720 26 1 58.6	" LMK	GPS: (Unit ID)	
BANK:	Туре:	MATERIAL:	SHAPE: Single	DIMENSIONS:	SUBMERGED:	
FLOW:	Closed pipe	PVC/Plastic Bri	ck	Diameter: <u> 2 (ir</u>	D Partially	
Moderate Substantial Other:	Dpen channel	Concrete Earth	en Trapezoid D Parabolic W Other:	Depth: <u>(in)</u> Vidth (Top): <u>(in)</u> " (Bottom): <u>(in)</u>	NOT APPESCABLE	
CONDITION:	ODOR: NO	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GR	<b>COWTH:</b> None nge Green	
Corrosion Other:	Cancid/Sour	$\square Paint \\ \square Other: RUS+$	Inhibited Excessive Other: Surrounded by devel Whotward	POOL QUALITY: Good Odors Suds Algae Other:	No pool Colors Oils Floatables	
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
POTENTIAL RESTOR	ATION CANDIDATE	Discharge investig	ation 🗌 Stream daylighting	Local stream repair	outfall stabilization	
<i>If yes for daylighting:</i> Length of vegetative co	ver from outfall:	ft Type of e	existing vegetation: <u>Knot</u> i	NeldSlope:	45	
If yes for stormwater: Is stormwater currently ☐ Yes ☐ No ☑ No	controlled? t investigated	Land Use Area avai	description: <u>Forested</u> lable:	to residential	-	
OUTFALL H SEVERITY: cc (circle #) st	eavy discharge with a dist rong smell. The amount o impared to the amount of ream; discharge appears gnificant impact downstrea	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	hall discharge; flow mostly clear and o charge has a color and/or odor, the an charge is very small compared to the s w and any impact appears to be minor	dorless. If the nount of stream's base / localized.	es not have dry weather staining; or appearance any erosion problems.	
SKETCH/NOTES	5	4	3)	2	1	
SKETCH/INULES.						
)			F	REPORTED TO AUTHOR	ITIES: YES NO	

Reach Level Assessment



SURVEY REACH ]	D: CB05 WTRSHD/SU	bshd: C/Q	rus Brook	DATE: 7/10	108 Asses	ssed by: Friends
START TIM	E::AM/PM LM	(K:	END TIME:	:AM/PM	LMK:	GPS ID:
LAT''	" Long°	1 11	LAT'	" Long	0 1	11
DESCRIPTION: U	nderground		DESCRIPTION:	Lawn 2.		
RAIN IN LAST 24 HO	URS 🗆 Heavy rain 🛛 Stea	ndy rain	PRESENT CONDITION	s □ Heavy rain	□ Steady rain	□ Intermittent
		ce			Overcast	□ Partly cloudy
SURROUNDING LAN	D USE: $\Box$ Industrial $\Box$ C $\Box$ Golf course $\Box$ Pa	Commercial ark	□ Urban/Residential □ Crop	□ Suburban/Res □ Pasture	□ Forested □ Other:	□ Institutional
AVERAGE	CONDITIONS (check applical	5le)	REACH	I SKETCH AND SIT	TE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □ 509 □25-50 % □ 7	%-75% /5-100%	Simple planar sketch within the survey r feature.	a of survey reach. Tra each (OT, ER, IB,SC, s deemed appropriate.	ck locations and L UT, TR, MI) as we Indicate direction	Ds for all site impacts ell as any additional n of flow
<b>DOMINANT SUBSTR</b> Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5)	ATE slick)	-10") 0")				
WATER CLARITY Stained (clear, n Other (chemicals,	□ Clear □Turbid (suspende aturally colored) □ Opaque dyes)	ed matter) (milky)				
AQUATIC PLANTS IN STREAM	Attached: $\Box$ none $\Box$ som Floating: $\Box$ none $\Box$ som	ne 🗌 lots e 🗌 lots				
Wildlife in or Around Stream	(Evidence of) □ Fish □ Beaver □ □ □ Snails □ Other:	Deer			چې چېرې د در د	and a start of a start of the star
STREAM SHADING (water surface)	□ Mostly shaded (≥75% co □ Halfway (≥50%) □ Partially shaded (≥25% ) □ Unshaded (<25%)	verage)			99 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199 - 199	
CHANNEL	Downcutting B	ed scour	Professional Constants	Sion Con		
DYNAMICS	Widening Ba	ank failure	The Ford Science, Spin-	1000		
	Headcutting Ba	ank scour				
Unknown	$\square$ Sed. deposition $\square$ C	hannelized		ohr	aunites	
CHANNEL	Height: LT bank	(ft)		~~- •	228	
DIMENSIONS (Facing	RI bank	(ff)	6	ر		
DOWNSTREAM)	width: Bottom	(ft)	N		Lom	grain
	10p	(11)	Well Warmond	7	STU	amour il
	Fair: Forested or Difficult	Aust cross	+	で、う目	-	Hes the gran
Good: Open area in public ownership.	developed area wetland, si	teep slope, or	NI	20	magn	y with
sufficient room to	adjacent to stream. sensitive a	reas to get to	~	de l'	+ Kindel.	ş. <b>G</b>
stockpile materials,	removal or impact to stockpile a	vailable		5 1		
access for heavy	landscaped areas. and/or loca	ated a great	t t	1 1 - 1		
equipment using	stockpile areas distance fr small or distant from Specialize	om stream. d heavy		e nack	Ildye	-
existing roads of trails.	stream. equipment	required.	¥ 1 •	- proposition - and pro-		
NOTES: (higgest prod	+ <u> </u>	1			an a	
	you see in suivey reach			VUB-VI		
Str.	cam is entire	ly und	rigravia			
Super	ior propane	Mons bas	10 n trying t	REPOR	TED TO AUTHOR	ITIES 🗌 YES 🗌 NO
divert	. Previous owner	s said -	to have paise	ed land at	least 4	

		OVERALL STREAM COND	ITION	
	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
Freener		8 / 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sub Total In-str	ream:/80 + Be	uffer/Floodplain:/80	= Total Survey	Reach /160

Reach Level Assessment RCH

**.**....

SURVEY REACH I	D: <u>GBST-</u> OI WI	rrshd/Subshd: Ga	es Sauch Taily	DATE: <u>615</u>	Asse	ESSED BY:
Start Tim	e: <u>11</u> : <u>/77</u> AM/PN	и LMK:	END TIME://	: <u>40</u> AM/PM	LMK:	GPS ID:
LAT <u>41 ° 51 '</u>	<u>15,9</u> " Long_	720 25 131.2"	LAT <u>41 ° 51 ' 1</u>	<u>6.6</u> " Long 72	<u>° 25 10</u>	1.3 "
DESCRIPTION:		~ 1	DESCRIPTION:			
L		· · · · · · · · · · · · · · · · · · ·				
RAIN IN LAST 24 HO	urs 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	□ Heavy rain	□ Steady rair	1 🗆 Intermittent
□ None	Q <sup>∕</sup> Intermittent	t 🗆 Trace	□ Clear	□ Trace	Overcast	Partly cloudy
SURROUNDING LAN	DUSE:	al 🗆 Commercial urse 🗆 Park	□ Urban/Residential □ □ Crop □	□ Suburban/Res □ Pasture	Forested Other:	□ Institutional
AVERAGE	CONDITIONS (che	eck applicable)	REACH S	KETCH AND SIT	TE IMPACT TH	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	⊠ 50%-75% □ 75-100%	Simple planar sketch oj within the survey read features d	f survey reach. Trac ch (OT, ER, IB,SC, leemed appropriate.	ck locations and . UT, TR, MI) as w Indicate directio	IDs for all site impacts ell as any additional on of flow
DOMINANT SUBSTR □ Silt/clay (fine or □ Sand (gritty) ☑ Gravel (0.1-2.5	ATE slick) I C B ") D B	obble (2.5 –10") oulder (>10") ed rock		А 6 В3Т-03		2-1 R
WATER CLARITY	Clear □Turbio aturally colored) □ dyes)	d (suspended matter) Opaque (milky)	State - 2	-endd ro		Eroszan *
AQUATIC PLANTS IN STREAM	Attached: 🗹 non Floating: ☑ none	ne □ some □ lots e □ some □ lots		A o ses	For \	Applen treet
WILDLIFE IN OR AROUND STREAM	(Eyidence of) ☑ Fish □ Beav □ Snails □ Othe	ver Deer r:	Old stone T	52° P		original albeg
STREAM SHADING (water surface)	<ul> <li>☑ Mostly shaded</li> <li>□ Halfway (≥50%</li> <li>□ Partially shaded</li> <li>□ Unshaded (&lt; 25</li> </ul>	(≥75% coverage) %) d (≥25% ) 5%)			and Service Service	k
CHANNEL	Downcutting	Bed scour	$  / \langle \rangle \rangle$			1 tools
DYNAMICS	Widening	Bank failure				L'Erosiant
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Slope failure Channelized		A		1
CHANNEL	Height: LT bank	<u> </u>		V.		
DIMENSIONS	RT bank	(ft)	- 1/5	1		
(FACING	Width: Bottom	(ft)	A F			
DOWNSTREAM)	Тор	12 (ft)				
R	EACH ACCESSIBILI	TY		1 1		
Good: Open area in	Fair: Forested or	Difficult. Must cross	/	· /		
public ownership,	developed area adiacent to stream.	wetland, steep slope, or sensitive areas to get to		1		
sufficient room to stockoile materials.	Access requires tree	stream. Few areas to	. / 10	at DI		
easy stream channel	removal or impact to	stockpile available	GB-01 60			
access for heavy	Stockpile areas	distance from stream.		1.		
existing roads or trails.	small or distant from	Specialized heavy				
5 4	3 (2	2 1		>		
NOTES: (biggest prob	lem you see in survey	reach)				
)						
				REPOR	TED TO AUTHOR	RITIES 🗌 YES 🗌 NO

IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime) VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream) EROSION Correction	Optimal         reater than 70% of substrate         vorable for epifaunal colonization and sh cover; mix of snags, submerged         gs, undercut banks, cobble or other         able habitat and at stage to allow full         plonization potential (i.e., logs/snags         at are not new fall and not transient).         20       19         18       17         ore than 90% of the streambank         urfaces and immediate riparian zone         overed by native vegetation, including         gees, understory shrubs, or nonwoody         acrophytes; vegetative disruption         rough grazing or mowing minimal or         ot evident; almost all plants allowed to         own naturally.         eft Bank       10         9         ight Bank       9	Suboptimal         40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).         15       14       13       12       11         70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.         8       7       6	Marginal         20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.         10 9 8 7 6         50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Poor         Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.         5       4       3       2       1       0         Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.       5       eta streambank verage
IN-STREAM     Gr       HABITAT     fav.       (May modify criteria based on appropriate habitat regime)     log conteria based state       VEGETATIVE     Mc       PROTECTION     sui conteria bank, determine sides by facing downstream)     Mc       BANK     Ba       EROSION     or	reater than 70% of substrate vorable for epifaunal colonization and sh cover; mix of snags, submerged gs, undercut banks, cobble or other able habitat and at stage to allow full olonization potential (i.e., logs/snags at are <u>not</u> new fall and <u>not</u> transient). 20 19 18 17 16 ore than 90% of the streambank urfaces and immediate riparian zone overed by native vegetation, including ges, understory shrubs, or nonwoody acrophytes; vegetative disruption rough grazing or mowing minimal or ot evident; almost all plants allowed to ow naturally.	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).         15       14       13       12       11         70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.         8       7       6	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. <u>10</u> <u>9</u> <u>8</u> <u>7</u> <u>6</u> 50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0 Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
VEGETATIVE Mc PROTECTION Sun con- (score each bank, determine sides by facing downstream) group Le Rit BANK Ba EROSION or	20 19 18 17 16 ore than 90% of the streambank urfaces and immediate riparian zone overed by native vegetation, including sees, understory shrubs, or nonwoody acrophytes; vegetative disruption rough grazing or mowing minimal or ot evident; almost all plants allowed to ow naturally. eft Bank 10 9 ight Bank 10 9	151413121170-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.876	10987650-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	5 4 3 2 1 0 Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
VEGETATIVE Mc PROTECTION Sui cov (score each bank, determine sides by facing downstream) gro Le Rig BANK Ba EROSION or	ore than 90% of the streambank urfaces and immediate riparian zone overed by native vegetation, including ees, understory shrubs, or nonwoody acrophytes; vegetative disruption rough grazing or mowing minimal or ot evident; almost all plants allowed to ow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.876	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Le Ri BANK Ba EROSION or	eft Bank 10 9 ight Bank 10 9	8 7 6	_	
Ri BANK Ba EROSION or	ight Bank 10 9		5 4 3	2 1 0
BANK Ba EROSION or		8 7 6	5 4 3	2 1 0
downstream)	anks stable; evidence of erosion bank failure absent or minimal; tle potential for future problems. 5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
Le	eft Bank 10 9/	8 7 6	5 4 3	2 1 0
Rip	ight Bank 10 (/ 9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION Hig to e ent	gh flows (greater than bankfull) able enter floodplain. Stream not deeply trenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19/18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	✓ Over.	ALL BUFFER AND FLOODPLAI	N CONDITION	
~	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH Width	idth of buffer zone >50 feet; human tivities (i.e., parking lots, roadbeds, ear-cuts, lawns, crops) have not pacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
Let	eft Bank (10) 9	8 7 6	5 4 3	2 1 0
Rig	ght Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN Pre VEGETATION is n	edominant floodplain vegetation type mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Eve HABITAT wat	en mix of wetland and non-wetland bitats, evidence of standing/ponded tter	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN No ENCROACH- mai MENT mai	e evidence of floodplain croachment in the form of fill aterial, land development, or anmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 ( 18 )17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Reach Level Assessment RCH

SURVEY REACH ]	D: GBSFOR WTRSHD/SUBSHD: Gase	, BKS Trib	Date: 6 15	ASSESSED BY	·:
START TIM	E: 1/ : 50 AM/PM LMK:	END TIME:	<u>: 45</u> AM/PM	LMK:	GPS ID:
LAT <u>41° 51 '</u>	166" LONG <u>20 ° 25 '043</u> "	LAT <u>4/ ° 51 '1</u>	<u>7.0 </u> " Long <u>7.</u>	<u>2°24 '393''</u>	
<b>DESCRIPTION:</b>		DESCRIPTION:			
D		-			····· I
RAIN IN LAST 24 HO	DURS $\Box$ Heavy rain $\Box$ Steady rain	PRESENT CONDITIONS	$\Box$ Heavy rain	□ Steady rain □ Inte	ermittent
SURROUNDING LAN	$\square \text{ IISE: } \square \text{ Industrial } \square \text{ Commercial}$	Urban/Residential	Suburban/Rec	Vercast Par	itutional
	$\Box \text{ Golf course } \Box \text{ Park}$	Crop	□ Pasture	Other: Highwoo	
AVERAGE	CONDITIONS (check applicable)	REACH S	KETCH AND SIT	E IMPACT TRACKIN	G
BASE FLOW AS %	□ 0-25%	Simple planar sketch oj	f survey reach. Trac	ck locations and IDs for a	ll site impacts
CHANNEL WIDTH	□25-50 % □ 75-100%	within the survey read features d	ch (OT, ER, IB,SC, leemed appropriate	UT, TR, MI) as well as any Indicate direction of flow	v additional
DOMINANT SUBSTR □ Silt/clay (fine or □ Sand (gritty) ☑ Gravel (0.1-2.5	ATE slick) ⊡ Cobble (2.510") ⊡ Boulder (>10") 5") □ Bed rock		0730	Sc-1 Cm.	e de
WATER CLARITY	Clear DTurbid (suspended matter) aturally colored) Dopaque (milky) dyes)	force	-f dot-	2	
AQUATIC PLANTS	Attached: $\square$ none $\square$ some $\square$ lots		1 1340	"Envell	
IN STREAM	Floating: I none I some I lots			9 5- 100 p	
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beaver □ Deer □ Snails □ Other: <u>snake</u>		Y / ide	d .	
STREAM SHADING (water surface)	<ul> <li>Mostly shaded (≥75% coverage)</li> <li>□ Halfway (≥50%)</li> <li>□ Partially shaded (≥25%)</li> <li>□ Unshaded (&lt; 25%)</li> </ul>		and the second s		
CHANNEL	Downcutting Bed scour		D HOSER		
DYNAMICS	Widening Bank failure		n		
Unknown	Headcutting       Bank scour         Aggrading       Slope failure         Sed. deposition       Channelized		Erosion /		
CHANNEL	Height: LT bank(ft)		annorth	i de f	
DIMENSIONS	RT bank(ft)		Y Y	$\checkmark$	
(FACING DOWNSTREAM)	Width: Bottom(ft)	and the	1	Aur and a second	
	Top <u>12.5 (ft)</u>	Jree	116	COST	
R	REACH ACCESSIBILITY		14	· · · · · · · · · · · · · · · · · · ·	
Good: Open area in	developed area Difficult. Must cross wetland, steep slope, or	Server and the second sec	F GANU	al wedger	
sufficient room to	adjacent to stream. sensitive areas to get to		- Alph	t tributory	
stockpile materials,	removal or impact to stockpile available		"We let I compare	0	
access for heavy	landscaped areas. and/or located a great		and the second		
equipment using	small or distant from Specialized heavy	c S le			
5	stream. equipment required.		\$ Č		
NOTES: (biggest prob	lem you see in survey reach)	L			
)					
			REPORT	TED TO AUTHORITIES	Yes 🗌 No

~	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
·····	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	OVER	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	6 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Ser.	Minor floodelain an an abused in the	Moderate floodplain	Significant floodplain
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	form of fill material, land development, or manmade structures, but not effecting floodplain function	encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function

			Sto	orm Water Outfalls
WATERSHED/SUBS	HED: States	South shill	DATE: 61510	Assessed by: DTR
SURVEY REACH ID	: (~BST.02 '	TIME: 12: <u>30</u> AM/PM	Рното ID: (Camera-H	Pic#)DBCanon 1# 1834
SITE ID (Condition-#)	• <b>OT-</b> <u>ØZ</u>	LAT 4 . 51 . 17.1	"Long 72 . 24 . 47.3	<b> GPS:</b> (Unit ID)
BANK: LT RT Hea FLOW: None Trick	d TYPE: d Kle	MATERIAL: Concrete ÁN PVC/Plastic E Other:	SHAPE: Single Ietal Circular Double Brick Elliptical Triple	e Diameter: <u>76 (in)</u> SUBMERGED: Diameter: <u>76 (in)</u> Partially Fully
Substantial	Open channel	Concrete Ear	then Trapezoid I Parabolic C Other:	Depth:         (in)           Width (Top):         (in)           " (Bottom):         (in)
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: X No Gas Sewage Rancid/Sou Sulfide Other:	D DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: None         Brown       Orange         Other:         POOL QUALITY:       No pool         Good       Odors         Suds       Algae         Floatables         Other:
ONLY     FLO,       OTHER     E       CONCERNS:     N       POTENTIAL RESTOR       no       If yes for davlightime	ATABLES: No	one Sewage (toilet p plastic bags) Du tenance Bar TE Discharge invest	aper, etc.)  Petroleum mping (bulk)  Excessive sk Erosion  Other:   igation  Stream daylighting fit  Other:	n (oil sheen) Other: e Sedimentation .S. erosin n. hule Decal stream repair/outfall stabilization
Length of vegetative c         If yes for stormwater         Is stormwater currently         □ Yes □ No       N	r: y controlled? Jot investigated	ft Type o Land U Area av	f existing vegetation: se description: railable:	slope:°
OUTFALL SEVERITY: (circle #)	Heavy discharge with a c strong smell. The amount compared to the amount stream; discharge appea significant impact downs	distinct color and/or a to f discharge is significant of normal flow in receiving irs to be having a tream.	Small discharge; flow mostly clear and o discharge has a color and/or odor, the a discharge is very small compared to the flow and any impact appears to be mino	odorless. If the mount of stream's base r / localized.
SKETCH/NOTES:	SU embor	ot or w/ A	y artather filtered	2 1
a na na an	an a construction and a second se		0°Z, una constanti de constante de const	
 			]	REPORTED TO AUTHORITIES: YES NO

WATERSHED/SUBSUED:       GL_S. 7/16       DATE: AISLEW       ASSESSED BY:         SURVEY REACH ID \$\$657-02       TIME: AISLEWARD       PHOTO ID: (Camere Pre.D) Arg. / H / S 35         STRE ID (Cambra - F) OT_D2       LAT 11.º G 1 / 7.0 " LONG 22.º G 4 / 3.6 M / M / GPS: (Unit ID)         BANK:       TYPE:       MATERIAL:       SIMPE: (ISL 0 / 1.0 M /				Stor	rm Water Outfalls	ΟΤ	
SIRVEY REACH DIG 657-52       TIME [2:22 AM/PM       PHOTO ID: (Concera-Pic R) (2 000 / 14 / 15 55         SITE DI Condition.st; OT-23       LAT 51.0 / 2 1 / 7.0 " LONG 72.0 2 4 / 2 / 2	WATERSHED/SUBS	HED: Games BI	LS. Trib	DATE: 615109	<b>Assessed by:</b>		
STIELD (Condition #): OT	SURVEY REACH II	GBST-02 7	ГIME: <u>12:35</u> АМ/РМ	Рното ID: (Camera-Pi	c#)/anon 1#	18.35	
BANK:       TYPE:       MATERIAL:       SIAPE:       Single       DIMENSIONS:       SUBMERCED:         BLOW:       Closed       Other:       Concrete       Bliptical       Triple       Dimensions:       SUBMERCED:         Moderate       Other:       Other:       Other:       Dimensions:       SUBMERCED:         Substantial       Open       Concrete       Earthen       Trapecoid       Depth:       (in)         Obder:       Concrete       Earthen       Trapecoid       Depth:       (in)       Nor #854,825         CONTTON:       Open       Concrete       Earthen       Trapecoid       Depth:       (in)       Nor #854,825         CONTTON:       Open       Concrete       Earthen       Trapecoid       Depth:       (in)       Nor #854,825         Concrete       Gas       Sewage       Flow Line       Inhibited       Brown Inc       Bathibited       Porte:       Other:	SITE ID (Condition-#	): <b>O</b> T- <u>^3</u>   I	LAT 4/ 0 61317.0 " L	ONG 72 ° 24 ' 39.9	' LMK	GPS: (Unit ID)	
Moderate       Open       Concrete       Earthem       Trapezoid       Depth:       (in)       NOT Alexter.82.E         Substantial       Other:       Other:       Other:       (in)       NOT Alexter.82.E         COSPITION:       Open       Open       Other:       "Gettom):       (in)       NOT Alexter.82.E         COSPITION:       Open       Open       DepOSITS/STAINS:       VEGGIE DENSIV:       PIFE BENTHIC GROWTH:       None         Chip/Cracked       Gas       Other:       None       Other:       Ponone       Other:       None         Other:       Other:       Other:       Other:       None       Other:       Other:       Other:       None         Other:       Other:       Other:       Other:       Other:       None       Other:       Other:       None         Plaint       Excessive       Other:	BANK: LT RT Head FLOW: None Tric	td TYPE:	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE:  Single Circular Double Elliptical Triple	DIMENSIONS: Diameter: <u>24 (in)</u>	SUBMERGED:	
CONDITION:       ODOR: Gas       ODOR: Shone       None       Brown       Orange Green         Chip/Cracked       Ges       Sware       None       Brown       Orange Green         Corrosion       Guidadi Sour       Flow Line       Inhibited       Brown       Orange Green         Other:       Goto       Other:       Other:       Other:       POOL QUALITY:       No no         Other:       Other:       Other:       Other:       Other:       Other:       Other:         For       Cocost:       Øren:       Statistic       Other:       Other:       Other:         MAINTERDENT:       Øren:       Other:       Other:       Other:       Other:       Other:         For       Cocost:       Øren:       Statistic       Good Other:       Other:       Other:         ONLY       THEMPOTY:       Ørone Ostatistic       Statistic       Coude Cases Irash (paper) plastic bags)       Dumping (bulk)       Decessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Dank regularian       Stream daylighting:       Local stream repair/outfall stabilization         no       Storm water retrofit       Other:       Other:       Stope:       °         If yes for stormwater:	<ul> <li>✓ Moderate</li> <li>✓ Substantial</li> <li>Other:</li> </ul>	Open channel	Concrete Earthen	□ Trapezoid D □ Parabolic W □ Other: ,	epth: <u>(in)</u> /idth (Top): <u>(in)</u> ' (Bottom): <u>(in)</u>	NOT APPEICABLE	
□ Corrosion       □ Sulfide       □ Paint       □ Excessive       □ Oddors       □ Colors       □ Oddors	CONDITION: ✓ None Chip/Cracked Peeling Paint	ODOR: A No Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line	VEGGIE DENSITY:	PIPE BENTHIC GRO	WTH: None	
FOR PLOPTING       COLOR:       Image: Color of the answer of the	Corrosion Other:	Sulfide	Deint Other:	Excessive	Good Odors [ Suds Algae ] Other:	Colors Oils Floatables	
POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         In o       Storm water retrofit       Other:       Other:       Storm vater retrofit       Store:         If yes for daylighting:       Length of vegetative cover from outfall:      ft       Type of existing vegetation:      o         If yes for stormwater:       Isstormwater currently controlled?       Land Use description:      o         Yes       No       Not investigated       Area available:       Outfall does not have dry weather discharge is significant compared to the amount of discharge is significant compared to the amount of discharge is very small compared to the stream's base is ginificant impact appears to be minor / localized.       Outfall does not have dry weather discharge is very small compared to the stream's base for ausing any erosion problems.         is ginificant impact downstream.       5       4       3       2       1         SKETCH/NOTES:       Impact appears to be minor / localized.       2       1	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
Length of vegetative cover from outfall:ft   If yes for stormwater:   Is stormwater currently controlled?   Yes No   No   Not investigated   Area available:     OUTFALL   SEVERITY:   (circle #)     Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant color and/or a significant impact downstream.   Severity:   (circle #)     Strong smell. The amount of discharge significant impact downstream.     Strang discharge appears to be having a significant impact downstream.     SkettcH/Notes:     Outfall does not have dry weather discharge significant impact downstream.     SkettcH/Notes:	POTENTIAL RESTO	PRATION CANDIDA	TE Discharge investigatio	n 🗌 Stream daylighting [	Local stream repair/o	utfall stabilization	
If yes for stormwater:       Is stormwater currently controlled?       Land Use description:         Yes       No       Not investigated       Area available:         OUTFALL SEVERITY: (circle #)       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge; staining; or appearance of causing any erosion problems.         5       4       3       2       1         SKETCH/NOTES:	Length of vegetative	g: cover from outfall: _	ft Type of exist	ting vegetation:	Slope:	0	
OUTFALL SEVERITY: (circle #)       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.       Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.         5       4       3       2       1	If yes for stormwate Is stormwater current Yes No	er: ly controlled? Not investigated	Land Use des Area availabl	e:			
SKETCH/NOTES:	OUTFALL SEVERITY: (circle #)	Heavy discharge with a d strong smell. The amount compared to the amount stream; discharge appea significant impact downst	listinct color and/or a t of discharge is significant of normal flow in receiving rs to be having a tream. Small d dischar dischar flow an 4	lischarge; flow mostly clear and oc ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor /	dorless. If the loount of tream's base / localized. 2	not have dry weather aining; or appearance ny erosion problems. 1	
Plands DE	SKETCH/NOTES:		an a	and the second			
	)	Plass	or a	R	EPORTED TO AUTHODIT		

					Channe	Modificatio	n	CM
WATERSHED/SUBSHED:	Gazes Bks	. Trib	·	DATE	: 61 5-	-108	ASSESSEI	DBY: JHW
SURVEY REACH ID: G	35T-02	TIME: <u>12</u> :	40 AM/PM	]	PHOTO ID:	(Camera-Pic #)	/# ↓	835
SITE ID: (Condition-#)	START LAT 1 °	<u>SI 177.1</u> "	LONG 72	o 24 I	1493"	LMK 8" 2	GPS	: (Unit ID)
CM!	END LAT 41 °	51120"	LONG 72	<u>• 2 1/ 1</u>	39.8 "	LMKISY	الله الم الم	
			·····					

<b>TYPE:</b> Channelization	Bank armoring concrete channel	loodplain encroach	ment 🗌 Other:	<del></del>
MATERIAL:	Does channel have perennial flow?	🕅 Yes 🗌 No	DIMENSIONS:	
Concrete Gabion	Is there evidence of sediment deposition?	Yes 🗌 No	Height Bottom Width	(ft)
	Is vegetation growing in channel?	Yes 🗌 No	Top Width:	(ft)
Other:	Is channel connected to floodplain?	🗌 Yes 📈 No	Length:	See GPS coord (ft)

BASE FLOW ( Depth of flow Defined low f % of channel	CHANNEL (in) low channel?  Yes  No bottom  %	ADJACENT STREAM Available width Utilities Present?	M CORRIDOR LT < 2.0	_(ft) RT <u>/00+</u> (ft) Fill in floodplain? □Yes ⊠ No		
POTENTIAL R	ESTORATION CANDIDATE	tructural repair 🛛 🗌 Bas	e flow channel creation	n 🗌 Natural char	nnel design 🔲 Can't tell	
l no		De-channelization 🗌 Fisl	n barrier removal	🕅 Bioengineer	ing	
CHANNEL- IZATION       A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.       A moderate length (>20 beginning to function as Vegetated bars may have			out channel stabilized and tural stream channel. med in channel.	An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.		
	5	<u> </u>		2 1		
NOTES:	J-84 Veb	upland (Forest)		annander an annander an anna an anna an an an an an an an an	mandformet (management	

				Storm Water Outfa				
WATERSHED/SUBSHE	D: G-BSI	-02	DATE: <u>615</u>	ASSESSED BY	X: DPR			
SURVEY REACH ID: TIME: 12: 10 AM/PM			PHOTO ID: (Cal	mera-Pic #) /#	1829			
SITE ID (Condition-#): O	0T- <u>01</u>	LAT_ • 200 7	T" DONG - OF SEE	P(SFE PHOTO LMK	GPS: (Unit ID)			
	······································	FOTE CO	NFLUENCES	· · · · · · · · · · · · · · · · · · ·	······································			
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete M PVC/Plastic Other:	SHAPE: $\square$ S Metal $\square$ Circular $\square$ Brick $\square$ Elliptical $\square$ $\square$ Other:	Single <b>DIMENSIONS:</b> Double Triple Diameter: <u>6</u>	SUBMERGED: No (in) Partially Fully			
Moderate Substantial Other:	Open channel	Concrete Ea	arthen Trapezoid Parabolic Other:	Depth:(ir Width (Top):(ir " (Bottom):(ir	1) NOT APPECABLE 1)			
CONDITION: None Chip/Cracked Peeling Paint	ODOR: N Gas Sewage	0 <b>DEPOSITS/STAINS</b> ☐ None ⊠Oily ur Ø Flow Line	S: <b>VEGGIE DENSI</b>	PIPE BENTHIC C       Brown     O       Other:	GROWTH: None range Green			
Corrosion Other:	Sulfide	Paint Other:	Children Content	POOL QUALITY:         Good         Suds         Alga         Other:	: ⊠ No pool s □Colors □Oils e □ Floatables			
FOR     COLOR       FLOWING     TURBID       ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:							
POTENTIAL RESTORAT	TION CANDID	ATE Discharge inves	stigation 🗌 Stream dayligh rofit 🛛 Other:	hting 🕅 Local stream repa	air/outfall stabilization			
Length of vegetative cove	er from outfall:	ft Type	of existing vegetation:	Slop	e:°			
If yes for stormwater: Is stormwater currently co	ontrolled?	AGSVME D Area a	Use description: <u>HIG</u> t available:	WAY (84				
OUTFALL Hea SEVERITY: stro (circle #) stre sign	vy discharge with a ng smell. The amou pared to the amour am; discharge appe ificant impact down	distinct color and/or a nt of discharge is significant t of normal flow in receiving ars to be having a stream.	Small discharge; flow mostly cle discharge has a color and/or odd discharge is very small compare flow and any impact appears to	ear and odorless. If the or, the amount of ed to the stream's base be minor / localized.	does not have dry weather ge; staining; or appearance ng any erosion problems.			
SKETCH/Norma		<u> </u>	+ (3)	2	1			
SKETCH/NOTES:	WEILAN	STET CHARGE	HI ELOTED - H	RT 8	Second and the second			
<u>}</u>				REPORTED TO AUTHO	DRITIES: YES NO			

Stream Crossing WATERSHED/SUBSHED: Gears Rh DATE:  $\int / S$ ASSESSED BY: 110 102 URVEY REACH ID: 6-35T - 02 TIME: 12 : 40 AM/PM PHOTO ID: (Camera-Pic #) LAT 41°51 127.0" LONG 7 024 191.8" SITE ID: (Condition-#) SC- 021 LMK GPS (Unit ID) TYPE: 🕅 Road Crossing 🔲 Railroad Crossing 🔲 Manmade Dam 📋 Beaver Dam 🗔 Geological Formation 🔲 Other: **#BARRELS: DIMENSIONS:** (*if variable, sketch*) SHAPE: **MATERIAL:** ALIGNMENT: Arch Bottomless Single X Concrete Flow-aligned Barrel diameter: English and a second \_\_(ft) 🗌 Box Double Elliptical Metal Not flow-aligned Height: (ft)FOR ROAD/ X Circular Triple Other: 🗌 Do not know RAILROAD Other: Other: CROSSINGS Culvert length: (ft) **CONDITION:** (Evidence of...) **CULVERT SLOPE: O**NLY 🔽 Flat Width: (ft)Cracking/chipping/corrosion Downstream scour hole  $\Box$  Slight (2° – 5°) Sediment deposition Failing embankment  $\Box$  Obvious (>5°) Roadway elevation: descripty wood (ft) Other (*describe*): POTENTIAL RESTORATION CANDIDATE Fish barrier removal Culvert repair/replacement Upstream storage retrofit 🖾 no Local stream repair Other: IS SC ACTING AS GRADE CONTROL No ☐ Yes Unknown **BLOCKAGE SEVERITY:** (circle #) **EXTENT OF PHYSICAL BLOCKAGE:** 🗌 Total Partial A structure such as a dam or A total fish blockage on a A temporary barrier such as a Temporary Unknown road culvert on a 3rd order or tributary that would isolate a beaver dam or a blockage at If yes for greater stream blocking the significant reach of stream, the very head of a stream with CAUSE: fish barrier upstream movement of or partial blockage that may very little viable fish habitat Drop too high Water Drop: \_\_\_\_\_ (in) anadromous fish; no fish interfere with the migration of above it; natural barriers such passage device present. anadromous fish. as waterfalls. Flow too shallow Water Depth: \_\_\_\_\_ (in) Other: 5 4 3 **NOTES/SKETCH:** NETTERA 07 OS **REPORTED TO AUTHORITIES** YES NO

			Reach Level Assessment RCH
SURVEY REACH	D: 6361-03 W1	rshd/Subshd:	DATE: 615 108 ASSESSED BY:
START TIM	IE: 11:39 AM/PN	1 LMK:	END TIME: : AM/PM LMK: CPS ID:
LAT 41051 1	14.6" LONG	720 25 043"	LAT 41° 51 ' 17, 4" LONG 72° 2,5 '944C."
DESCRIPTION: CO	mf. of 6735T	5 01,02, QOS	DESCRIPTION: SC-01
RAIN IN LAST 24 HC	DURS  Heavy rain Nntermittent	□ Steady rain □ Trace	PRESENT CONDITIONS       □ Heavy rain       □ Steady rain       □ Intermittent         □ Clear       □ Trace       □ Overcast       ⊠ Partly cloudy
SURROUNDING LAN	D USE: 🗆 Industria	l 🗆 Commercial arse 🗆 Park	□ Urban/Residential □ Suburban/Res ☑ Forested □ Institutional □ Crop □ Pasture □ Other:
AVERAGE	CONDITIONS (che	ck applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ⊠ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
<b>DOMINANT SUBSTR</b>	ATE slick) 🕅 C	$abble (2.5 - 10^{2})$	S & STOY
Sand (gritty)		oulder (>10")	
□ Gravel (0.1-2.5	o") ⊔Be	ed rock	- FMBANKU
WATER CLARITY	Clear Turbic aturally colored)	d (suspended matter) Opaque (milky)	BOULDERS ASSA
	Attached: M non	e 🗆 some 🗆 lots	
IN STREAM	Floating: Anone	$e \square some \square lots$	
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beav	er 🗌 Deer	
STREAM SHADING (water surface)	Mostly shaded     Halfway (≥50%     Partially shaded     Unshaded (< 25	(≥75% coverage) 6) 1 (≥25% ) 5%)	- BSLAND Kiking S. J. Contraction,
CHANNEL DYNAMICS ON Unknown	Downcutting Widening Headcutting Aggrading Sed. deposition	Bed scour Bank failure Bank scour Slope failure Channelized	EWOODED S & MUDDED
CHANNEL	Height: LT bank	<u>1.5</u> (ft)	
DIMENSIONS	RT bank	<u>2.5</u> (ft)	
(FACING DOWNSTREAM)	Width: Bottom	(ft)	
	Тор	(a(ft)	
Good: Open area in public ownership, sufficient room to	EACH ACCESSIBILIT Fair: Forested or developed area adjacent to stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to	
stockpile materials,	Access requires tree removal or impact to	stream. Few areas to stockpile available	LEST 02 CRUT and
access for heavy	landscaped areas. Stockpile areas	and/or located a great distance from stream	M) 50
equipment using existing roads or trails.	small or distant from	Specialized heavy	
5 4	3 2		
NOTES: (biggest prob	lem you see in survey	reach)	
CUL	NUT ASTRASUL	re hwy	
			REPORTED TO AUTHORITIES [] YES [] NO

				1 .			
	Optimal	Suboptimal	Marginal	Poor			
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.			
	Left Bank 10 9	8 7 6	5 4 3	2 1 0			
	Right Bank 10 9	8 7 6	5 4 3	2 1 0			
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.			
	Left Bank 10 9	8 7 6	5 4 3	2 1 0			
	Right Bank 10 9	8 7 6	5 4 3	2 1 0			
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.			
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0			
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION				
	Optimal	Suboptimal	Marginal	Poor			
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.			
	Left Bank 10 9	8 7 6	5 4 3	2 1 0			
	Kight Bank 10 9	8 7 6	<u>5</u> 4 3	2 1 0			
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function			
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0			
Sub Total In-st	ream:/80 + B	uffer/Floodplain:/80	= Total Survey	Reach/160			

WATERSHED:       Water Schedul And Marken Schedul And Marken Schedul Assessed by:       The Schedul Assessed by:			A			Stre	am Cros	ssing	SC
AUVEY REACH D:       CMS TIME:       If SQ 26 #2       If SQ 26 #2       If SQ 26 #2         STIF D:       (Condition-4)       SC 2       LAT       If SQ 26 #2       LAT       If SQ 26 #2         STIF D:       (Condition-4)       SC 2       LAT       If SQ 26 #2       LAT       If SQ 26 #2         STIF D:       (Condition-4)       SC 2       LAT       If SQ 26 #2       LAT       If SQ 26 #2         STIF D:       (Condition-4)       SC 2       If SQ 26 #2       LAT       If SQ 26 #2         STIF D:       (Condition-4)       SC 2       If SQ 26 #2       LAT       If SQ 26 #2         STIF D:       (Condition-4)       Stight Condition I       Stight Condition I       If SQ 26 #2       Data       Bare diametal       If SQ 26 #2         FOR ROADY       Condition I       Do not know       Condition I       If SQ 26 #2       Data (If SQ 26 #2       If SQ 26 #2       Condition I       If SQ 26 #2       Condition I       Condition II       Condition II       Condition III       Condition IIIIIII       Condition IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	WATERSHED	SUBSHED: Doyes Son	th-trile		DATE:	515102	ASSE	SSED BY	DEB
STEID: (Conductor, b): SC-O1       LAT	JURVEY REA	CHID: CISST-OR	TIME: 1:50	Dam/pm	Рното I	D: (Camera-Pi	c #)	/#	1826+23
TYPE: Image: Strate in the	SITE ID: (Con	dition-#) SC-0 LAT	4051.17	" LONG	2.25	'OHLY L	MK	GP	S (Unit ID)
TYPE: I Road Crossing       Railroad Crossing       Manmade Dam       Beaver Dam       Geological Formation       Other:         FOR ROAD RAILROAD       StrAFE: Base diments       Base diments       Chickets       Ch								- 1	
SHAPE:       Bareh       Bootomless       # BARRELS:       MATERIAL:       Concrete       Dimensions:       (f) worlable, sheeld)         FOR ROADD       Boo.       Elliptical       Double       Occurred       Dimensions:       (f) worlable, sheeld)         CROSSING       Circular       Other:       Double       Dimensions:       (f) worlable, sheeld)         CROSSING       Contert:       Double       Dimensions:       (f) worlable, sheeld)         Bediment deposition       Failing embankment       Dist flow-aligned       Culvert length:       (f)         Bight (2 - 5)       Contert:       Double       Bight (2 - 5)       Roadvay elevator:       (f)         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repain/replacement:       Upstream storage retrofit         Storad       Local stream repair       Other:       Cher       Atal fist biockage on a tobucque at the world of atom, or adouble on a biocque at the world of atom, or adouble on a biocque at the world of atom, or adouble atom on a biocque at the world of atom, or adouble on a biocque at the world of atom, or adouble atom or a biocque at the world of atom, or adouble atom or a biocque at the world of atom, or adouble atom or a biocque at the world of atom, or adouble at the world of atom or adouble at the world of atom or adouble at the world of at a first or adouble of at the world of a	TYPE: 🛛 Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beav	er Dam	] Geological For	mation	Other:	
ONLY       Charling (chousend of -)         Image: Charling (chousend of -)       Image: Charling (chousend of -)         Sediment deposition       Image: Failing embankment       Image: Stight (2°-5°)         OTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Charling (chousend of -)       Image: Culvert repair/replacement       Upstream storage retrofit       Image: Culvert repair/replacement       Upstream storage retrofit         Image: Charling (chousend of -)       Image: Culvert repair/replacement       Upstream storage retrofit       Image: Culvert repair/replacement       Upstream storage retrofit         Image: Charling (chousend of contemportation)       Image: Culvert repair/replacement       Upstream storage retrofit       Image: Culvert repair/replacement       Upstream storage retrofit         Image: Culvert of PHYSICAL BLOCKAGE:       Image: Culvert on a 3d collect on a 3d colect on a 3d collect on a 3d colect on a 3d collect on	For Road/ Railroad Crossings	SHAPE:       # BARRELS:         Arch       Bottomless         Box       Elliptical         Circular       Triple         Other:       Other:		MATERIAL:	: ALIGNMENT: Flow-aligned S Not flow-aligned Do not know		<b>DIMENS</b> Barrel dia Culvert le	DIMENSIONS: (if variable, sketch) Barrel diameter: <u>4</u> (ft) Height: (ft) Culvert length: 250(ft)	
Stellment deposition       Failing embankment       Stight (2°-5°)       Roadway elevation:       Stellment deposition         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Is SC ACTING AS GRADE CONTROL       Icoel stream repair       Other:       BLOCKAGE       Image: Stream repair in the such as a dam or grade culver on a 3d rofer or	ONLY	Condition. (Evidence of)	n 🗌 Downstream	n scour hole		at		Width:	(ft)
POTENTIAL RESTORATION CANDIDATE         fish barrier removal         Culvert repair/replacement         Upstream storage retrofit <u>M</u> no         Local stream repair         Other:                ISSC ACTING AS GRADE CONTROL         No         Yes         Unknown                EXTENT OF PHYSICAL BLOCKAGE:              BLOCKAGE SEVERITY: (circle fi)               A temporary barrier such as a dam or regreter freem blocking the upstream movement of a steam with a dower dam or a blockage at traver dam or a blockage the upstream movement of a steam with the migration of a steam with the migrati		Sediment deposition	ankment	D SI ⊅O	ight (2° – 5°) bvious (>5°)	Roadway	elevation	: <u> </u>	
Is SC ACTING AS GRADE CONTROL No Yes Unknown EXTENT OF PHYSICAL BLOCKAGE: Total Partial Toporary Unknown If yes for fish barrier CAUSE: Dop too high Water Drop: UE (in) Other: S 4 3 2 1 NOTES/SKETCH:	POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Cul <sup>.</sup> repair 🗌 Oth	vert repair/re	eplacement	Upstream s	torage retr	rofit
EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)         If yes for fish barrier       CAUSE:       A structure such as a dam or road culver on a 3rd order or upsteam movement of anadromous fish, no fish Based etations of the passage device present.       A total fish blockage on a thould isolate a significant teach of stream or partial blockage that may interfere with the migration of assage device present.         NOTES/SKETCH:       Structure such as a dam or road culver on a 3rd order or upsteam movement of anadromous fish, no fish assage device present.       A total fish blockage on a thou way that would isolate a significant teach of stream or partial blockage that may indermous fish.         NOTES/SKETCH:       5       4       3       2       1	IS SC ACTING	G AS GRADE CONTROL		es 🗍 Unk	nown				
Image: Second		EXTENT OF PHYSICAL BLC			BL	OCKAGE SEVE	RITY: (circ	:le #)	
NOTES/SKETCH:	If yes for fish barrier	CAUSE:       Drop too high       Water Drop:       UR         Image: Temporary       Unknown       Unknown         CAUSE:       Image: Temporary       Unknown         Image: Temporary       Unknown       Unk		A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a dam or 3rd order or locking the nent of ; no fish present.	dam or order or g the ish ish interfere with the migration anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
NOTES/SKETCH:	<u>p</u>			5		4 (3)	)	2	1
	)	cn.							

Reach Level Assessment

SURVEY REACH	D. <u>6857-</u> 044 W1	rshd/Subshd:	Ble South This	Date: <u>6 / 5</u>	_/0% As	SESSED BY:
START TIM	e: <u>2 : 35</u> am/pn	1 LMK:	END TIME:	3_: <u>05_</u> AM/PM	LMK:	GPS ID:
LAT 41 ° 51 ']	<u>4.1</u> " Long	72 0 25 105.5 "	LATU 0 51 1	07.4 " LONG <u>7</u>	2025 V	35 "
<b>DESCRIPTION:</b>		2 <sup>4</sup>	DESCRIPTION:			с.
				<u> </u>		
RAIN IN LAST 24 HC	URS 🗌 Heavy rain	□ Steady rain	PRESENT CONDITIONS	□ Heavy rain	□ Steady ra	ain 🗆 Intermittent
					Overcas	t Partly cloudy
SURROUNDING LAN	D USE: 🗀 Industria	I Commercial rse Park	☐ Urban/Residential ☐ Crop	⊡ Suburban/Res □ Pasture	Forested Other:	□ Institutional
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	TE IMPACT '	TRACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	☑ 50%-75% □ 75-100%	Simple planar sketch within the survey re features	of survey reach. Tra ach (OT, ER, IB,SC, deemed appropriate	ck locations an UT, TR, MI) as Indicate direc	nd IDs for all site impacts s well as any additional ction of flow
<b>DOMINANT SUBSTR</b> Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE At Lower slick Condense B (") D Ba	obble (2.5 –10") oulder (>10") ed rock	· .	uccinen eppi opi ene.	initial and	
WATER CLARITY	Clear Turbie aturally colored) dyes)	d (suspended matter) Opaque (milky)				
AQUATIC PLANTS IN STREAM	Attached: non	e $\square$ some $\square$ lots				
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☐ Fish  ☐ Beav ☐ Snails  ☐ Othe	er Deer		Share 1 San 1 S		
STREAM SHADING (water surface)	☐ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	(≥75% coverage) b) 1 (≥25% ) 5%)		6-1		
CHANNEL	Downcutting	Bed scour		J.		
DYNAMICS	Widening	Bank failure		ž.		
Unknown	Aggrading Sed. deposition	Bank scour Slope failure	23	Se .		
•	Height: LT bank		5			
	RT hank	(it)				
(FACING	Width: Bottom					
DOWNSTREAM)	Ton	30 (ft)				
a	FACH ACCRESIBIL	(II)		and the second se		
Good: Open aron in	Fair: Forested or	Difficult. Must cross		(Linear Street)		
public ownership,	developed area	wetland, steep slope, or				
sufficient room to	Access requires tree	sensitive areas to get to stream. Few areas to		WHER OT-		
stockpile materials,	removal or impact to	stockpile available	and a second	aan ah		
access for heavy	landscaped areas.	and/or located a great	J-84	l		
equipment using	Stockpile areas	uistance from stream. Specialized beavy		n an de le general de la constant d	•	
existing roads or trails.	stream.	equipment required.				
5 4	3 2	2 (1)				
)	iem you see in survey	reach)		X		
				REPORT	FED TO AUTH	ORITIES YES NO
~	Optimal	Suboptimal	Marginal	Poor		
--	---	--	--	---	--	--
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	NKBanks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.Grade and wid areas of bank caused by a pi impaired ripari adjacent use.		Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 22	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
apre sergini	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Marginal Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Poor Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH	Optimal         Width of buffer zone >50 feet; human         activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not         impacted zone.         Left Bank       10       9	Suboptimal         Width of buffer zone 25-50 feet;         human activities have impacted zone         only minimally.         8       7         6	Marginal         Width of buffer zone 10-25 feet;         human activities have impacted         zone a great deal.         5       4         3	Poor       Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9	Suboptimal       Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.       8     7     6       8     7     6       8     7     6	MarginalWidth of buffer zone 10-25 feet; human activities have impacted zone a great deal.543543	Poor       Width of buffer zone <10 feet; little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank (10)       9         Right Bank (10)       9         Predominant floodplain vegetation type is mature forest	Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6	Marginal         Width of buffer zone 10-25 feet;         human activities have impacted         zone a great deal.         5       4         5       4         7       4         9       3         9       7         9       4         10       3         9       10         10       10      <	Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank (10) 9         Right Bank (10) 9         Predominant floodplain vegetation type is mature forest         20       19       18       17       16	Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       9       9         15       14       13       12       11	MarginalWidth of buffer zone 10-25 feet; human activities have impacted zone a great deal.543543976	Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       0       9         Predominant floodplain vegetation type is mature forest       17         20       19       18       17         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water       9	Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         Predominant floodplain vegetation type is young forest       15       14       13       12       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       6       6       6	Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       6	Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       0       9         Predominant floodplain vegetation type is mature forest       11         20       19       18       17         20       19       18       17         20       19       18       17         20       19       18       17         20       19       18       17         18       17       16	SuboptimalWidth of buffer zone 25-50 feet; human activities have impacted zone only minimally.876876Predominant floodplain vegetation type is young forestvegetation1514131215141312Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water151514131215141312151413121514131215141312	MarginalWidth of buffer zone 10-25 feet; human activities have impacted zone a great deal.543543976Either all wetland or all non- wetland habitat, evidence of standing/ponded water10987109876	Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       17       16         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water       20       19       18       17       16         No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures       0       19       18       17       16	SuboptimalWidth of buffer zone 25-50 feet; human activities have impacted zone only minimally.876876Predominant floodplain vegetation type is young forest15141514131211Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water151413121514131211Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function11	Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       old         10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       10       9       8       7       6         10       9       8       7       6       6         Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function       0	Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		

WATERSHED/SUBSH	ED: Caraca An	als & M. T.L	DATE: 61510	ACCE	SEED DV.	
SURVEY REACH ID:	GBZEOUR T	Гіме: 2 : 40 ам/рм	PHOTO ID: (Camera )	Dic #		
SITE ID (Condition-#):	OT 1	LAT 41 ° 51 '14.1_" L	ONG <u>12 ° 25 ' 65 5</u>	<u>" LMK</u>		SA GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE:       Single       DIMENSIONS:       SU         Circular       Double       Image: Circular in the second seco			SUBMERGED
Moderate Substantial	Open channel	$\Box \text{ Concrete } \Box \text{ Earthen} \\ \Box \text{ Other: } riprays$	Trapezoid J Parabolic C Other:	$\Box \text{ Trapezoid } \text{Depth: } \underbrace{2.5 \text{ (in)}}_{Parabolic} \text{Width (Top): } \underbrace{3.6 \text{ (in)}}_{Parabolic} \text{Vidth (Top): } \underbrace{3.6 \text{ (in)}}_{Parabolic} Vidth $		NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO	DEPOSITS/STAINS:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BEN Brown Other: POOL QU Good Suds Other:	VTHIC GRO	WTH: None e Green No pool Colors Oil Floatables
$\begin{array}{c c} ONLY & FLOAT\\ \hline OTHER & \Box Ex \\ \hline \end{array}$	TABLES: DNO	ne Signi Cloudiness ne Sewage (toilet paper, o plastic bags) Dumping	Cloudy     Opaque       etc.)     Petroleum       g (bulk)     Excessive	(oil sheen) Sedimentati	Ot]	her:
ONLY     FLOA       OTHER     Ex       CONCERNS:     Ne       POTENTIAL RESTOR       Ino       If yes for daylighting	ATION CANDIDAT	ne Singht Cloudiness ne Sewage (toilet paper, o plastic bags) Dumping enance Bank Ero TE Discharge investigatio Storm water retrofit	Cloudy Opaque Cloudy Opaque Cloudy Petroleum (bulk) Excessive sion Other:	(oil sheen) e Sedimentati	Oti on eam repair/ou	her:
ONLY     FLOA:       OTHER     Ex       CONCERNS:     Ne       POTENTIAL RESTOR       Ino       If yes for daylighting:       Length of vegetative contents	ATION CANDIDAT	ne Singht Cloudiness ne Sewage (toilet paper, o plastic bags) Dumping enance Bank Ero TE Discharge investigatio Storm water retrofit ft Type of exist	Cloudy Opaque Cloudy Opaque Cloudy Petroleum (bulk) Excessive sion Other:	(oil sheen) e Sedimentati	On eam repair/ou	her: utfall stabilization
ONLY       FLOA:         OTHER       Ex         CONCERNS:       Ne         POTENTIAL RESTOR       Ino         If yes for daylighting:       Length of vegetative construction         If yes for stormwater:       s stormwater currently         Yes       No       No	ATION CANDIDAT	ne Singht Cloudiness ne Sewage (toilet paper, oblastic bags) Dumping enance Bank Ero TE Discharge investigatio Storm water retrofit ft Type of exist Land Use des Area available	Cloudy Opaque etc.) Petroleum (bulk) Excessive sion Other:	(oil sheen) e Sedimentati	Ot	her: utfall stabilization
ONLY     FLOA:       OTHER     Ex       CONCERNS:     Ne       POTENTIAL RESTOR     In       In no     If yes for daylighting:       Length of vegetative cor     If yes for stormwater:       Is stormwater currently     No       OUTFALL     He       SEVERITY:     Statistic cor       Concerter     Statistic cor	ATION CANDIDAT ATION CANDIDAT ATION CANDIDAT ver from outfall:	Ime       Singht Cloudiness         ne       Sewage (toilet paper, ablastic bags)         plastic bags)       Dumping         enance       Bank Ero         Image: Bank Ero       Image: Bank Ero         Image:	Cloudy Opaque etc.) Petroleum g (bulk) Excessive sion Other: n Stream daylighting Other: ting vegetation: e: sischarge; flow mostly clear and of ge has a color and/or odor, the arge is very small compared to the d any impact appears to be minor	(oil sheen) Sedimentati Local stru- bodorless. If the mount of stream's base / localized.	Outfall does n discharge; sta of causing any	her: utfall stabilization ot have dry weather aining; or appearance y erosion problems.
ONLY     FLOA:       OTHER     Ex       CONCERNS:     Ne       POTENTIAL RESTOR.     In       In no     If yes for daylighting:       Length of vegetative cor     If yes for stormwater:       Is stormwater currently     No       Yes     No       OUTFALL     Hetsi       Severity:     Stice       Circle #)     Stice	ATION CANDIDAT ATION CANDIDAT ver from outfall: controlled? t investigated eavy discharge with a di ong smell. The amount mpared to the amount of eam; discharge appear inficant impact downstr 5	Image: Singlet Cloudiness         ne       Sewage (toilet paper, ablastic bags)         Datastic bags)       Dumping         plastic bags)       Bank Ero         Image: Storm water retrofit       Image: Storm water retrofit         Image: Storm water retrofit <td< td=""><td>Cloudy Opaque   Cloudy Opaque   etc.)   Petroleum   g (bulk)   Excessive   osion   Other:   n Stream daylighting   Other:   ing vegetation:   cription:   e:   ischarge; flow mostly clear and coge has a color and/or odor, the arge is very small compared to the d any impact appears to be minor   3</td><td>(oil sheen) Sedimentati Local structure bodorless. If the mount of stream's base / localized.</td><td>Otf on eam repair/ou Slope: Outfall does n discharge; sta of causing any 2</td><td>her: utfall stabilization o o tot have dry weather aning; or appearance y erosion problems. 1</td></td<>	Cloudy Opaque   Cloudy Opaque   etc.)   Petroleum   g (bulk)   Excessive   osion   Other:   n Stream daylighting   Other:   ing vegetation:   cription:   e:   ischarge; flow mostly clear and coge has a color and/or odor, the arge is very small compared to the d any impact appears to be minor   3	(oil sheen) Sedimentati Local structure bodorless. If the mount of stream's base / localized.	Otf on eam repair/ou Slope: Outfall does n discharge; sta of causing any 2	her: utfall stabilization o o tot have dry weather aning; or appearance y erosion problems. 1

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## Stream Crossing SC

WATERSHED	/SUBSHED: Contra Ba	ad and g	rite	DATE: 6	15 108	ASSE	SSED BY: DDP	
URVEY REA	CHID: GEST-OMA	Тіме: 💋 : 23	AM/PM	Рното ID	: (Camera-Pic	:#)/a.o.o.	1# 1241	
SITE ID: (Con	dition#) SC- <u>2 </u> LAT	41_0 <u>51_07</u> 3	" Long 72	0 <u>25</u> 1	<u> 35 "</u> LI	MK	GPS (Unit ID)	
TYPE: 🗌 Roa	ad Crossing 🔲 Railroad Crossi	ng 🔣 Manmade	Dam 🗌 Beaver	Dam	Geological Form	nation 🔲	Other:	
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIGI	NMENT: ow-aligned t flow-aligned o not know	DIMENSI Barrel dia	ONS: (if variable, sketch meter:( Height:(	
ONLY	CONDITION: (Evidence of)         Cracking/chipping/corrosion         Downstream         Sediment deposition         Failing emb         Other (describe):		m scour hole $\Box$ Flat $\Box$ Slight (2° – 3) $\Box$ Obvious (>5)		<b>TERT SLOPE:</b> at ght $(2^\circ - 5^\circ)$ avious $(>5^\circ)$	Roadway	Width:        (           elevation:        (	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culve repair 🕅 Other	rt repair/rep : Sed/r	placement 🗌 l	Jpstream st	orage retrofit	
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unkn	own	and a second s	<u> </u>		
	EXTENT OF PHYSICAL BLC	CKAGE:	[	BLO	CKAGE SEVER	UTY: (circi	le #)	
If yes for fish barrier	X Total       Partial         Temporary       Unknow         CAUSE:       Drop too high         Flow too shallow       Water D         Other:       Other:	wn rop: <u>42</u> (in) epth: (in)	A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as beaver dam or a blockage at the very head of a stream wi very little viable fish habitat above it; natural barriers suc as waterfalls.	
NOTES/SKET	°CH:		5		4 3	<u> </u>	2 1	
	GEDWENT							
)					Repor	TED TO AUT	THORITIES 🗌 YES 🗍	

Reach Level Assessment RCH

							L	
SURVEY REACH	D:6337.64 } W1	rrshd/Subshd: 🖧 🐖	Br Sour	l This	DATE: 6/5	_/ <u>08</u> Ass	ESSED BY:	
START TIM	ie: <u>2:25</u> AM/PN	1 LMK:	END	TIME:	:AM/PM	LMK:		GPS ID:
LAT 0 10 51 1	01.9" LONG?	2 . 25 .05.5"	LAT 1/1	•	53.1 " LONG ?	2025 10	24 "	
DESCRIPTION:		<u></u>	DESCRIP	TION		( <u>1</u> )	<u></u>	
			Discin					
RAIN IN LAST 24 HO	ours 🗆 Heavy rain	□ Steady rain	PRESENT C	ONDITIONS	□ Heavy rain	□ Steady rai	n 🗆 Intern	nittent
□ None	🖾 Intermittent		□ Clear		□ Trace	🖾 Overcast	Partly	y cloudy
SURROUNDING LAN	D USE: 🗆 Industria	l □ Commercial rse □ Park	□ Urban/R □ Crop	esidential	☑ Suburban/Res □ Pasture	Forested Other:	🗆 Institu	itional
AVERAGE	CONDITIONS (che	ck applicable)		REACH	SKETCH AND SI	ГЕ ІМРАСТ Т	RACKING	
BASE FLOW AS %	□ 0-25%	⊠-50%-75%	Simple pl	anar sketch	of survey reach. Tra	ck locations and	IDs for all s	ite impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%	within t	he survey re	each (OT, ER, IB,SC,	UT, TR, MI) as	vell as any a	dditional
DOMINANT SUBSTR A-Silt/clay (fine or Gand (gritty) G-Gravel (0.1-2.5	ATE slick)	obble (2.5 –10") oulder (>10") ed rock	A-	SE-01-	R-60" CA	AP Ho	on of flow	
WATER CLARITY	Clear Turbie aturally colored) dyes)	d (suspended matter) Opaque (milky)			Re bere			
AQUATIC PLANTS IN STREAM	Attached: 🖾 non	$\square$ some $\square$ lots			) aburba			
Wildlife in or Around Stream	(Evidence of) □ Fish □ Beav □ Snails-ᡚ Othe	er Deer		Control of the second s Second second secon second second sec	- lower			
STREAM SHADING (water surface)	<ul> <li>☑ Mostly shaded</li> <li>☐ Halfway (≥50%</li> <li>□ Partially shaded</li> <li>□ Unshaded (&lt; 25%)</li> </ul>	(≥75% coverage) 6) 1 (≥25% ) %)		and the second se		,' 		
CHANNEL	Downcutting	Bed scour		. 4	W (	Carolyse ervertigene		S.
DYNAMICS	U Widening	Bank failure			2/1	Property Refer Co. 19. Honorow		2
Unknown	Aggrading Sed. deposition	Bank scour Slope failure Channelized				or not provide the second second		A.
0	Height: LT bank	3 (ft)		Inetis	A second			~
	RT hank	7. (A)	100	W	////			
(FACING	Width Dattar		A second second	y	/ WOTON	5 Percentarian	XI	-
DOWNSTREAM)		(ft)			and the second se	from the second	S 1	
	lop	(ft)	- The second sec				1 5	/ YON
<u></u>	EACH ACCESSIBILI	IY Difficult Must cross	- Honz	Molton-		A Realist Angel	ò Ì	1/19
Good: Open area in	developed area	wetland, steep slope, or	Contraction of the second seco	IB-0	• / //	90.6m) - 64.amulu	2 (2)	国
sufficient room to	adjacent to stream.	sensitive areas to get to		-	R.H.	OFT-OBMORPHICATION	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	12
stockpile materials,	removal or impact to	stream. Hew areas to stockoile available		$\langle \rangle$	511			HET.
easy stream channel	landscaped areas.	and/or located a great				Sea Linear Marca	200	PLAN
equipment using	Stockpile areas	distance from stream.			- 1- 1- 1- A	~   ~	No.	2 9
existing roads or trails.	smail or distant from stream.	opecialized neavy equipment required.	- 01	and the second	ana ana amin'ny desira dia mampika dia mampika dia 1971. Ny haafana amin'ny tanàna dia kaominina dia kaominina dia kaominina dia kaominina dia kaominina dia kaominina di	5	an an an a' a' an	
5 4	3	2 1	1			IA		M
NOTES: (biggest prob	olem you see in survey	Feach)						
1								
· · · · · · · · · · · · · · · · · · ·			- <u></u>		REPOR	TED TO AUTHO	RITIES	es 🗌 No

		OVERALL STREAM COND	ITION			
L	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAJ	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 (6)	<u>5</u> <u>4</u> <u>3</u>	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 (6)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Sub Total In-str	ream:/80 + B	uffer/Floodplain:/80	= Total Survey	Reach/160		

IR Impacted Buffer WATERSHED/SUBSHED: BLSach DATE: 6/5/08 IVID ASSESSED BY: DRR **URVEY REACH:** PST-OYR TIME: 2: ZO AMPM PHOTO ID: (Camera-Pic #) 1# ranks SITE ID: (Condition-#) GPS: (Unit ID) START LAT 41 ° 51 '07.9" LONG 72 ° 25 '055" LMK **IB-** 6 o END LAT " LONG \*\* LMK REASON INADEQUATE: 🕅 Lack of vegetation 🕅 Too narrow 🗌 Widespread invasive plants IMPACTED BANK: LT KRT Both Recently planted Other: LAND USE: Private Institutional Golf Course Park Other Public UNKNOW (Facing downstream) LT Bank  $\Box$ : ম RT Bank  $\square$ □: DOMINANT Paved Bare ground Turf/lawn Tall grass Shrub/scrub Trees Other LAND COVER: LT Bank X RT Bank  $\Box$ X X  $\square$ <u></u>: **INVASIVE PLANTS:** □ None Rare Partial coverage Extensive coverage unknown STREAM SHADE PROVIDED? Partial 🗌 Full WETLANDS PRESENT? Yes Unknown POTENTIAL RESTORATION CANDIDATE Active reforestation Greenway design 🛛 Natural regeneration 🗍 Invasives removal 🗌 no Other: **RESTORABLE AREA** Impacted area on public land Impacted area on either Impacted area on private where the riparian area does public or private land that is land where road; building REFORESTATION LT BANK RT not appear to be used for any presently used for a specific encroachment or other **POTENTIAL:** Length (ft): whiteesser œ specific purpose; plenty of purpose; available area for feature significantly limits (Circle #) area available for planting planting adequate available area for planting Vidth (ft): 5 4 53 **POTENTIAL CONFLICTS WITH REFORESTATION** Widespread invasive plants Detential contamination Lack of sun Deor/unsafe access to site Existing impervious cover Severe animal impacts (deer, beaver) ownership NOTES: Merg PROM Scrub Sharlo 420 vanin MUCHI

Stream Crossing

117.	1. 0. 1	and the second second		D	15 1000				
WATERSHED	SUBSHED: (-10013 Bree)	Turn 2 15		DATE: <u>6</u>	<u>10 108</u>	ASSES	SED BY:		
JURVEY REA	CH ID: (3821-048	$\underline{\text{IIME: } : : : : : : : : : : : : : : : : : :$	_AM/PM	PHOTO IL	D: (Camera-Pic	#) ('lenis	) /# 1.5 GDC		
SITE ID: (Con	dition-#) SC- <u>21</u> [LA	T <u>41 ° 51 '03.</u>	$\_$ "LONG $\underline{\gamma}$		<u></u> "LI	/IK	GPS (Unit ID)		
TYPE: 🗌 Roa	TYPE: Road Crossing Railroad Crossing Manmade Dam Reaver Dam Geological Formation Other								
For Road/ Railroad	SHAPE:         ☐ Arch       ☐ Bottomless         ☐ Box       ☐ Elliptical         ☑ Circular       ☐ Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIG	NMENT: ow-aligned of flow-aligned o not know	DIMENSIC Barrel dian	DNS: (if variable, sketch) neter: <u>5</u> (ft) Height: <u>5</u> (ft)		
CROSSINGS ONLY	CONDITION: (Evidence of Cracking/chipping/corror Sediment deposition Other (describe):	) ion 🔲 Downstrear 🗌 Failing emb	n scour hole bankment	CULV Fla Sli Ob	<b>VERT SLOPE:</b> at gpht $(2^{\circ} - 5^{\circ})$ pvious (>5°)	Culvert len V Roadway e	$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $		
		/							
POTENTIAL I	RESTORATION CANDIDAT	E Fish barrier re	emoval M Culve	rt repair/rej 	placement 🗌 U	Jpstream sto	orage retrofit		
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unkn	own		<del></del>			
	FYTENT OF PHYSICAL B			BLO	CKAGE SEVER	ITY: (circle	> #)		
If yes for fish barrier	CAUSE: Drop too high Water Flow too shallow Water Other:	al nown Drop: (in) Depth: (in)	A structure such as road culvert on a 3 greater stream bloo upstream moveme anadromous fish; r passage device pro	s a dam or rd order or cking the nt of no fish esent.	dam or rder or g the f sh t. A total fish blockage on tributary that would isol significant reach of stre or partial blockage that interfere with the migra- anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
NOTEC/SUTT			5		4 3		2 (1)		
NOTES/SKET	С.н.	-oehr Rd	SC-7						
L			<u></u>		REPOR	FED TO AUTI	HORITIES YES NO		

- ` `



SURVEY REACH ID: GBST-9A WTRSHD/SUBSHD: GAGES BL S. TILD DATE: 615105 ASSESSED BY:
START         TIME:        AM/PM         LMK:          END         TIME:        AM/PM         LMK:        GPS ID:
LAT 41 051 103.1 " LONG 72025 1069 " LAT 41 051 100.7 " LONG 720 25 1 1017"
DESCRIPTION: DESCRIPTION:
RAIN IN LAST 24 HOURS 🗆 Heavy rain 🖆 Steady rain PRESENT CONDITIONS 🗆 Heavy rain 🗆 Steady rain 🗆 Intermittent
□ None □ Intermittent □ Trace □ Clear □ Trace □ Overcast □ Partly cloudy
SURROUNDING LAND USE: Industrial Commercial Urban/Residential Suburban/Res Forested Institutional Golf course Park Crop Pasture Other:
AVERAGE CONDITIONS (check applicable) REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS %       □ 0-25%       □ 50%-75%       Simple planar sketch of survey reach. Track locations and IDs for all site impacts         CHANNEL WIDTH       □ 25-50 %       □ 75-100%       Simple planar sketch of survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE         Silt/clay (fine or slick)         Cobble (2.5 -10")         Sand (gritty)         Boulder (>10")         Gravel (0.1-2.5")         Bed rock
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)
AQUATIC PLANTS       Attached:       Image: none       Image: some       Image: lots         N STREAM       Floating:       Image: none       Image: lots
WILDLIFE IN OR       (Evidence of)         AROUND STREAM       Fish         Isnails       Other:
□ Mostly shaded (≥75% coverage)         □ Halfway (≥50%)         □ Halfway (≥50%)         □ Partially shaded (≥25%)         □ Unshaded (< 25%)
CHANNEL     Downcutting     Bed scour       DYNAMICS     Widening     Bank failure       Headcutting     Bank scour
Unknown       Aggrading       Slope failure         Sed. deposition       Channelized
CHANNELHeight:LT bank $5$ (ft)DIMENSIONSRT bank $5$ (ft)FACINGWidth:Bottom $3$ (ft)OWNSTREAM)Top $/2$ (ft)
REACH ACCESSIBILITY
iood: Open area in ublic ownership, ufficient room to tockpile materials, asy stream channel ccess for heavy quipment using xisting roads or trails.Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas small or distant from stream.Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.Sc-1 C G B ST-9B54321
OTES: (biggest problem you see in survey reach)

REPORTED TO AUTHORITIES YES NO

		OVERALL STREAM COND	ITION		
~ <u></u>	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 6 6	5 4 3	2 1 0	
	Right Bank 10 9	8 2 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
~	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0	
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0	
Sub Total In-str	ream:/80 + Bi	uffer/Floodplain:/80	= Total Survey	Reach /160	

## Stream Crossing

WATERSHED	SUBSHED: GAJES BLE S	. Trib		DA	те: <u>6</u>	15 108	ASSE	CSSED BY:
URVEY REACH ID: GBST-9A TIME: AM/PM PHOTO ID: (Camera-Pic #) /# 1844								
SITE ID: (Cond	dition-#) SC LAT	41 0 51 102.	6 "Long	<u>°_2 °</u>	25 !	<u>10.2</u> " LI	ИК	<b>GPS</b> (Unit ID)
TYPE: Roa	d Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beav	er Da	ım 🗌	Geological Form	nation	Other:
For Road/ Railroad	SHAPE:         Arch       Bottomless         Box       Elliptical         Circular       Other:	# BARRELS:	MATERIAL:	est.	ALIG	NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter: <u>IG <sup>M</sup> (ft)</u> Height: (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Downstream	n scour hole pankment		CULV Fla	<b>ERT SLOPE:</b> it ght (2° – 5 <sup>0</sup> ) vious (>5°)	Culvert le Roadway	so         (ft)           Width:         10         (ft)           elevation:         4         (ft)
POTENTIAL F	RESTORATION CANDIDATE	<ul> <li>Fish barrier re</li> <li>Local stream</li> </ul>	emoval 🗌 Cul <sup>.</sup> repair 🔲 Oth	vert re er:	epair/rej	placement 🔲 U	Jpstream s	torage retrofit
IS SC ACTING	G AS GRADE CONTROL	No Y	es 🗌 Unl	cnowr	1			
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVER	UTY: (circ	cle #)
If yes for fish barrier	Total Partial     Temporary Unknow CAUSE:     Drop too high Water Dr     Flow too shallow Water Dr     Other:	vn op: (in) epth: (in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a da 3rd or locking nent of ; no fis presen	am or der or the h t.	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the r anadromous fish.	ge on a d isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SUET			5			4 3	(	(2) 1
			t d					
х.		Loel	hr Rd					
)						Repor	TED TO AU	THORITIES 🗌 YES 🗌 NO

			S	tream Cros	ssing SC			
WATERSHED	SUBSHED: GAZES BL S TO'S	D	ATE: <u>6 / 5 / 0</u>	18 Asse	SSED BY: THW			
JURVEY REA	CHID: GBST-9A TIME:	_AM/PM <b>P</b>	ното ID: (Camera	-Pic #)	1# 1846-48			
SITE ID: (Con	dition-#) SC LAT <u>41 ° 51 ' 00</u>	"?" LONG 72	0 25 1 10,7 "	LMK	<b>GPS</b> (Unit ID)			
TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:								
For Road/ Railroad	SHAPE:       # BARRELS:         Arch       Bottomless         Box       Elliptical         Circular       Triple         Other:       Other:	MATERIAL: Concrete Metal Other:	ALIGNMENT:	DIMENS Barrel dia	DIMENSIONS: (if variable, sketch) Barrel diameter: <u>UML</u> (ft) Height: <u>UML</u> (ft)			
KAILKOAD CROSSINGS ONLY	CONDITION: (Evidence of)         Cracking/chipping/corrosion         Sediment deposition         Sediment deposition         Other (describe):	n scour hole ankment	CULVERT SLOPE $\Box$ Flat $\Box$ Slight ( $2^\circ - 5^\circ$ ) $\Box$ Obvious (>5°)	Culvert le Roadway	solution:         solution:         (ft)           elevation:         (ft)			
POTENTIAL I	<b>RESTORATION CANDIDATE</b> Fish barrier re	emoval 🗌 Culvert	repair/replacement	Upstream st	torage retrofit			
🗌 no	Local stream	repair D Other:						
IS SC ACTING	G AS GRADE CONTROL 🗌 No 🔲 Ye	es 🗌 Unkno	wn					
	EXTENT OF PHYSICAL BLOCKAGE:		BLOCKAGE SE	VERITY: (circ	ele #)			
If yes for fish barrier	EXTENT OF PHYSICAL BLOCKAGE:         Total       Partial         Temporary       Unknown         If yes for       Drop too high         Water Drop:       (in)         Flow too shallow       Water Denth:         (in)       (in)		a dam or A total fish bl order or tributary that significant re of or partial blo fish interfere with anadromous	ockage on a would isolate a ach of stream, ckage that may the migration of fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.			
)	Other:	5	4	3	2 1			
NOTES/SKET	CH:		<u> </u>					
	raba h mar	ł						

EM 77 diam. unter REPORTED TO AUTHORITIES YES NO

Reach Level Assessment

SURVEY REACH	DEST_OR WIRS	HD/SUBSHD:	Sec Broke Suit	DATE: 615	ASSE	CSSED BY:
Start Tim	E: <u>3</u> : <u>45</u> AM/PM)	LMK:	END TIME:	:22 AM/PM	> LMK:	GPS ID:
LAT <u>41 ° 50 '</u>	58.7" LONG 72	° 25 115"	LAT410 5014	14.5" LONG 72	2 0 2 3 104	, <u>a</u> <b>11</b>
DESCRIPTION:			DESCRIPTION:			
RAIN IN LAST 24 HC	URS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	🗆 Heavy rain	□ Steady rain	Intermittent
□ None	[]/Intermittent	Trace	Clear	Trace	□ Overcast	Partly cloudy
SURROUNDING LAN	DUSE:  Industrial Golf course	□ Commercial □ Park	□ Urban/Residential   □ Crop	Suburban/Res □ Pasture	Forested Other:	□ Institutional
AVERAGE	CONDITIONS (check a	applicable)	REACH S	SKETCH AND ST	E IMPACT TF	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	☑ 50%-75% □ 75-100%	Simple planar sketch o within the survey rea features a	of survey reach. Trac ach (OT, ER, IB,SC, leemed appropriate.	ck locations and I UT, TR, MI) as w Indicate directic	IDs for all site impacts tell as any additional
DOMINANT SUBSTR □ Silt/clay (fine or □ Sand (gritty) ☑ Gravel (0.1-2.5	ATE slick) ⊡ <sup>7</sup> Cobb ⊡ <sup>*</sup> Boul ") □ Bed n	ole (2.5 –10") der (>10") rock	E.	0500 J	1-0 <sup>-</sup> 2	<i>n oj jion</i>
WATER CLARITY	☑ Clear □Turbid (s aturally colored) □ Op dyes)	uspended matter) Daque (milky)		TTUE	ter estatement State I o	
AQUATIC PLANTS IN STREAM	Attached: 🗹 none Floating: 🖉 none [	□ some □ lots □ some □ lots		<sub>reac</sub> ión de la constante de la const		
WILDLIFE IN OR AROUND STREAM	(Evidence of) ☑ Fish □ Beaver □ Snails □ Other:	Deer		and the second		
STREAM SHADING (water surface)	<ul> <li>Mostly shaded (≥7</li> <li>□ Halfway (≥50%)</li> <li>□ Partially shaded (≥</li> <li>□ Unshaded (&lt; 25%)</li> </ul>	25% coverage) 225% )	ER-1	∫ €I	Ŕ-1	
CHANNEL	Downcutting	Bed scour	1 /			
DYNAMICS	Widening	Bank failure		/		
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Slope failure Channelized				
CHANNEL	Height: LT bank	(ft)		j		
DIMENSIONS	RT bank	(ft)				
(FACING	Width: Bottom	(ft)		k.		
DOWNSIKEAWI	Тор	<u>    (ft)</u>				
R	EACH ACCESSIBILITY					
Good: Open area in	Fair: Forested or Di	fficult. Must cross				
public ownership,	adjacent to stream.	insitive areas to get to				
stockpile materials,	Access requires tree str	ream. Few areas to		<u>^</u>		,
easy stream channel	landscaped areas.	id/or located a great	1 Pond	y )		
equipment using	Stockpile areas dis	stance from stream.				
existing roads or trails.	stream.	uipment required.				
5 4	3 2	1				
NOTES: (biggest prob	lem you see in survey rea	ch)				
				REPORT	FED TO AUTHOR	ITIES YES NO

		OVERALL STREAM COND	ITION		
\	Optimal	Suboptimal	Marginal	Poor	
AN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	(8,0 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 (7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank (10, 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10' 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15(14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Sub Total In-str	ream:/80 + B	uffer/Floodplain:/80	= Total Survey	Reach /160	

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Goges Bk South Thib 6/5/08 DRB ER 0-B5T-093 4:00 DBCanon 1852 ER-01 41°50' 53.8" 72° 25% 12. other severe crountie 41°50'50.1" 72°25'09.7" 72° 25% 12.0" Bouh Scow/Jailure Bark of concern: outsick corren of wearders bength 2 sections 80' éach other smalter, older sconarg Bot width = 8' Top w = 25' welked w= 3' I-orest Bank stabilization, glade caribal No threat to projacity scow height is "A mat etisting upanian width = 100 + ft enosion sevening = Y Access = 1 crosion->

Stream	Cros	eina
Sueam	CIUS	Sing

Stream Crossing	SC

		•			,			
WATERSHED	SUBSHED: Corres Goode Sand	4 Tri	( <u>)</u>	DATE:	515108	ASSES	SSED BY:	
URVEY REA	CHID: GBST-ORB TIME:	4:10	AM/PM	Рното	<b>D:</b> (Camera-Pic	:#) [ <u>an</u> i	M 141453	
SITE ID: (Con	dition=#) SC- <u>D1</u> LAT <u>111°</u>	<u>50 ' 61</u>	2 <u>6</u> " Long <u>7</u> 2	2°24	<u>n(0</u> " LI	MK	GPS (Unit ID)	
	ad Crossing 🔲 Railroad Crossing 🔲 N	Aanmade	Dam 🔲 Beaver	r Dam [	Geological Form	nation	Other:	
FOR ROAD/ RAILROAD	SHAPE:     # BAR       Arch     Bottomless       Box     Elliptical       Circular     Trij       Other:     Oth	RELS: gle uble ole ler:	MATERIAL: Concrete Metal Other:		GNMENT: low-aligned Not flow-aligned Do not know	DIMENSI Barrel dian	ONS: (if variable, sketch) meter: $15.7$ (ft) Height: $15.7$ (ft)	
ONLY	CONDITION: (Evidence of)         Cracking/chipping/corrosion         Sediment deposition         Other (describe):	n scour hole vankment		LVERT SLOPE: Flat Stight (2° – 5 <sup>0</sup> ) Obvious (>5°)	Roadway	Width:         1/5/2         (ft)           elevation:         3         (ft)		
POTENTIAL RESTORATION CANDIDATE  Fish barrier removal Culvert repair/replacement  Upstream storage retrofit								
			es 🗌 Unbr	own				
15 5C ACTIN				B	OCKAGE SEVER	RITY: (circl	le #)	
If yes for fish barrier	Image: CAUSE:       Image: Cause:         Image: Cause:	• (in) (in)	A structure such as road culvert on a 3 greater stream bloo upstream moveme anadromous fish; r passage device pre	s a dam or ord order or cking the ent of no fish esent.	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	ige on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
)	U Other:		5		4 3	)	2 1	
NOTES/SKE1		1 D		nific po Like po manony				
)					REPOR	TED TO ALL		
	·····							

5C Gages Brook South Trib GB37.09B 4:15pm B37.09B 4:15pm 6/5/08 Canor 56-02 Lot 41051'495" Long. 72°25'09.1" 6/5/0% Canon, 57-58 Type: road crossing Ressel: one material concrete Alignment flow al. Shape: bottomless Amensions. Oramoter 24in Culvert Lenght: WOGL Roding elevation: 356 Condition Chipping Culvert slope: 2250 Restoration Candidate: No Blockage severity. 4 Water Drop. 40ft

Reach Level Assess

ach Level Assessm	ient	R	CH
Date: <u>615108</u>	Asses	SSED BY:	
<u>р: 32</u> ам/рм LM	К:		GPS ID:

SURVEY REACH ID: CB-O WTRSHD/SUBSHD: Cr	DATE: $615108$ Assessed by:
START TIME: <u>AMPM</u> LMK:	END TIME: $0:32$ AM/PM LMK: GPS ID:
LAT <u>41 ° 51 ' 105</u> " LONG 12º 25 '37.1"	LAT 41 ° 51 '25.4" LONG 72°25 129.1"
Description:	Description:
RAIN IN LAST 24 HOURS 🗆 Heavy rain 🔅 Steady rain	<b>PRESENT CONDITIONS</b> Heavy rain Steady rain Intermittent
□ None □/Intermittent □ Trace	□ Clear □ Trace ☑ Overcast □ Partly cloudy
SURROUNDING LAND USE:  Industrial Golf course Park	□ Urban/Residential □ Suburban/Res □ Forested □ Institutional □ Crop □ Pasture □ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
Base Flow as %         □ 0-25%         □ 50%-75%           Channel Width         □ 25-50 %         □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE         Silt/clay (fine or slick)       Cobble (2.5 -10")         Sand (gritty)       Boulder (>10")         Gravel (0.1-2.5")       Bed rock	Bridge
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)	E.
AQUATIC PLANTS       Attached:       none       some       lots         IN STREAM       Floating:       none       some       lots	15357-01
WILDLIFE IN OR       (Evidence of)         AROUND STREAM       Image: Construction of the strength of the strengt of the strength of the strength of the strength of the strength o	Brosion out
STREAM SHADING (water surface) $\square$ Mostly shaded ( $\geq$ 75% coverage)Image: Descent black Image: Descent black 	ER-2 ER-2
CHANNEL Downcutting Bed scour	
DYNAMICS Widening Bank failure	
Unknown Headcutting Bank scour Aggrading Slope failure Sed. deposition Channelized	natural
Height: LT bank 4 (ft)	Robon e
DIMENSIONS RT bank U (ft)	
(FACING Width: Bottom HTZ (ft)	rel
DOWNSTREAM) Top 90.25 (ft)	
Good: Open area in Fair: Forested or Difficult. Must cross	A de de la
public ownership, developed area wetland, steep slope, or	FR. STEFaver
sufficient room to Access requires tree stream. Few areas to get to	Trac pon
easy stream channel removal or impact to stockpile available	The return of Cl'1.61
access for heavy Iandscaped areas. and/or located a great Stockpile areas distance from stream	
equipment using small or distant from Specialized heavy	Read
5 4 3 /2 1	Intern
NOTES: (biggest problem you see in survey reach)	
) Consider making pre-tributary part of	G1402
₹°	
	<b>Reported to authorities</b> Yes No

10

Contraction of the local division of the loc	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habit of habitat is obvious; substr unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the strear surfaces covered by vegeta disruption of streambank vegetation is very high; veg- has been removed to 5 centimeters or less in ave stubble height.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall bank both sides of the stream ero a fast rate; erosion contribut significant amount of sedime stream; obvious threat to pro or infrastructure.
	Left Bank 10 9	8 7 6	(5 4 3	2 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than ban not able to enter floodplain. Stream deeply entrenched.
	20 10 10 17 16			
	20 19 18 17 16	15 14 13 12 11	10 9 (8 7 6	5 4 3 2 1
	20 19 18 17 16 OVER	15 14 13 12 11 ALL BUFFER AND FLOODPLA	10 9 <u>8</u> 7 6 IN CONDITION	5 4 3 2 1
	20 19 18 17 16 OVER Optimal	15 14 13 12 11 ALL BUFFER AND FLOODPLA Suboptimal	10 9 8 7 6 IN CONDITION Marginal	5 4 3 2 1 Poor
VEGETATED BUFFER WIDTH	20 19 18 17 16 OVER Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	15 14 13 12 11 ALL BUFFER AND FLOODPLAN Suboptimal Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	10       9       8       7       6         IN CONDITION       Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	5     4     3     2     1       Poor       Width of buffer zone <10 fee or no riparian vegetation due human activities.
VEGETATED BUFFER WIDTH	20       19       18       17       16         Over         Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9	15     14     13     12     11       ALL BUFFER AND FLOODPLA)       Suboptimal       Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.       8     7     6	10       9       8       7       6         IN CONDITION       Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.       5       4       3	5     4     3     2     1       Poor       Width of buffer zone <10 fee or no riparian vegetation due human activities.       2     1     0
VEGETATED BUFFER WIDTH	20       19       18       17       16         Over         Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9	15     14     13     12     11       ALL BUFFER AND FLOODPLAT       Suboptimal       Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.       8     7     6       8     7     6       8     7     6	10     9     8     7     6       IN CONDITION       Marginal       Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.       5     4     3       5     4     3	5     4     3     2     1       Poor       Width of buffer zone <10 fee or no riparian vegetation due human activities.       2     1     0       2     1     0
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	20       19       18       17       16         Over         Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       9	15       14       13       12       11         ALL BUFFER AND FLOODPLA)         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         9       7       6         9       7       6         Predominant floodplain vegetation type is young forest	10       9       8       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       old	5     4     3     2     1       Poor       Width of buffer zone <10 fee or no riparian vegetation due human activities.       2     1     0       2     1     0       2     1     0       Predominant floodplain vege type is turf or crop land     1
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	20       19       18       17       16         Over         Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       20       19       18       17       16	15       14       13       12       11         ALL BUFFER AND FLOODPLAT         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8 $7$ 6         8 $7$ 6         8 $7$ 6         8 $7$ 6         9 $7$ 6         10 $7$ 14         (15)         14       13       12	10       9       8       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         9       8       7       6	5     4     3     2     1       Poor       Width of buffer zone <10 fee or no riparian vegetation due human activities.       2     1     0       2     1     0       2     1     0       Predominant floodplain vege type is turf or crop land     5     4     3     2     1
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	20       19       18       17       16         Over         Over         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest         20       19       18       17       16         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	15       14       13       12       11         ALL BUFFER AND FLOODPLA)         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       13         12       11       13         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	10       9       8       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       7       6	5       4       3       2       1         Poor         Width of buffer zone <10 fee or no riparian vegetation due human activities.         2       1       0         2       1       0         2       1       0         Predominant floodplain vege type is turf or crop land       2       1         5       4       3       2       1         Either all wetland or all non- wetland habitat, no evidence standing/ponded water       3       2       1
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	20       19       18       17       16         Over         Optimal         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       20       19       18       17       16         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water       20       19       18       17       16	15       14       13       12       11         ALL BUFFER AND FLOODPLAI         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         9       7       6         15       14       13       12         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water         15       14       13       12       11	10       9       8       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       7       6	5       4       3       2       1         Poor         Width of buffer zone <10 fee or no riparian vegetation due human activities.         2       1       0         2       1       0         2       1       0         2       1       0         Predominant floodplain vege type is turf or crop land       2       1         5       4       3       2       1         Either all wetland or all non- wetland habitat, no evidence standing/ponded water       1         5       4       3       2       1
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	20       19       18       17       16         OVER         OVER         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest         20       19       18       17       16         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water         20       19       18       17       16         No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	15       14       13       12       11         ALL BUFFER AND FLOODPLAT         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       7       6         9       9       9         15       14       13       12       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water         15       14       13       12       11         Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	10       9       8       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field         10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water         10       9       8       7       6         Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	5       4       3       2       1         Poor         Width of buffer zone <10 fee or no riparian vegetation due human activities.         2       1       0         2       1       0         2       1       0         Predominant floodplain vege type is turf or crop land       2       1         5       4       3       2       1         Either all wetland or all non- wetland habitat, no evidence standing/ponded water       5       4       3       2       1         Significant floodplain encroachment (i.e. fill materia land development, or man-m. structures). Significant effect floodplain function       2       1

1.20 2

Trash and Debris

WATERSHED/SUE	SHED: Goog		DATE: <u>6/5</u>	10%	ASSESSED BY:		
JURVEY REACH ]	D: GB-61	TIME: <u>9</u> : <u>33</u> AM/PM	PHOTO ID: (Came	era-Pic #) (Arto	n 1# 1510		
SITE ID: (Condition	+#) TR- <u>(^)</u>   Lat_	°'Long	0 F	" LMK	GPS: (Unit ID)		
Industr Residential	$\begin{array}{c} S \\ a \\ \hline a \\ \hline Appliances \\ \hline Automotive \\ \hline C \\ \hline \end{array}$	aper Metal construction Medical Yard Waste Other: Acts, brush fem y	SOURCE: I Unknown [ Flooding [ I flogal dump] Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	a LAND OWNERSHIP: Public □ Unknown Private AMOUNT (# Pickup truck loads): 3		
POTENTIAL RESTORATION CANDIDATE       Stream cleanup       Stream adoption segment       Removal/prevention of dumping         no       Other:							
If yes for trash or debris removal	EQUIPMENT NEEDED : Who can do it:	Heavy equipment Tr	ash bags 🗍 Unknowr	n 🗌 Other	DUMPSTER WITHIN 100 FT:		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) lo inside a park with easy access	A large amount of trash, or with easy access. Trash m a long period of time but i few days, possibly with a sn	bulk items, in a small area ay have been dumped over t could be cleaned up in a nall backhoe.	A large amoun area, where ac or indications o	t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials		
	5	(4)	3	2	<u>1</u> ·		
notes:		Hence Barshpiles					
<u>)</u>		E		Reported	TO AUTHORITIES 🗌 YES 🗌 NO		

## TR

viranner nouncatio	Channel	Modification
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· · · · · · · · · · · · · · · · · · ·									
WATERSHED	SUBSHED:	Cares		DATE: 6 1 5 108		ASSESSED BY:			
SURVEY REA	<u>сн ID: [] /</u>	3-101	<u>Тіме:///</u> :	<u>AM/PM</u>	Рното І	<b>D:</b> (Camera-Pic #)(	anon 1# 1815		
SITE ID: (Cond	dition-#)	START LAT 41	<u>51 '224"</u>	LONG <u>72</u>	<u>•25 1372 "</u>	LMK	GPS: (Unit ID)		
<u>CM-@)</u>		END LAT $\frac{U}{2}$	<u>51 126.5</u> "	Long <u>72</u>	<u>°25 '37/</u> "	LMK	_		
TYPE: M Channelization Bank armoring concrete channel Floodplain encroachment Other:									
MATERIAL: Does channel have perennial flow?			ow?	Yes No DIMENSIONS:					
Concrete	Gabion	ion hen Is there evidence of sediment deposition? Is vegetation growing in channel? Is channel connected to floodplain?			Yes No	Height	(ft)		
Metal					Yes No	Top Width:	$\frac{14}{22}$ (ft)		
Other:					Yes No	Length:	(ft)		
Depth of flow	<b>BASE FLOW CHANNEL</b> Depth of flow $\binom{1}{2}$ (in)					REAM CORRIDO	R		
Defined low f						Available width $LT 00^{-1}$ (ft) $RT 00^{-2}$ (ft)			
					Utilities Present? Fill in floodplain?				
% of channel I	% of channel bottom <u>%</u> 9 %					Yes ⊿No ∠Yes □ No			
POTENTIAL R	ESTORATIO	ON CANDIDATE [	Structural re	oair 🗌 Bas	se flow channel cro	eation 🗌 Natural	channel design 🛛 Can't tell		
De-channelization Fish barrier removal Bioengineering							neering		
CHANNEL-	CHANNEL- A long section of concrete stream (>500') A moderate length (> 200')				out channel stabilized a	An earthen ch	annel less than 100 ft with good water		
IZATION	IZATION     channel where water is very shallow (<1"			atural stream channel.	depth, a natur	al sediment bottom, and size and to the unchannelized stream reaches			
SEVERITY: (Circle #)				ars may have for	rmed in channel. above an		ow impacted area.		
<u>```</u> ````		5	4	3		$\underline{\mathcal{O}}$	1		
NOTES:									

		St	torm Water Outfalls				
WATERSHED/SUBSHED: 65-944 DATE: 61 5108 ASSESSED BY: DEB							
SURVEY REACH ID: 6-B-01	TIME: 10: 30 AM/P	м <b>Рното ID:</b> (Camera-	Pic#) DR Lamon 1# 1817				
SITE ID (Condition-#): OT-02	LAT 41 . 51 .21.	1" LONG 72025 36.	<u>I</u> LMK         GPS: (Unit ID)				
BANK:  TYPE:    X LT RT Head  Closed    FLOW:  Dipe    Moderate	MATERIAL:	SHAPE: Single ]Metal Circular Doub ]Brick Elliptical Triple Other:	DIMENSIONS: SUBMERGED: ble Diameter: (in) Partially Fully				
Substantial     Open       Other:     channel	Concrete $\mathcal{B}$ E	Carthen Trapezoid Parabolic Other:	Depth:     3 (in)       Width (Top):     12 (in)       " (Bottom):     6 (in)				
CONDITION:       ODOR: III         None       Gas         Chip/Cracked       Sewage         Peeling Paint       Rancid/S         Corrosion       Sulfide         Other:       Sewage         VG1       Weg. Webe	NO <b>DEPOSITS/STAIN</b> None Oily our Flow Line Paint Other:	S: VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GROWTH:       None         Brown       Orange       Green         Other:       Image:       Image:         POOL QUALITY:       Image:       No pool         Good       Odors       Colors       Oils         Suds       Algae       Floatables       Other:				
ONLY       FLOATABLES:       Inone       Slight Cloudiness       Older:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         ONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         X       Other:       Other:       Other:							
If yes for daylighting: Length of vegetative cover from outfal If yes for stormwater: Is stormwater currently controlled? Yes X No X Not investigated	l:ft Type LSSUMEd Land Area	of existing vegetation: Use description: available: :: : : : : : : : : : : : : : : : : :	slope:				
OUTFALL SEVERITY: (circle #) Heavy discharge with strong smell. The am compared to the amo stream; discharge ap significant impact dow	a distinct color and/or a ount of discharge is significant unt of normal flow in receiving pears to be having a vnstream.	Small discharge; flow mostly clear and discharge has a color and/or odor, the discharge is very small compared to th flow and any impact appears to be min	d odorless. If the amount of e stream's base or / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.				
SKETCH/NOTES:	s Moter.	GIS data shows e	GBST jù the location				
Viole: Ois della shows OBSI in the location of this ditch. In veality, GBST& GB Conflow near other end of GB=01							
· /			REPORTED TO AUTHORITIES: YES NO				

					Storm	Water C	Dutfalls	OT
WATERSHED/SUB	SHED: Gan	es Ble	DA	TE: 1_ 1_ 5	108	ASSESS	ED BY:	JHW
SURVEY REACH I	D: 68-01	TIME: 10 : 25 AM/P	м Рн	юто ID: (Cai	mera-Pic #)	· · · · · · · · · · · · · · · · · · ·	/# /	818
SITE ID (Condition-	t): <b>OT-</b>	LAT-1/ º 51 · 20.	1 "Long	720251	37.5"	LMK_		GPS: (Unit ID)
BANK: LT RT He FLOW: None Trice	ad TYPE: Closed pipe	MATERIAL:	SH ]Metal ]Brick	APE: S Circular C Elliptical C Other:	Single ] Double Triple I	DIMENSIC	ONS: (in)	SUBMERGED:
Substantial	Dpen channel	Concrete	Earthen	Trapezoid Parabolic Other:	Depth Width " (B	n:( n (Top): <u>3</u> ottom):/{	<u>e (in)</u> <u>6 (in)</u> 8 (in)	NOT APPEICABLE
CONDITION:	ODOR:	NO DEPOSITS/STAIN		GGIE DENSIT None Normal Inhibited		IPE BENT	HIC GRO	WTH: Mone
Corrosion Other: Vegetated	Sulfide	Paint Other:		Excessive Other:		OOL QUA ] Good □ ] Suds □ ] Other:	LITY: [ ]Odors [ ] Algae [	ľNo pool ]Colors □Oils ] Floatables
FOR     Co       FLOWING     TU       ONLY     FLO       OTHER     I       CONCERNS:     I	LOR: ZATABLES: ZATABLES: ZATABLES: ZATABLES: ZATABLES: Needs Regular Ma	Clear Brown C Clear Slight Cloudir None Slight Cloudir None Sewage (toilet pr/plastic bags) E intenance B	Grey Y Y ness C C t paper, etc.) Dumping (bul Bank Erosion	ellow Gr loudy Op Pet k) Ex Oth	een 🔲 Ora vaque roleum (oil cessive Sed ner:	ange 🗌 R sheen) imentation	ed 🗌 Oth	ier:
If yes for daylightin Length of vegetative	ng: cover from outfall	ATE Discharge in ve	estigation trofit	Stream daylig Other: egetation:	hting L I	Local stream	m repair/ou	utfall stabilization
If yes for stormwat Is stormwater current Yes No	er: ily controlled? Not investigated	Land Area	Use descript available:	ion:				
OUTFALL SEVERITY: (circle #)	Heavy discharge with strong smell. The amor compared to the amor stream; discharge app significant impact dow	a distinct color and/or a ount of discharge is significant unt of normal flow in receiving oears to be having a instream.	Small dischar discharge has discharge is v flow and any i	ge; flow mostly cle a color and/or ode ery small compare mpact appears to	ear and odorles or, the amount ed to the strean be minor / loca	ss. If the of n's base lized.	Outfall does n discharge; sta of causing an	iot have dry weather lining; or appearance y erosion problems.
SKETCH/NOTES:	<u> </u>	5	4	(3)		2		1
	C	ガ-01 マ						
		I 84 Box ca	- Iverts	tan gan yang tang tang tang tang tang tang tang t	_			
					REPC	RTED TO A	UTHORITI	ES: 📙 YES 📙 NO

.

				S	Severe B	ank Erosic	m ER
WATERSHED/SUBS	HED: Goges	Brook.		DATE: 6 / 5	108	ASSESSED	BY: DOR
SURVEY REACH:	(78-01	TIME: 10 :	CO AM/PM	PHOTO ID (CAI	mera-Pic #	t): /	# 1411 1817
SITE ID: (Condition-	#) START LAT	11 0 51 1245	" LONG 72 º2	5 1322"	LMK	GI	PS: (Unit ID)
ER- <u>01</u>	END LAT	11 0 51 1 23.6	" LONG 72.02	5 34.3"	LMK		,
		1					
PROCESS:	Currently unknown	BANK OF CO	$\mathbf{D} \mathbf{N} \mathbf{C} \mathbf{E} \mathbf{R} \mathbf{N} \mathbf{C} \mathbf{R} \mathbf{N} \mathbf{R} \mathbf{R} \mathbf{N} \mathbf{R} \mathbf{N} \mathbf{R} \mathbf{R} \mathbf{N} \mathbf{R} \mathbf{R} \mathbf{R} \mathbf{R} \mathbf{R} \mathbf{R} \mathbf{R} R$	RT Both (	looking dow	vnstream)	<i>"</i> –
Downcutting	Bed scour	DIMENSION		Straight section	Steep s	slope/valley w	all Other:
	Bank failure	Length (if no.		s and/or PT		Detter	11 6-150
Headcutting	Bank scour	Bank Ht	JT f	and/or RT	ft	Top width	$dth = 6^{-1/2} tt$
Sod demonstrian	Channelized	Bank Angle		° and/or RT	î	Wetted W	$\frac{10-20}{10}$ It
LAND OWNERSHIP		c 📋 Unknown	LANDCOVER	Forest	Field/Ag		1:
POTENTIAL RESTO	DRATION CANDIDATI	E: Grade	e control [	🗴 Bank stabilizatio	'n		
THREAT TO PROPE	ERTY/INFRASTRUCT	URE: 🔀 No	Yes (Descri	pe):			·
EXISTING RIPARIA	N WIDTH:	≤25 ft	25 - 50 ft	50-75ft75	5-100ft	⊠>100ft	
EROSION	Active downcutting; tall ban	ks on both sides	Pat downcutting evid	ent, active stream	Crode one		
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks activ	ely eroding at a	failure/ero	sion; likely cause	d by a pipe outfall, local
Channelized= 1	stream; obvious threat to pi infrastructure.	operty or	infrastructure	out to property of	scour, imp	aired riparian veç	jetation or adjacent use.
	5	n nublia	4 3	· · · · · · · · · · · · · · · · · · ·	2	1	
ACCESS:	ownership, sufficient room t materials, easy stream chan heavy equipment using exist trails.	to stockpile nnel access for sting roads or	Fair access: Foreste adjacent to stream. A removal or impact to Stockpile areas smal	d or developed area ccess requires tree landscaped areas. or distant from stream.	other sens stockpile a distance fr	ccess. Must cros itive areas to acc areas available ar om stream sectio	s wetland, steep slope or sess stream. Minimal Id/or located a great on. Specialized heavy
	5	4	4 3	(	2	1	
INOTES/CROSS SEC	DENSE E AICROACH JWASU	A C	cont	ndercot DEN ENC IM	> 41 SE BOAC JUASI	tt inc VES	
			and second second second		Reporte	D TO AUTHOR	AITIES 🗌 YES 🥅 NO
antan i 10 1001 i transm		,			······		

					Severe Ba	ank Erosion	ER
WATERSHED/SUBS	SHED: Gogy	Brook		DATE: _6_/_	5108	ASSESSED BY:	DER
SURVEY REACH:	C-B-01	TIME: <u>10</u> :	O_AM/PM	Рното ID (С	AMERA-PIC #	+): DB(mal#	G15
SITE ID: (Condition-	#) START LAT	11 . 51 . 22.2	" LONG 72 °2	5 .31.2."	LMK	GPS: (1	Unit ID)
ER- <u>0</u> 1	END LAT	0 1	" LONG°	1 11	LMK		
PROCESS:	Currently unknown Bed scour Bank failure Slope failure Channelized Private Public	BANK OF CC LOCATION: DIMENSIONS Length (if no C Bank Ht Bank Angle	DNCERN: SLT Meander bend S: GPS) LTf LTf LTf LAND COVER	RT       Both         Straight section         and/or       RT_/         and/or       RT         and/or       RT         and/or       RT         Forest       C	(looking dow on ☐ Steep s 50_ft ft °	nstream) lope/valley wall [ Bottom width _ Top width _2 Wetted Width _ Developed:	] Other: /Oft _5ft _1Oft
POTENTIAL RESTO	DRATION CANDIDATE	C: Grade	control	🗶 Bank stabilizat	tion	1997 (1997) 	
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🔀 No	Yes (Descrit	pe):		<u> </u>	
EXISTING RIPARIA	N WIDTH:	□ ≤25 ft	25 - 50 ft	] 50-75ft □	75-100ft [	<b>∑</b> >100ft	
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall ban of the stream eroding at a fa contributing significant amo stream; obvious threat to pr infrastructure.	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thr infrastructure	ent, active stream ely eroding at a eat to property or	Grade and failure/eros scour, impa	width stable; isolated a sion; likely caused by a aired riparian vegetatior	reas of bank pipe outfall, local n or adjacent use.
ACCESS:	5 Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile anel access for ting roads or	4 3 Fair access: Foreste adjacent to stream. A removal or impact to Stockpile areas small	d or developed area ccess requires tree andscaped areas. or distant from strean	2 Difficult ac other sensi stockpile a distance fro equipment	1 ccess. Must cross wetla tive areas to access str reas available and/or lo om stream section. Spe required.	and, steep slope or eam. Minimal cated a great ecialized heavy
	5		4 3		2)	1	
		to 8	y inoft evosion i. J i. J	rdereut			
)					Reportei	D TO AUTHORITIES	Yes No

			R	Reach Level As	ssessment	RCH
SURVEY REACH I	D: <u>GB-OZ</u> WT	rshd/Subshd: G-	akes Brand.	DATE: 6/ 3	ASSE	SSED BY:
START     TIMI       LAT     41 ° 51 ' 2       DESCRIPTION:     4	E: <u>10 : 30</u> AM/PM 2 <u>6-1</u> " LONG 7 0077 RIDC-{	LMK: Z° <u>25 ' 29.4</u> " E	END TIME:_ LAT_41° 57 ' DESCRIPTION: BAT	AM/PM 32.9" LONG 7 75 WIEE FE,	LMK: Z° 25 '24 VeF	GPS 10: 
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain □ Trace	PRESENT CONDITIONS	G 🗆 Heavy rain	□ Steady rain	Intermittent     Partly cloudy
SURROUNDING LANE	DUSE:  Industrial Golf cour	l 🗆 Commercial rse 🗆 Park	□ Urban/Residential □ Crop	□ Suburban/Res □ Pasture	ی Forested بالک پاک Other: با	$\Box \text{ Institutional}$
AVERAGE	CONDITIONS (chec	ck applicable)	REACH	SKETCH AND SI	FE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	∑ 50%-75% □ 75-100%	Simple planar sketch within the survey re	of survey reach. Tra each (OT, ER, IB,SC,	ick locations and I UT, TR, MI) as we	Ds for all site impacts ell as any additional
DOMINANT SUBSTRA Silt/clay (fine or s) Sand (gritty) Gravel (0.1-2.5)	ATE CHEMEN slick) 🗆 Co 🗆 Bo ") 🗌 Be	lozele w Some PLACES bbble (2.5–10") pulder (>10") d rock	A Skub RAP	Broad	. maicule airectio	n oj jiow
WATER CLARITY	Clear □Turbid aturally colored) □ dyes)	l (suspended matter) Opaque (milky)	q's e	FIGOD PLANN WEDTEP		
Aquatic Plants in Stream	Attached: none Floating: none	e □ some ⊠ lots	JE-OL			
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beave □ Snails □ Other	er KI Deer and Brach, Birgs	DETR			
STREAM SHADING (water surface)	Mostly shaded ( ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	≥75% coverage) ) (≥25% ) %)	BOIDM	IN ETLAND		
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading	Bed scour Bank failure Bank scour Slope failure	SAND SICT SHOTO SUG OF ALL			FRANCE
	Height: LT bank	$\underline{\mu } \underline{\nu} (ft)$	VERNO	BANK ~ I'H		T
(FACING DOWNSTREAM)	Width: Bottom Top		Prinawie (	mild without	ס	DEALALLY
R	EACH ACCESSIBILIT	Y		Ell'		1 MIDSIELATE
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. 3	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	WOUDED GROSS SHR Silt colub bottem 4	in the transformed to the transf	who and som	He BANK NZ'H Hour 14
<b>NOTES:</b> (biggest probl	lem you see in survey r	reach)				
1				~		
				REPOR	TED TO AUTHOR	ITIES 📋 YES 📙 NO

N. 7. \*. . .

	-	OVERALL STREAM CONDI	ITION	
	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sub Total In-str	ream:/80 + Bi	uffer/Floodplain:/80	= Total Survey	Reach /160

-

Trash and Debris

WATERSHED/SUB	SHED: GAGES TS	Rook	DATE: <u>6 / 3</u>	3 <u>108</u> 1	ASSESSED BY: DRD
JURVEY REACH I	D: 65-02	TIME: 11: / (_AM/PM	Рното ID: (Ca	mera-Pic #)	1# 1708
SITE ID: (Condition	+#) TR- <u>01</u> Lat <u></u>	<u>[° 51 ' 24,5</u> " Long	12 . 25 . 27	<u><u> </u></u>	GPS: (Unit ID)
TYPE: Industrial Commercial Residential	MATERIAL:         Plastic       Pap         Tires       Con         Appliances       Yan         Automotive       Oth	per	SOURCE: Unknown Flooding Ullegal dump Local outfall	LOCATION: Stream Riparian Area Lt bank Rt bank	LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 1 (22 c)
POTENTIAL REST	ORATION CANDIDATE	] Stream cleanup	madoption segment	Removal/prev	vention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED : [ Who can do it: [	Heavy equipment Arr	ash bags 🔲 Unkno ov 🔲 Hazmat Te	wn am 🗌 Other	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., k than two pickup truck loads) loca inside a park with easy access	A large amount of trash, or with easy access. Trash m a long period of time but i few days, possibly with a sr	bulk items, in a small ar ay have been dumped or t could be cleaned up ir nall backhoe.	A large amount area, where acce or indications of t	of trash or debris scattered over a large ess is very difficult. Or presence of drums hazardous materials
NOTES:	(5)	4	3	2	
<u>}</u>				REPORTED	TO AUTHORITIES 🗌 YES 🕅 NO

TR

			-			RCH
			Ke	ach Level As	sessment	<b>MCII</b>
SURVEY REACH	D:65-05 W	rrshd/Subshd: Gas	U.S.	DATE: <u>6/3</u>	_/O<	SED BY:
START TIM	E: 12: 18 AM/PN	1) LMK:	END TIME:	: 20 AM/PM	LMK:	GPS ID:
LAT 41 ° 51 '	<u>37.9</u> " Long <u>4</u>	<u>z°25'24.2"</u>	LAT COLIS	<u>[]</u> " LONG <u>7</u>	5° <u>15'</u> 12	<u> </u>
Deservit mon. D	ARB VIZE	IENLE	Desekii Holti. Des	PT Dougle	-CUIVOT	
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain : □ Trace	PRESENT CONDITIONS	□ Heavy rain □ Trace	□ Steady rain □ Overcast	<ul> <li>Intermittent</li> <li>Partly cloudy</li> </ul>
SURROUNDING LAN	D USE: 🗆 Industria	l 🗆 Commercial rrse 🗆 Park	□ Urban/Residential □ □ Crop □	□ Suburban/Res □ Pasture	☑ Forested ☑ Other: 015	□ Institutional Fパンシ
AVERAGE	CONDITIONS (che	ck applicable)	REACH S	KETCH AND SIT	E IMPACT TR	ACKING
BASE FLOW AS % Channel Width	□ 0-25% □25-50 %	□ 50%-75% ▲ 75-100%	Simple planar sketch og within the survey read	f survey reach. Tra ch (OT, ER, IB,SC,	ck locations and II UT, TR, MI) as we	Ds for all site impacts ll as any additional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5)	ATE poent clas slick) B i'') B Clear Turbi	bble (2.5 –10") oulder (>10") ed rock	Jeaures a	eeneu appropriate. Pr	παιςαιε αιτεςποι	of flow
$\Box \text{ Stained (clear, not of the clear)} $ $\Box \text{ Other (chemicals, of the clear)} $	aturally colored)	Opaque (milky)	Sino Come			
AQUATIC PLANTS IN STREAM	Attached: non Floating: Anon (Evidence of) Patter S Fish Beau	e Some lots e some lots en Jamen and Page er Deer	Set Film	another a		
STREAM SHADING (water surface)	☐ Snails ☐ Othe ☐ Mostly shaded ☐ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 25	r: (≥75% coverage) b) 1 (≥25% ) 5%)	Live Jours			
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading Sed. deposition	Bed scour Bank failure Bank scour Slope failure Channelized	2 Martin 254	ş.		
CHANNEL DIMENSIONS (FACING DOWNSTREAM)	Height: LT bank RT bank Width: Bottom Top	$\begin{array}{c} 2.75  (ft) \\ 2.0  (ft) \\ \hline 8-9  (ft) \\ 11  (ft) \end{array}$	del hal	> * { <sup>1</sup> / <sub>2</sub>		
R	EACH ACCESSIBILI	<u> </u>		K with		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy	North States	- 4.0 		
5 (4	stream.	equipment required.	× × × × ×			•
NOTES: (biggest prob	lem you see in survey	reach)	BARDEZ	N.NC		gran C. X.
)				5.		
				REPORT	ГЕД ТО АПТНОРІ	
· ••••••••••••••••••••••••••••••••••••		· · · · · · · · · · · · · · · · · · ·			~~ 10 AUTHORI	

		OVERALL STREAM COND	ITION	
<u>.</u>	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	<u> </u>	2 1 0
	Right Bank 10 9	8 7 6	<u>6</u> 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAJ	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Kight Bank 10 9	8 7 6	<u>543</u>	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 (17)16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sub Total In-str	ream:/80 + B	uffer/Floodplain:/80	= Total Survey	Reach/160

					Severe B	Bank Er	osion	ER
WATERSHED/SUBS	HED: Gages			DATE: <u>6</u> /	3108	ASSES	SED BY:	
SURVEY REACH:	3B-03A	TIME: <u>/2</u> :	30 AM/PM	Рното ID ((	CAMERA-PIC	#): 17/	// /#	
SITE ID: (Condition-	#) START LAT	0 1	" Long °	1 11	LMK		GPS: (t	Jnit ID)
<u>er01</u>	END LAT	0 t	" LONG°	t t!	LMK_		Ì	
PROCESS:	Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized Private Public	BANK OF CO LOCATION: DIMENSIONS Length (if no C Bank Ht Bank Angle	DNCERN: • LT Meander bend S: GPS) LTf LTf LT LAND COVER	RT Bot Straight section and/or RT_ and/or RT_ and/or RT_ Forest	$\begin{array}{c} \text{h} & (looking do\\ \text{ion} & \Box & \text{Steep} \\ \hline 1 & 0 & D \\ \hline \hline 3 & ft \\ \hline \hline 3 & ft \\ \hline 6 & \odot & \circ \\ \hline \hline & \hline & \text{Field/Ag} \end{array}$	wnstream, slope/vall Botto Top v Wette	) m width _ vidth ed Width _ loped:	] Other: ft ft ft
POTENTIAL RESTO	DRATION CANDIDATE	: Grade	control [ :	Bank stabiliza	ation			
EXISTING RIPARIA	N WIDTH:	≤25 ft	25 - 50 ft [	_] 50-75ft	75-100ft	<b>X</b> >1001	ft	
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall ban of the stream eroding at a fa contributing significant amou stream; obvious threat to pri infrastructure.	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thr infrastructure	ent, active stream ely eroding at a eat to property or	Grade ar failure/er scour, im	nd width stab osion; likely o paired riparia	le; isolated a caused by a j an vegetation	reas of bank bipe outfall, local l or adjacent use.
ACCESS:	5 Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile Inel access for ting roads or	4 3 Fair access: Foreste adjacent to stream. A removal or impact to Stockpile areas small	d or developed area ccess requires tree landscaped areas. or distant from strea	12 Difficult other ser stockpile distance equipme	access. Mus Isitive areas areas availa from stream nt required.	1 st cross wetla to access stru- ble and/or loo section. Spe	nd, steep slope or eam. Minimal cated a great ccialized heavy
	5	(4	3		2		1	
	HON SKEICH.							
.)					Report	ED TO AUI	HORITIES	🗌 Yes 🗌 No

## Storm Water Outfalls

WATERSHED/SUBSH	IED: Goges		DATE: <u>6 / 3 / 05</u>	ASSESSED BY:	
SURVEY REACH ID:	63.03 R 1	'IME: <u>12:55</u> AM/PM	Рното ID: (Camera-Pi	c#) Canon 1#	1715
SITE ID (Condition-#):	OT   1	AT' I	20NG ''	LMK	GPS: (Unit ID)
					I
BANK:	TYPE:	MATERIAL:	SHAPE: Single	DIMENSIONS:	SUBMERGED:
	□ □ Closed	Concrete Metal	Circular Double	Diamotor: (ii	□ No
FLOW:	pipe	Other:	Conternational Conter		Partially
Moderate		M ANC VISIBLE			
Substantial	X Open	Concrete Earther	Parabelia	epth: <u>1.5 (m)</u> -	ft
Other:	channel	Dother: Ripzap	Other: Shape	idth (Top): $30$ (m)	NOT APPEICABLE
CONDITION		DEPOSITE/STAINS.		(Bottom): 10, 3 (In)	
□ None		None	None	Brown Cora	ROWTH: Mone
Chip/Cracked	Sewage	Oily	Normal	Other:	
Peeling Paint	Rancid/Sour	Flow Line	Inhibited	POOL QUALITY:	No pool
Corrosion	Contraction of the second seco	Other:	L Excessive	Good Odors	Colors Oils
<u> </u>				Suds Algae	☐ Floatables
	L				
FOR COLO	DR: 🛛 🔀 Cle	ar 🗌 Brown 🗌 Grey	Yellow Green	Orange 🗌 Red 🗌 (	Other:
FLOWING TURE	BIDITY: No	ne Slight Cloudiness	Cloudy Opaque		
	TABLES: 1 194 INO	lastic bags)	, etc.) Petroleum (	oil sheen)	Other:
CONCERNS: $\square$ N	eeds Regular Mainte	enance 🗌 Bank En	$\nabla$ osion $\nabla$ Other: $\sqrt{a}$	matien in RI	ORAT
)		·····			<u> </u>
POTENTIAL RESTOR	RATION CANDIDAT	TE 🔲 Discharge investigati	on 🗌 Stream daylighting	Local stream repair	/outfall stabilization
no		Storm water retrofit	Other: Findables	Condroll?	
If yes for daylighting					
Length of vegetative co	over from outfall:	ft Type of exi	sting vegetation:	Slope:	o
If yes for stormwater					
Is stormwater currently	controlled?	Land Use d	escription:		
Yes No N	ot investigated	Area availal	ple:		-
OUTFALL	leavy discharge with a di	stinct color and/or a	discharge; flow mostly clear and od	orless. If the	
SEVERITY:	compared to the amount	of normal flow in receiving discharge	arge has a color and/or odor, the am	ount of discharge;	es not have dry weather staining; or appearance
	stream; discharge appear significant impact downsti	s to be having a flow a	nd any impact appears to be minor /	localized. of causing	any erosion problems.
	5	4	3	2	1
SKETCH/NOTES:					
)					
)			R	EPORTED TO AUTHOR	ITIES: UYES NO

					Stre	am Cros	ising SC
WATERSHED	SUBSHED: Acres		DA	ате: <u>6</u>	13108	ASSE	SSED BY: Egin
URVEY REA	сн ID: <b>GBO3A</b>	TIME: 1 : 05	AM/PM PH	юто ID	: (Camera-Pie	c #)	/#
SITE ID: (Con	dition-#) SC LAT	410 51 137	<u>]</u> " LONG <u>15</u> °	25	<u>17.9</u> " L	мк	GPS (Unit ID)
		···· ··· ·····························					
TYPE: Roz	d Crossing 🗌 Railroad Cross	ing 🗌 Manmade	Dam 🗌 Beaver D	am 🗌	Geological Fori	nation 🗌	Other:
For Road/ Railroad	SHAPE:     Arch   Bottomless     Box   Elliptical     Circular     Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIGI Flo	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	<b>IONS:</b> (if variable, sketch) meter: $7/4$ (ft) Height: $425$ (ft) 7/4 (ft)
CROSSINGS ONLY	<b>CONDITION:</b> (Evidence of)	on Downstream	n scour hole	CUEV	<b>TERT SLOPE:</b> tt ght $(2^{\circ} - 5^{\circ})$	Curvert le	Width: $\underline{7}$ (ft)
	Other ( <i>describe</i> ): rush			ОЪ	vious (>5°)	Roadway	elevation: <u>14</u> (ft)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culvert repair 📝 Other: į	repair/rep ack d	placement 🔲 1 depth 1117 L	Upstream st low	torage retrofit
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unknow	/n (2	1 0 0		
	EXTENT OF PHYSICAL BL	OCKAGE:		BLO	CKAGE SEVEL	RITY: (circ	le #)
If yes for fish barrier	Total Partial     Temporary Unkno CAUSE:     Drop too high Water D     Flow too shallow Water D	own Drop: (in) Depth: <u>1. 5</u> (in)	A structure such as a road culvert on a 3rd o greater stream blockir upstream movement o anadromous fish; no f passage device prese	dam or order or og the of ish nt.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Ild isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
<u>)</u>	U Other:		5		4 3		(2) 1
NOTES/SKET	CH:				Repor	TED TO AU	<b>THORITIES</b> □ YES □ NO

			Re	each Level As	ssessment	RC
SURVEY REACH	ID: <u>63-03</u> 3 WTR	SHD/SUBSHD: Gua	es Bh	DATE: <u>6 / 3</u>	/08 ASSE	SSED BY:
$\frac{START}{LAT} \frac{TIN}{2}$ LAT $\frac{41 \circ 51}{2}$	1E: <u>3 : 1 3 AM</u> PM <u>32.7"</u> LONG <u>7</u> 5C -01 (GR-03A	LMK: 2°25 '12.9"	END     TIME: 4       LAT     1       DESCRIPTION:     5	-: <u>06</u> AM/PM 57.5" LONG 75 -0.7. (GB -	LMK: 2 • <u>25 • 14</u> 38)	<u></u> G
RAIN IN LAST 24 HO	DURS 🗆 Heavy rain	□ Steady rain □ Trace	PRESENT CONDITIONS	□ Heavy rain □ Trace	Steady rain	□ Intermitte
SURROUNDING LAN	DUSE: X Industrial	Commercial e 🗆 Park	□ Urban/Residential 1 □ Crop	□ Suburban/Res □ Pasture	□ Forested □ Other:	□ Institution
AVERAGI	E CONDITIONS (check	applicable)	REACH S	SKETCH AND SI	FE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ₽ 75-100%	Simple planar sketch o within the survey rea features a	f survey reach. Tra ch (OT, ER, IB,SC, leemed appropriate.	ck locations and 1 UT, TR, MI) as w Indicate directio	'Ds for all site i ell as any addii on of flow
<b>DOMINANT SUBSTR</b> Silt/clay (fine or Sand (gritty) Gravel (0.1-2.3)	ATE slick) ØCob Dou 5") Ded	oble (2.5 –10") 1lder (>10") 1 rock		Induistrial		
WATER CLARITY $\Box$ Stained (clear, r) $\Box$ Other (chemicals,		(suspended matter) paque (milky)				
AQUATIC PLANTS IN STREAM	Attached: □ none Floating: ☑ none	$\square$ some $\square$ lots $\square$ some $\square$ lots				
Wildlife in or Around Stream	(Evidence of) ☑ Fish □ Beaver □ Snails □ Other:	Deer 2000 Sovalsid	- p			
STREAM SHADING (water surface)	<ul> <li>✓Mostly shaded (≥</li> <li>□ Halfway (≥50%)</li> <li>□ Partially shaded (</li> <li>□ Unshaded (&lt;25%)</li> </ul>	75% coverage) ≥25% ) 6)	Hin Station			
CHANNEL Dynamics	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour	baor d'wall		والمحافظة فالمحافظ فالمحافظ فالمحافظ والمحافظ	
Unknown	Aggrading Sed. deposition	Channelized	<ul> <li>International Control of Contro</li></ul>			
CHANNEL DIMENSIONS	Height: LT bank RT bank	$\frac{2.5}{1.5}$ (ft)		derrich werden die der der der der der der der der der de		
(f' ACING DOWNSTREAM)	Width: Bottom Top	(ft)			r N	
l	REACH ACCESSIBILITY			L T	Ĭ	
<b>Good:</b> Open area in public ownership, sufficient room to stockpile materials	Fair: Forested orIdeveloped areavadjacent to stream.sAccess requires trees	Difficult. Must cross vetland, steep slope, or sensitive areas to get to stream. Few areas to		5		
easy stream channel access for heavy equipment using existing roads or trails.	removal or impact to s landscaped areas. a Stockpile areas c small or distant from S _stream.	tockpile available ind/or located a great listance from stream. Specialized heavy quipment required	G	erber Rd		
5	3 2		·			
<b>NOTES:</b> (biggest prob	plem you see in survey re	ach)	11			

OVERALL STREAM CONDITION							
	Optimal	Suboptimal	Marginal	Poor			
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).		Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.			
	Left Bank 10 9	8 7 6	5 4 3	2 1 0			
	Right Bank 10 9	8 7 6	5 4 3	2 1 0			
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.			
	Left Bank 10 9	8 7 6	5 4 3	2 1 0			
	Right Bank 10 9	8 77 6	5 4 3	2 1 0			
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	) High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION				
	Optimal	Suboptimal	Marginal	Poor			
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.			
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0			
FLOODDLAD	Right Bank 10 9	8 / 6	5 (4) 3	2 1 0			
<b>FLOODPLAIN</b> VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land			
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0			
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0			
Sub Total In-stream:/80 + Buffer/Floodplain:/80 = Total Survey Reach/160							

$W_{\text{ATEDSUED}}$ $( P)$ $P_{\text{ATEDSUED}}$								
SUDVEY DEACU II	Transfer	DN 2 MANNER	DATE: 0 1 2 100	DATE: 0 2 00 ASSESSED BY: DEB				
SURVEY REACH II	11 CF5-05 5 11	ME: <u>S</u> AM/PM	PHOTO ID: (Camera-Pid		.M			
SITE ID (Condition-#): OT-02 LAT 10°31 ' 31.0" LONG 72°25 ' 16-1" LMK GPS: (Unit ID)								
BANK	TVPF	MATEDIAL	SUADE: Cinala	DIMENSIONS S	IPMERCED:			
	ad	Concrete Metal Concrete Metal PVC/Plastic Brick Other:	etal $\Box$ Circular $\Box$ Double	DIMENSIONS: 5	No			
FLOW:			ick Elliptical Triple	Diameter: (in)	Partially			
None 🗌 Tric	kle		Other:		Fully			
Moderate		Concrete Earthen	Trapezoid De	epth: $\mathcal{L}$ (in)				
Other:	Channel		Parabolic W	Vidth (Top): 5 (in) NOT APPECA				
			Other: "	(Bottom): (in)	$\langle \ \setminus$			
CONDITION:	ODOR: 🔀 No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: None				
None Chin/Created	Gas							
Peeling Paint	Rancid/Sour	Rancid/Sour Flow Line		C Other:				
Corrosion	☐ Sulfide	Paint		POOL QUALITY: No pool				
Other:	Other:	Other: UFACES	Other:	Good Odors Colors Oils				
		TEASY		Other:				
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         Ø no       Storm water retrofit       Other:       TC+6+1       Def MOUAC         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Slope:       °         If yes for stormwater:       Slope:       °								
Yes No Xi	Not investigated	Land Us Area ava	ilable:	TE PARKWELET				
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstrea	f discharge is significant normal flow in receiving to be having a am.	mall discharge; flow mostly clear and od scharge has a color and/or odor, the am scharge is very small compared to the st ow and any impact appears to be minor /	orless. If the bunt of ream's base localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.			
Cummers /Norma	5	4	3	2	1			
V OF 3 V OF 3 CTRASH STER & DEB RIS OF 2								
)		Control Co	PARUNCOT R	EPORTED TO AUTHORITIES:	YES NO			

F			Sto	orm Water O	utfalls	UI		
WATERSHED/SUBSHE	D: Grages	DATE: 61310	DATE: 6/3/06 ASSESSED BY: DES					
SURVEY REACH ID: 65-035 TIME: 3:25 AM/PM			Рното ID: (Camera-I	PHOTO ID: (Camera-Pic #) DF, COMON 1# 1722				
SITE ID (Condition-#): OT-01 LAT <u>U1 ° 5/ ' 37.1</u> " LONG <u>72 ° 25 ' 7.3</u> " LMK GPS: (Unit II								
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete Ma PVC/Plastic Br. Other:	SHAPE: Single etal Circular Doubl ick Elliptical Triple Other:	DIMENSION e Diameter:	NS: 1 <u>2 (in)</u>	SUBMERGED:		
☐ Substantial	Open channel	Concrete Earth	nen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	<u>(in)</u> (in) (in)	NOT APPECABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: ⊠ NO ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:	DEPOSITS/STAINS: Diversion of the second se	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTH         Brown         Other:         POOL QUAL         Ø Good         Suds         Other:	IIC GROW Orange MOGS ITY: 11 Ddors 10 Algae 1	TH: ⊠ None ☑ Green No pool Colors □Oils Floatables		
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:								
no If yes for daylighting:		Storm water retrofi	t Other:					
Length of vegetative cover from outfall:ft Type of existing vegetation:Slope:°								
If yes for stormwater:         Is stormwater currently controlled?         Yes No Not investigated         Land Use description:         Tudyestrial         Area available:								
OUTFALL     He       SEVERITY:     str       (circle #)     str	eavy discharge with a dist ong smell. The amount of mpared to the amount of eam; discharge appears inificant impact downstre	tinct color and/or a f discharge is significant normal flow in receiving to be having a am. 4	nall discharge; flow mostly clear and scharge has a color and/or odor, the a scharge is very small compared to the w and any impact appears to be mind	odorless. If the amount of e stream's base or / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.			
SKETCH/NOTES:					<u></u>	I		
	Pa. Th	ELINE ELINESS BAT	or you	J.+	T	-		
)				REPORTED TO AU	THORITIES	5: 🗌 YES 🔺 NO		
	9	94		Storm V	Vater Outfalls	ΟΤ		
--	---	--	---	--	--	--	--	
WATERSHED/SUBS	HED:		DATE: 6 1	3 1 08	ASSESSED BY:	Team		
SURVEY REACH II	: GB-30	TIME: 3 : 40 AM/P	м Рното ID: (	Camera-Pic #)	1725 /#			
SITE ID (Condition-#	0T- <u>3</u>	LAT 41 ° 51 ' 3	52" LONG 72° 25	· 16.3 "	LMK	GPS: (Unit ID)		
BANK: LT RT Hea FLOW: None Trick	d TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: [ ]Metal	Single <b>D</b> Double Triple Di	IMENSIONS: iameter: <u>24 (in)</u>	SUBMERGED:		
Substantial	Open channel	Concrete E	Earthen Trapezoid	Depth: Width ( " (Bot	(Top): <u>(in)</u> (tom): <u>(in)</u>	NOT APPEICABLE		
CONDITION: None Chip/Cracked	ODOR: Gas	No DEPOSITS/STAIN	S: VEGGIE DEN		PE BENTHIC GRO Brown 🔲 Orang Other:	DWTH: 🗌 None ge 🔲 Green		
Corrosion	Peeling Paint   IRancid/So     Corrosion   Sulfide     Other:   Other:	Paint Other:	☐ Inhibited ☐ Excessive ☐ Other:		OL QUALITY: [ Good □Odors [ Suds ☑ Algae [ Other:	☐ No pool ☐Colors ☐Oils ☐ Floatables		
FORCOLFLOWINGTURONLYFLOOTHERFLOCONCERNS:FLO	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:							
POTENTIAL RESTO	RATION CANDID	ATE Discharge inve	estigation 🗌 Stream day rofit 🛛 Other:	'lighting 🗌 Lo	ocal stream repair/o	outfall stabilization		
If yes for daylightin Length of vegetative of	g: cover from outfall:	ft Type	of existing vegetation:_		Slope:	0		
If yes for stormwate Is stormwater current	r: y controlled? Not investigated	Land Area a	Use description: available:					
OUTFALL SEVERITY: (circle #)	Heavy discharge with a strong smell. The amou compared to the amou stream; discharge appr significant impact dowr	a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a hstream.	Small discharge; flow mostl discharge has a color and/o discharge is very small com flow and any impact appears 4 3	ly clear and odorless r odor, the amount of pared to the stream's s to be minor / localiz	. If the f Outfall does discharge; s base ced.	not have dry weather taining; or appearance ny erosion problems.		
SKETCH/NOTES:		المحمد المربع المربع المحمد المربعة المحمد المربعة المحمد المربعة المحمد المحمد المحمد المحمد المحمد المحمد الم المحمد المربع المربع المحمد المحمد المحمد المحمد المربعة المحمد المحمد المحمد المحمد المحمد المحمد المحمد المحم	generation of the second s	<u></u>		1		
		47 3084 +	Jured and					
)			angaran	REPOR	TED TO AUTHORIT	TIES: YES NO		

					Impac	ted But	ffer	IB
WATERSHED/SUBSHED: (-	Jack S Br	sole		DATE:	61310	8 Ass	ESSED E	Y: DRB
URVEY REACH: OFB - C	22B	TIME: Š	: 15 AM/PM	Рнот	D ID: (Camera-l	Pic #)	vm /	#1719177
SITE ID: (Condition-#)	r Lat °	1 11 1	0NG °	········	' LMK		GPS:	(Unit ID)
$ \mathbf{B} - \mathcal{O}  = \sum_{i=1}^{N}  \mathbf{B} - \mathcal{O} $		<u> </u>		1 11			50	Carrier
		1					015	shevin
IMPACTED BANK:     REAST       LT     RT       Both	ON INADEQUATE:	Lack of Recently	vegetation 🕅 planted 🙀	Too narrow Other: Veto	Widespread i	nvasive p 5' form	lants 727	BRNIC
LAND USE: Priva	te Institutional	Golf Cou	rse Park	Other Publ	ic			
(Facing downstream) LT Bank				X	: INDUSTICH	N.		
RT Bank				X	: INDUSTRU	16		
DOMINANT P	aved Bare ground	d Turf/lav	vn Tall gra	ss Shrub/s	crub Trees	Other	چوند میں	. 7
LAND COVER: LI Bank							~ 1866	e e e e e e e e e e e e e e e e e e e
		<u>L</u>					Ketaiki	ng wall
INVASIVE PLANTS:	None 🗌 Rare	<u>ы</u> Б	artial coverage		tensive coverage	unkı	nown	
STREAM SHADE PROVIDED? [	None Part	ial 💢	Full WE	TLANDS PF	RESENT? No	X Yo	es 🗌 U	Jnknown
POTENTIAL RESTORATION CAN	NDIDATE Activ	ve reforestati er: FiGH	on Greenwa REFUS A	ay design [ ムズエインイ	] Natural regener	ation 🔽	Invasive	es removal
<b>RESTORABLE AREA</b> LT BANK RT Length (ft): $\sqrt{400}^{4}$ $\sqrt{100}^{4}$	REFOREST POTENTIAL (Circle #)	ATION L:	Impacted area or where the riparia not appear to be specific purpose, area available fo	n public land n area does used for any plenty of r planting	Impacted area on ei public or private land presently used for a purpose; available a planting adequate	ther d that is specific rea for	Impacted land wher encroach feature sig available	area on private e road; building ment or other gnificantly limits area for planting
Width (ft): <u>~ 20</u> 10-13			5		1 3	(2	)	1
POTENTIAL CONFLICTS WITH F	<b>REFORESTATION</b> Existing impervious c	Wi over 🗌 Sev	despread invas vere animal imp	ve plants acts (deer, b	Potential conta peaver) Other	amination 	La	ick of sun
NOTES:	YP. SICTION	WA	n z	17		(facing	s U/s	;)
			λ					
)								

						Stre	am Cros	ssing SC
WATERSHED	/SUBSHED:			DA	те: <u>6</u>	13108	5 ASSE	SSED BY: Tram
JURVEY REA	сн ID: 68-38	TIME: <u>3:55</u>	<u>2</u> am/pm	Рн	ото ID	: (Camera-Pie	c#) 17:	27 /#
SITE ID: (Con	dition-#) SC LAT	<u>41° 51 ' 37</u>	<u>[]</u> " Long 7	<u>2°</u>	<u> 25 '</u>	<u>145</u> " L	мк	GPS (Unit ID)
						······································		
TYPE: MROA	ad Crossing 🔲 Railroad Crossi	ng Manmade I	Dam 🗌 Beav	er Da	am 🗌 (	Geological For	nation	Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL:		ALIGN Flo	MMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	<b>IONS:</b> (if variable, sketch) ameter: $644$ (ft) Height: $644$ (ft)
CROSSINGS ONLY	CONDITION: (Evidence of)	Downstream	n scour hole ankment		CULVI	ERT SLOPE: t ght $(2^\circ - 5^\circ)$	Culvert le	ength: $(ft)$ Width: $(ft)$
	Other (describe):	<u>{ b040n, son</u>	1 racting	9-		vious (> 5 )	Roadway	elevation: <u>(</u> (ft)
POTENTIAL I	POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no       Local stream repair       Other:							
IS SC ACTING	G AS GRADE CONTROL	No Ye	es 🗌 Unk	nowi	n			
	EXTENT OF PHYSICAL BLO	CKAGE:	[		BLO	CKAGE SEVEI	RITY: (circ	le #)
If yes for fish barrier	CAUSE: Drop too high Water D	vn cop: (in) epth: <u>+/</u> (in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a d 3rd or locking nent of r no fis presen	am or rder or the th	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
)	C Other:		5		4	3		2 1
NUTES/SKET	Сп:			the second se		hop is duty	rmed	
						Repor	TED TO AU	THORITIES 🗌 YES 🥅 NO



SURVEY REACH ]	D: <u>GB-4</u> w	rshd/Subshd: G	ages Brooke	DATE: 6 14	10% Asse	ESSED BY:
Start Tim	E: 7 : 10 AM/PN	1 LMK:	END TIME:	7:45 AM/PM	LMK:	GPS ID:
LAT41 . 55 .	5%9 " LONG 7	9 ° 20 1499"	LATYNOSI	43.8" LONG 7	202511	- <u>1</u> 1
DESCRIPTION:			DESCRIPTION:	)1. 1720	· · · ·	
				1010 1128		
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	Heavy rain	M Steady rair	Intermittent
□ None	⊡ Intermitten	Trace	□ Clear		□ Overcast	$\Box$ Partly cloudy
SURROUNDING LAN	DUSE: 🗹 Industria	l 🗹 Commercial	Urban/Residential	□ Suburban/Res	□ Forested	□ Institutional
	□ Golf cou	rse 🗆 Park	Crop	Pasture	Other:	
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	TE IMPACT TH	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% □ 75-100%	Simple planar sketch within the survey re features	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	ck locations and . UT, TR, MI) as w Indicate directio	IDs for all site impacts vell as any additional on of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) C B ;") DB	obble (2.5 –10") oulder (>10") ed rock	_			
WATER CLARITY	Clear Turbic aturally colored) dyes)	d (suspended matter) Opaque (milky)		and the second	ya dana a waka na sa	
AQUATIC PLANTS	Attached: 🕅 non	$\square \text{ some } \square \text{ lots}$	I	distrial we	st	
IN STREAM	Floating: 1/2 none	e ∐ some ∐ lots	. 515	MAN		
WILDLIFE IN OR AROUND STREAM	(Evidence of) Ø-Fish 🗆 Beav 🗋 Snails 🖾 Othe	er Deer :: racoon song bird	ord			
STREAM SHADING (water surface)	DMM ostly shaded □ Halfway (≥50% □ Partially shaded □ Unshaded (< 25	(≥75% coverage) 6) 1 (≥25% ) 5%)	ots autholl			
CHANNEL	Downcutting	Bed scour	012-			
DYNAMICS	U Widening	🔲 🔲 Bank failure	large	0		
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Slope failure	boulders 19 sediment	\$		
	Height: LT bank	2 (ft)	appredictionst			
CHANNEL DIMENSIONS	RT bank	<u> </u>				
(FACING	Width: Bottom	/0 (ff)	faller ]	1		
DOWNSTREAM)	Ton	<u> </u>	free 1			
R	EACH ACCESSIBIL	(II)				
Good: Open area in	Fair: Forested or	Difficult. Must cross	- 	baarori		
public ownership,	developed area	wetland, steep slope, or	A	NUL	gggfinfeldelingggfineet an en offen	
sufficient room to	adjacent to stream.	sensitive areas to get to	and the second se	have be and		
stockpile materials,	removal or impact to	stocknile available	Inde	istrial const		
easy stream channel	landscaped areas.	and/or located a great	A State Sta	- Weight and a second se		
access for heavy	Stockpile areas	distance from stream.				
existing roads or trails.	small or distant from	Specialized heavy				
5 4	stream.	equipment required.				
NOTES: (biggest prob	Tem you see in survey	reach)	<u> </u>			
						<b></b> ,
	1948-14-1 - 1949-1			<b>KEPOR</b>	TED TO AUTHOR	RITIES YES NO

	Optimal	Suboptimal	Marginal	Poor
I-STREAM ABITAT Iay modify iteria based appropriate abitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION Secore each bank, determine ides by facing lownstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamba surfaces covered by vegetation disruption of streambank vegetation is very high; vegeta has been removed to 5 centimeters or less in averag stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks both sides of the stream erodir a fast rate; erosion contributing significant amount of sedimeni stream; obvious threat to prop- or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN Connection	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankf not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
	OVER	ALL BUFFER AND FLOODPLAI	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: or no riparian vegetation due t human activities.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegeta type is turf or crop land
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence o standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material land development, or man-ma structures). Significant effect
MENT	manmade structures		effect on floodplain function	floodplain function

				Storm Water O	utfalls OT
WATERSHED/SUBSHED	: G-B-02	1 Games T	3 DATE: 6/4	109 Assesse	DBY: DRS
SURVEY REACH ID:	(-13-04 TH	ме: <u>7</u> : <u>10</u> ам/ри	А Рното ID: (Cam	nera-Pic #) DE Cana	1# 1728 1720
SITE ID (Condition-#): O'	<u>r-01</u>   La	т <u>чь ° 55 ' 58</u>	" LONG 17.0 14	<u>র এ</u> " LMK	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: Si Metal Circular D Brick Elliptical T Other:	ngle <b>DIMENSIO</b> Double Criple Diameter:	NS: SUBMERGED:
Moderate Substantial Other:	Open channel	Concrete E	arthen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	(in) (in) NOT APPESCABLE (in)
CONDITION: None Chip/Cracked Peeling Paint	ODOR: 🛛 NO Gas Sewage Rancid/Sour	<b>DEPOSITS/STAINS</b> Dily         Flow Line	S: <b>VEGGIE DENSIT</b> Mone Normal Inhibited	Y: PIPE BENTH	IIC GROWTH: Mone
Corrosion	Sulfide	Paint Other:	District DISCHA	POOL QUAL           Good         0           Suds         0           Other:         0	JTY: ⊠ No pool Odors □Colors □Oils Algae □ Floatables
OTHER     Excess       OTHER     Excess       CONCERNS:     Need       POTENTIAL RESTORAT       no	BLES: None ss Trash (paper/pla s Regular Mainten	Sewage (torlet stic bags) D ance Ba C Discharge inve Storm water retr	paper, etc.) Petro umping (bulk) Exc ank Erosion Stream dayligh ofit Other:	ting	Other:
If yes for daylighting:         Length of vegetative cover from outfall:       ft         Type of existing vegetation:       Slope:         If yes for stormwater:         Is stormwater currently controlled?         Land Use description:         Type of existing vegetation:         Type of existing vegetation:         Slope:         o					
OUTFALL Heav SEVERITY: comp (circle #) streat signi	y discharge with a disti g smell. The amount of pared to the amount of m; discharge appears t ficant impact downstrea	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	Small discharge; flow mostly clea discharge has a color and/or odo discharge is very small compared flow and any impact appears to b	ar and odorless. If the r, the amount of d to the stream's base e minor / localized.	utfall does not have dry weather scharge; staining; or appearance causing any erosion problems.
SKETCH/NOTES:	5	4	43	2	1
SALETCH/ITOTES:	~ \	viewed a	when as en	d of day	yesterolar
		flow	V		

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			Sto	rm Water Outfalls			
WATERSHED/SUBS	HED:		DATE: 6 1 4 10	ASSESSED BY:			
SURVEY REACH II	):GB_4 Т	IME: 7: 3) AM/PM	Рното ID: (Camera-F	//////////////////////////////////////			
SITE ID (Condition-#	): OT- <u>2</u> L	AT 41 º 51 Buh	"LONG 72 ° 25 12 2	" LMK GPS: (Unit ID)			
BANK: / LT / RT Heat FLOW:	d TYPE:	MATERIAL:	SHAPE: Single etal Circular Double ick Elliptical Triple	DIMENSIONS: SUBMERGED: Diameter: (in) Partially			
None Trick Moderate Substantial	cle	Concrete Eart	hen Parabolic Other:	Depth: Fully Vidth (Top): (in) NOT APDESCABLE " (Bottom): (in)			
CONDITION: None Chip/Cracked Peeling Paint Corrosion	ODOR: TNO Gas Sewage Rancid/Sour Sulfide	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: IN None         Brown       Orange         Green         Other:         POOL QUALITY:       No pool         Good       Odors       Oils			
			U Otner:	U Suds Algae Floatables			
For Con FLOWING TUP ONLY FLC	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper etc.)       Petroleum (oil sheer)       Other:						
OTHER DI CONCERNS: DI	Excess Trash (paper/p Needs Regular Mainte	lastic bags) 🗌 Dum mance 🗌 Bank	ping (bulk)	Sedimentation			
POTENTIAL RESTO	RATION CANDIDAT	E Discharge investig	gation 🗌 Stream daylighting	Local stream repair/outfall stabilization			
If yes for daylightin	g:	Storm water retrof	t Other:				
Length of vegetative	cover trom outfall:	ft Type of	existing vegetation:	Slope:°			
If yes for stormwate Is stormwater current $\Box$ Yes $\Box$ No $\Box$ 1	r: y controlled? Not investigated	Land Us Area ava	e description:				
OUTFALL SEVERITY: (circle #)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		nall discharge; flow mostly clear and o scharge has a color and/or odor, the a scharge is very small compared to the w and any impact appears to be minor	odorless. If the mount of stream's base / localized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.			
SVETOW/Norma	5	4	3	2 1			
SKEICH/NUIES:							
)				REPORTED TO AUTHORITIES: YES NO			

				Storm Water Ou	utfalls <b>OT</b>		
WATERSHED/SUBS	HED: OAUF	STSK	DATE: <u>6</u> / <u>4</u>	/한중 Assesse	D BY: TETE		
SURVEY REACH II	D: 673-04 7	ГIME: <u>7:30</u> ам/рм	Рното ID: (Came	era-Pic#) NB CAN	W# 1736		
SITE ID (Condition-#	): OT- <u>23</u> 1	LAT <u>41.º 51 · 12.</u>	UNG 72 • 25 1	LMK	GPS: (Unit ID)		
BANK: LT RT Heat FLOW: None Trick Moderate Substantial Other:	Ad TYPE: Ad Closed pipe Dopen channel	MATERIAL: Concrete N VC/Plastic F Other: Concrete Ea Other:	SHAPE:       Sir         Aetal       Circular       D         Brick       Elliptical       Tr         Other:       Other:         "then       Trapezoid         Other:       Other:	ngle <b>DIMENSION</b> ouble iple Diameter:	NS: SUBMERGED: (in) Partially (in) Fully (in) NOT APPENCABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: X No Gas Sewage Rancid/Sou Sulfide Other:	DEPOSITS/STAINS None Oily r Flow Line Paint Nother: SEP. IN STRE S.S.	<ul> <li>VEGGIE DENSITY</li> <li>None</li> <li>Normal</li> <li>Inhibited</li> <li>Excessive</li> <li>Other:</li> </ul>	" (Bottom):           PIPE BENTH           Brown           Other:           POOL QUALD           Good           Suds           Other:	(in) IC GROWTH: ∑ None ] Orange ☐ Green ITY: ∑ No pool Ddors ☐ Colors ☐ Oils Algae ☐ Floatables		
FLOWING     TUF       FLOWING     TUF       ONLY     FLO       OTHER     I       CONCERNS:     I       POTENTIAL RESTO       no       If yes for daylightin	FOR       COLOR:       Image: Clear       Brown       Grey       Yellow       Green       Orange       Red       Other;         FLOWING ONLY       TURBIDITY:       Image: None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       Image: None       Slight Cloudiness       Cloudy       Opaque         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Image: Bank Erosion       Other:       Stream daylighting       Local stream repair/outfall stabilization         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Image: Local stream repair/outfall stabilization         Image: Note       Storm water retrofit       Other:       Other:       Image: Local stream repair/outfall stabilization						
If yes for advingning.         Length of vegetative cover from outfall:      ft Type of existing vegetation:         If yes for stormwater:         Is stormwater currently controlled?         Yes in No investigated         Area available:					Slope:°		
SEVERITY: (circle #)	compared to the amount stream; discharge appea significant impact downs	of normal flow in receiving ars to be having a tream.	discharge has a color and/or odor, discharge is very small compared flow and any impact appears to be	the amount of to the stream's base minor / localized.	scharge; staining; or appearance causing any erosion problems.		
SKETCH/NOTES:	MARKA	Ding wear dischorn station Makarr	her		<u>, , , , , , , , , , , , , , , , , , , </u>		
)				REPORTED TO AU	THORITIES: YES NO		

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				Stori	m Water Outfall	s <b>UI</b>
WATERSHED/SUBSHEI	): GAGES	5 BK	DATE:/	·/	ASSESSED BY	
SURVEY REACH ID: (	-3-04 T	IME::AM/PN	м <b>Рното ID</b> :	(Camera-Pic	#) meslauon 1#	1726
SITE ID (Condition-#): O	T-OHA L	AT 41 ° 51 '36.	2" LONG 22 025	115.0"	LMK	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	<b>TYPE:</b> Closed pipe	MATERIAL:	SHAPE:    Metal ,	Single	DIMENSIONS: Diameter: $ Z $ (j	SUBMERGED:
Moderate Substantial Other:	Dpen channel	Concrete E	arthen	De Wi	pth: <u>(in)</u> idth (Top): <u>(in)</u> (Bottom): <u>(in)</u>	NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: 🕅 No Gas Sewage Rancid/Sour	DEPOSITS/STAIN	S: VEGGIE DE None Normal Inhibited	NSITY:	PIPE BENTHIC G. Brown Ora Other: POOL OUALITY:	ROWTH: None Inge Green
Corrosion Other:	Sulfide	☐ Paint ☑Other: .S¥Þ/M±WT	Excessive     Other:		Good Odors Suds Algae	Colors Oils
ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       X no       If yes for daylighting:	BLES: INOT BLES: NOT ss Trash (paper/pl ds Regular Mainte	ne       Signt Cloudin         ne       Sewage (toilet         lastic bags)       D         mance       B         TE       Discharge inve         Storm water retr	ess Cloudy paper, etc.)	Opaque Petroleum (d ] Excessive S   Other: ylighting	bil sheen)          Sedimentation          CFAVES          Local stream repain	Other:
Length of vegetative cover If yes for stormwater: Is stormwater currently co Yes Yo No Not i OUTFALL Hea SEVERITY:	r from outfall: ontrolled? investigated vy discharge with a dis ng smell. The amount o	ft Type Land Area a stinct color and/or a of discharge is significant	of existing vegetation: Use description:	tly clear and odd	Slope	••
(circle #) com streating signi	pared to the amount o am; discharge appears ificant impact downstre	of normal flow in receiving s to be having a eam.	discharge has a color and/d discharge is very small con flow and any impact appea	or odor, the amo npared to the str rs to be minor / I	eam's base localized.	; staining; or appearance g any erosion problems.
SKETCH/NOTES:		iono Sait	PARKUNE OFYA KRIPEAP			1
)				R	EPORTED TO AUTHOR	RITIES: YES NO

WATERSHED/SUBSHED: $G_{13}$ Date: $6_{14}_{108}$ Assessed by:SURVEY REACH ID: $G_{8}_{0}$ TIME: $7_{14}$ Photo ID: $(Camera-Pic #)$ $D_{32}$ $H_{17}_{14}$ SITE ID (Condition-#):OT- $4B_{10}$ Lat $M_{10}$ $5_{14}$ $M_{32}$ $M_{10}$ $M_{10}$ $M_{10}$ $M_{10}$	7 <u>59</u> nit ID)
SURVEY REACH ID: GB - 04       TIME: 7:45 @M/PM       PHOTO ID: (Camera-Pic #) DBCauch, I# 1737, I         SITE ID (Condition-#): OT- 4B       LAT 10:51 '43.9" LONG 12:025 '11.1"       LMK GPS: (U	759 nit ID)
SITE ID (Condition-#): OT- 47 LAT 10.51 '43.7" LONG 12.025 '11. " LMK GPS: (U	nit ID)
BANK:       TYPE:       MATERIAL:       SHAPE:       Single       DIMENSIONS:       SUBM         LT XRT       Head       Closed       Concrete       XMetal       Circular       Double       No       No       Dimensions:       SUBM         None       Trickle       Other:       Other:       Other:       Fu       Fu	ERGED: tially ly
Image: Another are       Image: Open channel       Image: Concrete image: Earthen image: Concrete image: Concrete image: Earthen image: Concrete image	<b>ALCABLE</b>
CONDITION:       ODOR: I No       DEPOSITS/STAINS:       VEGGIE DENSITY:       PIPE BENTHIC GROWTH:         None       I Gas       None       I None       I Brown I Orange I Gre         Chip/Cracked       I Sewage       Oily       I Normal       Other:	None en
Image: Corrosion       Sulfide       Paint       Excessive       Good       Good       Odors       Colors         Other:       Other:       Other:       Other:       Other:       Other:       Other:	☐Oils les
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:	
POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall state         no       Storm water retrofit       Other:	ilization
If yes for daylighting: Length of vegetative cover from outfall:ft Type of existing vegetation:Slope:	0
If yes for stormwater:         Is stormwater currently controlled?         Land Use description:         Yes         No         Not investigated         Area available:	
OUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge; staining; or ap of causing any erosion p       Outfall does not have dry discharge; staining; or ap of causing any erosion p	weather pearance oblems.
SKETCH/NOTES: 2 1	
STORE CB SC	

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Storm	Water	Outfalle
owin	vvalo:	Quudiis

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WATERSHED/SUBSHE	D:		DATE: $( / / 6 )$ Assessed by:			
SURVEY REACH ID:	GB-04 T	IME: 7 : 45AM/PM	Рното ID: (Camera-Pi	======================================	739	
SITE ID (Condition-#): (	)T- <u>5</u> L	AT 410 51 143.8 " LO	ONG 72 . 25 . 11.1 "	LMK	GPS: (Unit ID)	
<b>BANK:</b> $\Box LT \overline{M}RT \Box$ Head	TYPE:	MATERIAL:	SHAPE: Single	<b>DIMENSIONS:</b>	SUBMERGED:	
FLOW:	Closed	PVC/Plastic Brick	$\square$ Elliptical $\square$ Triple	Diameter: 24 (in)	Partially	
None Trickle	pipe	Other:	Other:	2 2	Fully	
X Moderate		Concrete D Forthon	Trapezoid De	epth: (in)	$\mathbb{N}$	
Other:	channel	Other:	Parabolic W	idth (Top): (in)	NOT APPEICABLE	
			U Other: "	(Bottom):(in)		
CONDITION:	<b>ODOR:</b> $\square$ No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	WTH: X None	
Chip/Cracked	Sewage	Oily	Normal	Brown Orang	e 🗌 Green	
Peeling Paint	Rancid/Sour	Flow Line	Inhibited		ZNo pool	
Corrosion	Sulfide	Paint Other		Good Odors	Colors Olis	
	L Other.		Uther:	Suds Algae	Floatables	
FOR COLOR	: 🛛 🖾 Clea	ir Brown Grey	Yellow Green	Orange 🗌 Red 🗌 Ot	her:	
ONLY FLOAT	BLES: Non	e Slight Cloudiness e Sewage (toilet paper, o	Cloudy Opaque	oil sheen) 🗌 Of	her	
OTHER Exc	ess Trash (paper/pl	astic bags) Dumping	(bulk) Excessive :	Sedimentation	ner,	
CONCERNS: Nee	ds Regular Mainter	nance 🗌 Bank Ero	sion 🗌 Other:			
BOTENTIAL DEGEODIN						
Dienital Restora	FION CANDIDAT	E Discharge investigation	n 🗌 Stream daylighting [	Local stream repair/o	utfall stabilization	
If yes for daylighting:			U Other:			
Length of vegetative cove	er from outfall:	ft Type of exist	ing vegetation:	Slope:	o	
TC C				······································		
If yes for stormwater: Is stormwater currently of	ontrolled?	Land Line dee	ominitions			
Yes No Not	investigated	Area available	e:		1	
OUTFALL Hea	vy discharge with a dis	tinct color and/or a Small di	ischarge: flow mostly clear and od	orless of the		
SEVERITY: Stro	ng smell. The amount of pared to the amount of	normal flow in receiving	ge has a color and/or odor, the amo	ount of discharge: st	not have dry weather aining: or appearance	
(ctrcte #) stre	am; discharge appears ificant impact downstre	to be having a flow and	any impact appears to be minor /	localized. of causing ar	iy erosion problems.	
	5	4	3	2	1	
SKETCH/NOTES:						
	0T4	- FCB - HI	LESC			
	1×r					
		NOTE (	and the second			
	have					
		7				
3		l	Managa Ang			
)			R	EPORTED TO AUTHORIT	IES: YES NO	

						Stre	am Cros	ssing SC
WATERSHED	SUBSHED: GOALS			DA	te: 6	14108	ASSE	SSED BY:
URVEY REA	CHID: (7-B-04	TIME: 7 : 4	AM/PM	Рн	ото ID	: (Camera-Pie	: #) DR(a	MON 1# 1738
SITE ID: (Con	dition-#) SC-OL LAT	41 0 5-1 1 43	.8" LONG 7	2 °	25 '	/\./ " L	MK	GPS (Unit ID)
TYPE: 🗹 Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beav	er Da	am 🔲	Geological For	nation 🔲	Other:
FOR ROAD/ RAILROAD	SHAPE:         Arch       Bottomless         Box       Elliptical         VR ROAD/       Circular         ILROAD       Other:		# BARRELS:       MATERIAL:         Single       Concrete         Double       Metal         Triple       Other:		ALIGNMENT: Flow-aligned Not flow-aligned Do not know		DIMENSIONS: (if variable, sket Barrel diameter: <u>10</u> 1 pro- Height:	
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Downstrear	n scour hole ankment		CULV Fla	<b>ERT SLOPE:</b> t ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	Culvert le Roadway	ength:         50 % U         (ft)           Width:        (ft)        (ft)
POTENTIAL I	RESTORATION CANDIDATE	<ul> <li>Fish barrier re</li> <li>Local stream</li> </ul>	emoval 🗌 Culv repair 🔲 Oth	vert r er:	epair/rep	placement 🔲 I	Upstream st	torage retrofit
IS SC ACTIN	G AS GRADE CONTROL	X No Y	es 🗌 Unk	now	n			
	EXTENT OF PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVEI	RITY: (circ	le #)
If yes for fish barrier	☐ Total ➢ Partial ☐ Temporary ☐ Unknow Leaves, Burnhay, Section CAUSE: 972 of the 3 ☐ Drop too high Water Du ☐ Flow too shallow Water Du	vn bornels rop: (in) epth: <u>6-12</u> (in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a d 3rd or locking nent of ; no fis presen	am or der or the h t.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
<u></u>	U Other:		5		4	1 3		2 1
NOTES/SKET	rch: Note: wet	weather f	Norr wo	e der	· y tù	Inext.	Ocepe	
)						REPOR	TED TO AU	
						KEPOR	TED TO AU	

Reach Level Assessment RCH

SURVEY REACH ]	D: GB-OFA WI	RSHD/SUBSHD:	~~~ ~~ /	DATE: 6 1 4	108 AS	SSESSED BY:	
START TIM	E: 9 : 120 AM/PN	<u>Uv</u>	END TIME:	1 · 2 SAM/PM	LMK.	Kam	CPS ID:
LAT 410 51 1	43.4 " LONG 7	2025111.21	LAT UIO SI 14	full" Long 7:	10751	07711	GI S ID.
DESCRIPTION		A had lis m	DESCRIPTION:	LUNG 1	<u> </u>	01.2	
DESCRIPTION.			DESCRIPTION:				
RAIN IN LAST 24 HC	OURS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	□ Heavy rain	🗹 Steady r	ain 🗆 Intern	nittent
□ None			□ Clear		□ Overcas	st 🗆 Partly	v cloudy
SURROUNDING LAN	D USE: ⊠ Industria □ Golf cou	l 🔄 Commercial rse 🗆 Park	□ Urban/Residential □ Crop	□ Suburban/Res □ Pasture	□ Forested □ Other:	🗆 Institu	tional
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	E IMPACT	TRACKING	
BASE FLOW AS %	□ 0-25%	☑ 50%-75%	Simple planar sketch	of survey reach. Trac	ck locations ar	nd IDs for all s	ite impacts
CHANNEL WIDTH	□25-50 %	□ 75-100%	within the survey re	ach (OT, ER, IB,SC,	UT, TR, MI) a.	s well as any a	dditional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) 🚽 Co [] B 5") [] Be	obble (2.5 –10") oulder (>10") od rock	jeuures	ucemea appropriate.	Indicule dire	cuon of flow	
WATER CLARITY	Clear Turbid aturally colored) dyes)	l (suspended matter) Opaque (milky)					
AQUATIC PLANTS	Attached: non	e $\Box$ some $\Box$ lots					
	(Evidence of)		_				
WILDLIFE IN OR AROUND STREAM	☐ Fish ☐ Beav ☐ Snails ☐ Other	er 🗗 Deer ::					
STREAM SHADING (water surface)	<ul> <li>☑ Mostly shaded</li> <li>□ Halfway (≥50%</li> <li>□ Partially shaded</li> <li>□ Unshaded (&lt; 25</li> </ul>	(≥75% coverage) ))   (≥25% ) %)		55	la -		
CHANNEL	Downcutting	Bed scour	Story	A.			
DYNAMICS	Widening Headcutting	Bank failure Bank scour Slope failure	autwirt 72		Lallen	free	
Unknown	Sed. deposition	h Channelized	work for the second second	<b>una</b> nni 1911 de la	$\vee$		
CHANNEL	Height: LT bank	<u> </u>	ALD TO S *				
DIMENSIONS	RT bank	(ft)		ì			
(FACING	Width: Bottom	(ft)	105.022 >	a control of			
DOMISINGALWI	Top	(ft)	for a l	$\sim$			
R	EACH ACCESSIBILI		-	< e ot			
Good: Open area in	Fair: Forested or	Difficult. Must cross		- the	h,		
public ownership,	developed area	wetland, steep slope, or	1 \2	1 tree			
sufficient room to	Access requires tree	stream. Few areas to	1	Innl			
easy stream channel	removal or impact to	stockpile available		Verdendament	n an Star Balancia Soction de Constante de Constante d'		
access for heavy	stockpile areas	distance from stream	Indus	trial East			
equipment using existing roads or trails	small or distant from	Specialized heavy	1-1 and an and a second second	on an	9.5.7 Magtasenska 2007-silan seksedikasi barange	telesidering.	
5	stream.	equipment required.	-				
NOTES: (biggest prob	lem you see in survey	reach)					
)	A m 4 1	*					
	YUUYU						
				Denor			
				KEPOR	IED TO AUTH	IORITIES 📋	LES LINO

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habit: of habitat is obvious; substr unstable or lacking.
habitat regime)	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
VEGETATIVE PROTECTION (score each bank, determine	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than	Less than 50% of the stream surfaces covered by vegeta disruption of streambank vegetation is very high; vege has been removed to
sides by facing downstream)	not evident; almost all plants allowed to grow naturally.	half of the potential plant stubble height remaining.	stubble height remaining.	5 centimeters or less in aver stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall bank both sides of the stream ero a fast rate; erosion contribut significant amount of sedime stream; obvious threat to pro or infrastructure.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than ban not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 fee or no riparian vegetation due human activities.
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vege type is turf or crop land
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	3 4 3 2 1
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill materi land development, or man-m structures). Significant effec floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

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F			Storm Water Outf	Talls OT
WATERSHED/SUBS	HED: CASTS	BK	DATE: 6 / 4 / 09 ASSESSED I	BY: DRS
SURVEY REACH II	): 66-054 TI	ME: 4 : 15 AM/PM	PHOTO ID: (Camera-Pic #) DR ( wow	# \741
SITE ID (Condition-#	): <b>OT</b> LA	.T, <u>500</u> , 1	ONG' LMK	GPS: (Unit ID)
BANK: LT RT Heat FLOW: Moderate	Ad TYPE: M Closed pipe	MATERIAL: Concrete Meta PVC/Plastic Brick Other:	SHAPE:       Single       DIMENSIONS:         Image: Circular       Double       Double         Image: Circular       Triple       Diameter:         Image: Circular       Triple       Depth:	SUBMERGED:
Other:	└ Open channel	Other:	Parabolic   Width (Top):(     Other:   " (Bottom):(	(in) NOT APPEICABLE
CONDITION: \[\] None Chip/Cracked Peeling Paint Corresion	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS: None Oily Flow Line Paint	VEGGIE DENSITY:     PIPE BENTHIC       None     Brown     0       Normal     Other:     0       Inhibited     POOL QUALITY	GROWTH: X None Orange C Green Y: No pool
Other:	Other:	Conter: Buggeres	$\Box \text{ Excessive} \qquad \Box \text{ Good } \Box \text{ Ode} \\ \Box \text{ Other:} \qquad \Box \text{ Suds } \Box \text{ Alg} \\ \Box \text{ Other: } \\ \Box \text{ Other: } \\ \Box  Comparison of the $	ors Colors Oils gae Floatables
FOR COI FLOWING TUR ONLY FLO	LOR:     Image: Clean	Brown Grey     Slight Cloudiness     Sewage (toilet paper     stic bage)	Yellow     Green     Orange     Red       Cloudy     Opaque       etc.)     Petroleum (oil sheen)	Other:
	Needs Regular Mainten	ance Bank E	osion Other: State Sedmentation	u t
POTENTIAL RESTO	PRATION CANDIDATE	Discharge investigat	on  Stream daylighting  Local stream re Other:	pair/outfall stabilization
If yes for daylightin Length of vegetative of	g: cover from outfall:	ft Type of exi	sting vegetation:Slc	ope:°
If yes for stormwate Is stormwater current	er: ly controlled? Not investigated	Land Use d Area availa	scription: Judismid	
OUTFALL SEVERITY: (circle #)	Heavy discharge with a disti strong smell. The amount of compared to the amount of stream; discharge appears t significant impact downstrea	nct color and/or a discharge is significant normal flow in receiving o be having a m.	discharge; flow mostly clear and odorless. If the rge has a color and/or odor, the amount of rge is very small compared to the stream's base of cau of cau	Il does not have dry weather arge; staining; or appearance ising any erosion problems.
SKETCH/NOTES:				<u>l</u>
Ŭ		mmar we dischar	t weather ge	
)			Reported to auth	IORITIES: 🗌 YES 🗌 NO

Reach Level Assessment

ent	RCH
Asses	SSED BY:

SURVEY REACH ]	<b>D: <u>(-В-05</u>6</b> Wi	rshd/Subshd: Go	where Ble	DATE: <u>614</u>	108 Asse	SSED BY:
START TIM	e: <u>2_:10_</u> AM/PM	b LMK:	END TIME:	: <u>45</u> AM/PM	) LMK:	GPS ID:
LAT 41 051 1	Long	<u>2°25 '06.3</u> "	LAT	1.5" LONG 7.	2° <u>25</u> '02	5-11
DESCRIPTION:	2010 176		DESCRIPTION:			
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	□ Heavy rain	□ Steady rain	Intermittent
						Partly cloudy
SURROUNDING LAN	$\Box$ Golf cou	rse $\Box$ Park	□ Urban/Residential	□ Suburban/Res □ Pasture	□ Forested □ Other:	
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SIT	TE IMPACT TF	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	<b>⊡</b> 75-100%	Simple planar sketch of within the survey red	of survey reach. Tra ach (OT, ER, IB,SC,	ck locations and I UT, TR, MI) as w	IDs for all site impacts ell as any additional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) 🗗 Co □ Bo ;") □ Be	obble (2.5 –10") oulder (>10") od rock	Jeanires	acemea appropriate.	Indicate directio	n of flow
WATER CLARITY Stained (clear, n Other (chemicals,	Clear □Turbic aturally colored) □ dyes)	l (suspended matter) Opaque (milky)		PA-1		
Aquatic Plants in Stream	Attached: none Floating: none	e $\square$ some $\square$ lots		~		
Wildlife in or Around Stream	(Evidence of) □ Fish □ Beave □ Snails □ Other	er ⊮Deer ∵		Catch basin		
STREAM SHADING (water surface)	<ul> <li>☐ Mostly shaded (</li> <li>☐ Halfway (≥50%)</li> <li>☐ Partially shaded</li> <li>☐ Unshaded (&lt; 25</li> </ul>	(≥75% coverage) )) ( (≥25% ) %)				
CHANNEL	Downcutting	Bed scour	- CFR-sc			
Unknown	Headcutting Aggrading Sed. deposition	Bank scour Bank scour Slope failure Channelized				
CHANNEL DIMENSIONS	Height: LT bank RT bank	<u>2.5</u> (ft) <u>2.5</u> (ft)	40	)T-1		
(FACING DOWNSTREAM)	Width: Bottom	<u>3.5</u> (ft)	Britge	MAND NOT HIT OF THE TAXABLE T		
R	TOP	(it)	A i i turbirida			
Good: Open area in	Fair: Forested or	Difficult. Must cross	Pueder and a second sec			
public ownership,	developed area adjacent to stream	wetland, steep slope, or sensitive areas to get to				
sumcient room to stockpile materials.	Access requires tree	stream. Few areas to	An office of the second s			
easy stream channel	removal or impact to landscaped areas.	stockpile available and/or located a great	Area Manual Area - A			
equipment using	Stockpile areas	distance from stream.				
existing roads or trails.	sinali or distant from	Specialized heavy equipment required.	An sa.	ed		
5 /4	3 2	1	4100			
INOTES: (biggest prob	tem you see in survey r	reach)				
2						
				Report	FED TO AUTHOR	

		OVERALL STREAM COND	ITION	
L	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
Program interest	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
Sub Total In-str	ream:/80 + Bi	uffer/Floodplain:/80	= Total Survey	Reach /160

Storm Water Outfalls OT									
WATERSHED/SUBSI	HED: GAGES -	BU	DA	ате: <u>6 / ч</u>	1 108	ASSES	SED BY:	DRB	
SURVEY REACH ID	:GB-053 1	`IME:AM/PI	м Рн	юто ID: (Ca	mera-Pic #	)DB( inc	/# 1	768	
SITE ID (Condition-#)	0T- <u>O(</u> 1	AT <u>410 57 145</u>	7_" Long	720251	06.3"	LMK_	(	GPS: (Unit ID)	
BANK: LT RT Hea FLOW: None Trick Moderate	d <b>TYPE:</b> d Closed pipe	MATERIAL:	SH ]Metal X ]Brick	APE: S Circular S Elliptical S Other:	Single Double Triple	DIMENSI Diameter:	IONS:	SUBMERGED:	
Substantial Other: Very sliphy	Open channel	Concrete E	arthen	Parabolic Other:	Widt " (E	n h (Top): 3ottom):	(in) (in) (in)	NOT APPESICABLE	
CONDITION:	ODOR: ANO	DEPOSITS/STAIN	S: VE	GGIE DENSI None Normal	ry: P	<b>IPE BEN</b> Brown Other:	THIC GRO	WTH: 🕅 None e 🔲 Green	
Corrosion	Sulfide	Paint Mother: Milder Mole		Excessive Other:		OOL QU Good [ Suds [ Other:	ALITY: <u>k</u> Odors [ Algae [	] No pool ]Colors	
FLOWING ONLY     TUR       ONLY     FLO       OTHER     E       CONCERNS:     N       POTENTIAL RESTO       no	BIDITY: X No ATABLES: X No Excess Trash (paper/p Needs Regular Mainto RATION CANDIDA	ne Slight Cloudin ne Sewage (toilet plastic bags) S D enance B TE Discharge inve	ess C C paper, etc.) humping (bul ank Erosion sstigation c rofit	loudy Op Pet k) Ex Otl Stream daylig Oth'er:	paque roleum (oil ccessive Sec her: hting A	Dancia sheen) limentatio Local stre	am repair/or	her: U	
<i>If yes for daylighting</i> Length of vegetative c	g: cover from outfall: _	ft Type	of existing v	regetation:			Slope:	o	
If yes for stormwate Is stormwater currentl X Yes □ No □ N	r: y controlled? lot investigated	Land Area	Use descript available:	ion: Comm	evit M.	dustrie	1 (sofrio	м со.)	
OUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge is color and/or odor, the amount of discharge; staining; or appeara of causing any erosion problem					not have dry weather aining; or appearance y erosion problems.				
SKETCH/NOTES:	<u>&gt;</u>	in soil )	4	(1)		2		1	
junk lippe		Friday Friday N, S Flor	light (4	murorer		Parking Lot			
<u>)</u>		Receive /			REP	ORTED TO	AUTHORITI	es: 🗌 yes 🖉 no	

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r

					Se	evere Ba	ank Erc	sion	EF	2
WATERSHED/SUB	SHED: GALEES	BU		DATE:	14	108	ASSESS	SED BY:	DEB	
SURVEY REACH:	GB-05B	TIME: Z:	2 <u>0</u> am/pm	Рното І	D (CAMI	era-Pic #	):78(M		7711	
SITE ID: (Condition-	#) START LAT	1051 142.71	" Long 72.°	25 104311	Ĭ	JMK	1. N. O. C. W.	GPS: (1	Init ID)	
ER	END LAT	1 ° 51 49.2	" LONG 72 °	25 101.3"	I			(		
PROCESS:	Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized Private Public	BANK OF CO LOCATION: { DIMENSIONS Length (if no C Bank Ht Bank Angle	NCERN: X LT Meander bend : GPS) LT LT LT LT LAND COVE	d CRT C RT C Straight : ft and/or F ft and/or F and/or R CR: C Forest	Both ( <i>loc</i> section [ RT RT RT Fig	oking dow ] Steep sftftftftftetd/Ag [	nstream) lope/valle Bottor Top w Wettee	ey wall [ n width ridth d Width oped:	] Other: <u>3</u> ft <u>5</u> ft <del>2 4550</del> Rawb5 (	RUDC- CANSCI
DOTENTIAL DECT			·					PRIV	ATE PAA	UC)
No	JRATION CANDIDATE	Crade	control	Bank stab	oilization					
THREAT TO PROP	ERTY/INFRASTRUCT	J <b>RE: </b> No	Yes (Desc	ribe):						
EXISTING RIPARIA	AN WIDTH:	<b>⊠</b> ≤25 ft	☐ 25 - 50 ft	☐ 50-75ft	75-1	00ft [	]>100ft	t		
EROSION SEVERITY(circle#)	Active downcutting; tall ban of the stream eroding at a fa contributing significant amo stream; obvious threat to pr infrastructure.	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting ev widening, banks ac moderate rate; no infrastructure	vident, active streat ctively eroding at a threat to property of	ım ı or	Grade and failure/eros scour, impa	width stable ion; likely c aired riparia	e; isolated ar aused by a p n vegetation	eas of bank vipe outfall, loo or adjacent u	cal se.
	5		4	3	2			1		
ACCESS:	Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile inel access for ting roads or	Fair access: Fores adjacent to stream removal or impact Stockpile areas sm	sted or developed . Access requires to landscaped are hall or distant from	area tree as. stream.	Difficult ac other sensi stockpile a distance fro equipment	cess. Must tive areas to reas availab om stream s required.	t cross wetla o access stre ole and/or loc section. Spe	nd, steep slop eam. Minimal cated a great cialized heavy	e or
	5	(4	)	3	2			1		
NUTES/CROSS SEC	Grass		HILL G	2.465	vote: 1 m p m be n for n	Repet de la so contens concles ring o project ula al atomit	y our rest rest be on be on t poo bo m	in go alling by. ( benefit torail nthe nop in	pecno solar Ouver de ta i (cerge nigeo	cture). non
)	(AS	FALLEN SOD CLUM	35			Reporte	D TO AUTI	HORITIES	Yes 🗌	No

Stream Crossing SC

WATERSHED	SUBSHED: GAALS			DATE: 🖉	<u> </u>	ASSE	SSED BY:
JURVEY REA	CH ID: (7/3-5B	TIME: <u>2:15</u>	_AM/PM	Рното Ш	<b>D:</b> (Camera-Pie	<u>c #) (Cano</u>	n 1# 1769
SITE ID: (Con	dition-#) SC- <u>[2]</u>   LAT	<u>11°51 14/</u>	<u>/</u> " LONG' <u>7</u> 2	<u>°25</u> '	<u> 2 "</u> L	MK	GPS (Unit ID)
TYPE: 🗹 Roa	ad Crossing 🔲 Railroad Crossir	ng 🔲 Manmade I	Dam 🔲 Beaver	Dam 🔲	Geological For	mation 🔲	Other:
	Shape:	# BARRELS:	MATERIAL:	ALIG	NMENT:	DIMENS	IONS: (if variable, sketch)
	Arch Bottomless	Single	Concrete	Flo	ow-aligned	Barrel dia	ameter: <u>3</u> (ft)
FOR ROAD/	Circular	Double	Metal		ot flow-aligned		Height: <u>3</u> (ft)
RAILROAD	Other:	Other:	U Other:		o not know		Rectioner general
CROSSINGS	<b>CONDITION:</b> (Evidence of)			CULV	/ERT SLOPE:	Culvert le	ength: $(ft)$
UNLY	Cracking/chipping/corrosion	Downstream	n scour hole	Fla	at $(2^{\circ}, 5^{\circ})$		Width: $\leq$ (ft)
	Sediment deposition	🗌 Failing emb	ankment		(2 - 5)	Poodway	algustion: 7 (ft)
	Uther (describe): MM				, , , , , , , , , , , , , , , , , , ,	Roadway	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🔲 Culve	rt repair/re	placement	Upstream s	torage retrofit
no		Local stream	repair 🗌 Other	:			
IS SC ACTING	G AS GRADE CONTROL	No Y	es 🗌 Unkn	own			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLC	CKAGE SEVE	RITY: (circ	ele #)
	Total Partial	un .	A structure such as	a dam or	A total fish blocka	age on a	A temporary barrier such as a
If yes for		*11	road culvert on a 3	rd order or sking the	tributary that wou	Id isolate a	beaver dam or a blockage at
fish barrier	CAUSE:	3.4 (in)	upstream movemen	nt of	or partial blockag	e that may	very little viable fish habitat
	Flow too shallow Water De	epth: 4 (in)	passage device pre	io fish esent.	anadromous fish.	migration of	above it; natural barriers such as waterfalls.
)	Other:	1 ( )	5		4 3		2 1
NOTES/SKET	°СН:		<u> </u>		<u> </u>		
			an and an	««تَصوقين»»، وال			
	مردن . مردن .		- 473-martfo <sup>2</sup>				
	647 <sup>74</sup>			1			
	محمد محمد						
		K	1				
		$\sim$					
		No					
)					_		
L					REPOR	TED TO AU	THORITIES   YES   NO

Stream Crossing

URVEY REACH ID:
SITE ID: (Condition #)       SC-Q2       LAT       LAT       Long T2 ° 25 ° 20 5 °
TYPE:       Road Crossing       Mainade Dam       Beaver Dam       Geological Formation       Other:         For ROAD/       Arth Bottomless       Single       Concrete       Flow-aligned       Dimensions: (if variable, sketch)         Box       Elliptical       Single       Double       Metal       Not flow-aligned         CrossINGS       Other:       Other:       Other:       Culvert length:       U/Or (ft)         CrossINGS       ConDITION:       Evidence of)       Downstream scour hole       Flat       Slight (2° - 5°)       Culvert length:       U/Or (ft)         Sediment deposition       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Solution of the construction of the constener on the constenere construction of the
TYPE:       Processing       Railroad Crossing       Mammade Dam       Geological Formation       Other:         FOR ROAD/       Arch       Bottomless       Single       Concrete       Flow-aligned       Barrel diameter:       #One (fr)         RAILROAD       Circular       Double       Other:       Do not know       Culvert sLope:       Do not know         CROSSINGS       ONLY       Other:       Dother:       Do not know       Culvert SLOPE:       Culvert length:       #One (fr)         Matter       Cracking/chipng/corrosion       Downstream scour hole       Flat       Slight (2° – 5°)       Culvert length:       #One (fr)         Science       Gother:       Gother:       Downstream scour hole       Slight (2° – 5°)       Roadway elevation:       (fr)         Box       Other (describe):       Gother:       Downstream repair       Other:       Culvert repair/replacement       Upstream storage retrofit         Chos       Dote (ascribe):       Gother:       Local stream repair       Other:       A structure such as a dam or ned culvert on a 3rd order or graduation of astream, or partial blockage that may interfere with the migration of anadromous fish, no fish       A structure such as a dam or ned culvert on a 3rd order or graduation of astream, or partial blockage that may interfere with the migration of anadromous fish.       A structure such as a dam or ned c
FOR ROAD/ RAILROAD CAROSSINGS ONLY       Battel: Box       Batteliptical       Battels: Concrete       Battel: Flow-aligned       Battel diameter: Double       Battel diameter: Concrete       Culvert stopped       Culvert stopped       Culvert length: Culvert length:       Up (th)       Culvert length: Culvert length:       Up (th)       Culvert concrete       Culvert length: Culvert length:       Up (th)       Culvert length:       Up (th)       Culvert       Culvert repait/replacement       Upstream storage retrofit       Width:       Up (th)       Culvert       Stopped       Stopped <td< td=""></td<>
FOR ROAD/ RAILROAD CROSSINGS       Box       Elliptical       Double       Metal       Not flow-aligned         Ohter:       Other:       Other:       Double       Metal       Not flow-aligned       Culvert length:       U/O         CROSSINGS       CONDITION: (Evidence of)       Other:       Other:       Culvert sLope:       Culvert length:       U/O       (ft)         Cracking/chipping/corrosion       Downstream scour hole       Slight (2° - 5°)       Roadway elevation:       (ft)         Sediment deposition       Failing embankment       Dobrious (>5°)       Roadway elevation:       (ft)         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Uno       Local stream repair       Other:       Other:       BLOCKAGE SEVERITY: (circle #)         Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         If yes for fish barrier       CAUSE:       Soft order or grater stream blocking the upstream movement of anadromous fish, no fish passage device present.       A total fish blockage on a the wey head of a stream with wey little viable fish habitat above it, natural barriers such as waterfalls.         NOTES/SKETCH:       Soft       Soft       Soft       Soft       Soft
POTENTIAL RESTORATION CANDIDATE       Fish barrier       Fish barrier       Culvert repair/replacement       Culvert length:       Unit of the construction of the constru
CROSSINGS ONLY       ConDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Sediment deposition Other (describe): Other (describe): Other (describe): Other (describe): Support       Culvert repair/replacement       Culvert length: Slight (2° – 5°) Obvious (>5°)       Culvert length: Widh: Upstream storage retrofit Obvious (>5°)         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit Upstream storage retrofit Doter:         Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE: Total Deporary       Mathematical Second Deporary       A total fish blockage on a though that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish, no fish asage device present.       A total fish blockage on a though that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromus fish, no fish asage device present.       A total fish blockage that may interfere with the migration of anadromus fish, and fish asage device present.         NOTES/SKETCH:       S       4       3       2       1
ONLY       Cracking/chipping/corrosion       Downstream scour hole       Flat       Width:       Wid
Sediment deposition       Failing embankment       Institut (2 - 3 )       Roadway elevation:       (ft)         Other (describe):       Obvious (>5°)       Roadway elevation:       (ft)         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Sediment deposition       Image: Culvert repair/replacement       Upstream storage retrofit       (ft)         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Sediment deposition       Image: Culvert repair/replacement       Upstream storage retrofit       Image: Culvert repair/replacement         Image: Sediment deposition       Image: Culvert repair/replacement       Image: Culvert repair/replacement       Image: Culvert repair/replacement         Image: Sediment deposition       Image: Culvert repair/replacement       Image: Culvert repair/replacement       Image: Culvert repair/replacement         Image: Sediment deposition       Image: Culvert repair/replacement       Image: Culvert repair/replacement       Image: Culvert repair/replacement       Image: Culvert repair/replacement         If yes for       Image: Sediment repair       A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish passage device present.       A total fish blockage on a the very head of a stream w
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).       Image: Solution (describe).         Image: Solution (describe).       Image: Solution (describ).       Image: Solution (describe)
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Ino       Local stream repair       Other:         Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       Total       Partial         Temporary       Unknown       A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish, no fish       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish, no fish       A temporary barrier such as a dam or subscent of anadromous fish, no fish         Other:       5       4       3       2       1         NOTES/SKETCH:
Imo       I Local stream repair       Other:         Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       Total       Partial         Total       Partial       A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish por partial blockage that may interfere with the migration of anadromous fish.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a beaver dam or a blockage at the very head of a stream with passage device present.         If yes for       Other:       2       1         NOTES/SKETCH:       State of the migration of anadromous fish.       2       1
Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       Total       Partial         Total       Partial       A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as a waterfalls.         Other:       5       4       3       2       1
EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (ctrcle #)         Total       Partial         Temporary       Unknown         If yes for       A structure such as a dam or orad culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat anadromous fish; no fish         Other:       5       4       3       2       1
If yes for       If yes for         fish barrier       CAUSE:         Drop too high       Water Drop:       Image: Comparison of the passage device present.         Other:       Structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as a waterfalls.         NOTES/SKETCH:       5       4       3       2       1
If yes for       fish barrier       CAUSE:       greater stream blocking the upstream movement of anadromous fish; no fish passage device present.       significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.         Other:       5       4       3       2       1
Drop too high       Water Drop:       C       (in)       anadromous fish; no fish passage device present.       interfere with the migration of anadromous fish.       above it; natural barriers such as waterfalls.         Other:       5       4       3       2       1         NOTES/SKETCH:       Anadromous fish, no fish passage device present.       Interfere with the migration of anadromous fish.       above it; natural barriers such as waterfalls.
$\square Other: \qquad \qquad$
NOTES/SKETCH:
m i Mart Vin
ON NOST I C

Reach Level Assessment RCH

SURVEY REACH	Ш: <u>СВ-6</u> WTF	ashd/Subshd:	mars Al	DATE: 6 / 4	ASSE	SSED BY:
START     TIM       Lat 41 ° 5/ '     '       Description:     '	16: <u>3</u> : <u>00</u> AM/RM 51.5" LONG 74 Fhate 1776	LMK: • 25 • 02.5"	END TIME: LAT 05 ' DESCRIPTION:	/_: <u>35_</u> am/pm) 5/.4_'' Long_7	LMK: 20 20, 3	GPS ID:
RAIN IN LAST 24 HO	DURS 🗆 Heavy rain	□ Steady rain □ Trace	PRESENT CONDITIONS	□ Heavy rain □ Trace	□ Steady rain □ Overcast	☐ Intermittent ☐ Partly cloudy
SURROUNDING LAN	DUSE: Industrial	□ Commercial se □ Park	□ Urban/Residential □ Crop	Suburban/Res □ Pasture	⊡ Forested □ Other:	□ Institutional
AVERAGI	E CONDITIONS (check	k applicable)	REACH	SKETCH AND SIT	FE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	Ø 50%-75% □ 75-100%	Simple planar sketch within the survey re features	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	ck locations and I UT, TR, MI) as we Indicate directio	Ds for all site impacts ell as any additional n of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5)	slick) Cot 5") Bec	bble (2.5 –10") alder (>10") l rock	p	A	Ţ	IB IB JB IB
WATER CLARITY	Clear □Turbid aturally colored) □ ( dyes)	(suspended matter) Opaque (milky)				Denors percentante en esta en esta en esta esta esta esta esta esta esta esta
AQUATIC PLANTS IN STREAM	Attached: 🗹 none Floating: 🗹 none	$\Box$ some $\Box$ lots $\Box$ some $\Box$ lots		÷\$2-3	und	ing 2
WILDLIFE IN OR AROUND STREAM	(Eyidence of) ☑ Fish □ Beaver □ Snails □ Other:	r Deer (rashish				
STREAM SHADING (water surface)	☑ Mostly shaded (≥ □ Halfway (≥50%) □ Partially shaded □ Unshaded (< 25%	275% coverage) (≥25% ) %)	ERI			(0)
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading	Bed scour Bank failure Bank scour Slope failure				
CHANNEL	L Sed. deposition Height: LT bank	Channelized	EN ROM	t materiale South C	ER	4
<b>DIMENSIONS</b> (FACING DOWNSTREAM)	RT bank Width: Bottom Top	(ft) (ft) (ft)				
F	REACH ACCESSIBILITY	¢			1 6	- Inconung
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy	Oto bed 07-39 P	i-i aftor-i	EK-3	Dan Sreite
existing roads or trails.	stream.	equipment required.	Surface disch	ensemmenenensemmenenen) ta KSGC	A	A
NOTES: (biggest prob	blem you see in survey re	each)				

**REPORTED TO AUTHORITIES** YES NO

~~ <u>~</u>	Optimal	Suboptimal	Marginal	Poor	
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9		5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Jub Total In-st	ream:/80 + B	uffer/Floodplain:/80	= Total Survey	Reach/160	

\$4

Storm	Water	Outfalls

OT	

WATERSHED/SUBS	HED: Godes	Bh	DATE: 6/4/08	Assessed by: 7223			
SURVEY REACH ID	: 7-8-06 TI	ME: 🤔 : ᅇ AM/PM	PHOTO ID: (Camera-Pic #)	1# 17-16			
SITE ID (Condition-#)	OT-OZ LA	T41 . 51 151.7 "	LONG 720 25 102.5"	LMK GPS: (Unit ID)			
BANK: LT XRT Hea FLOW: None Trick	d TYPE: d Closed pipe	MATERIAL: Concrete Meta PVC/Plastic Brick Other:	SHAPE: Single D Circular Double Elliptical Triple Di Other:	IMENSIONS:     SUBMERGED:       ameter:     Image: Constraint of the second se			
Moderate Substantial Other:	Open channel	Concrete Earthe	□ Trapezoid Depth: □ Parabolic Width ( □ Other: " (Bot	(Top): (in) NOT APPEICABLE tom): (in)			
CONDITION: Chip/Cracked Peeling Paint Corrosion Other:	ODOR: X NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS:	VEGGIE DENSITY:       PIP         None       Image: Comparison of the comparison	<b>DE BENTHIC GROWTH:</b> Image       None         Brown       Image       Green         Other:       Image       Green <b>OL QUALITY:</b> Image       No pool         Good       Image       Image       Image         Suds       Image       Image       Floatables         Other:       Image       Image       Image			
FOR FLOWING ONLYCOL TUR FLO,OTHERE CONCERNS:	OR: Clea BIDITY: Non- ATABLES: Non- Access Trash (paper/pla Jeeds Regular Mainten	r Brown Grey e Slight Cloudiness e Sewage (toilet pape astic bags) Dumpi ance Bank E	Yellow       Green       Oran         Cloudy       Opaque         r, etc.)       Petroleum (oil shift)         ng (bulk)       Excessive Sedin         rosion       Other:	age Red Other; neen) Other: nentation			
POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         Image: Markow for the stream strea							
Length of vegetative cover from outrall:      t       Type of existing vegetation:      Slope:          If yes for stormwater:							
SEVERITY: (circle #)	strong smell. The amount o compared to the amount of stream; discharge appears significant impact downstree	f discharge is significant normal flow in receiving to be having a am.	I discharge; flow mostly clear and odorless. large has a color and/or odor, the amount of large is very small compared to the stream's and any impact appears to be minor / localiz	If the base ted. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.			
SKETCH/NOTES:		T	J				
}	tuber 1	2 Estropt	07-01 EBS				
		171	<u>}</u>				

				Sto	orm Water	Outfalls	ΟΤ
WATERSHED/SUBSHE	D: GAGES	BC		DATE: <u>6 / 4 /0</u>	S Asse	SSED BY:	
SURVEY REACH ID:	FB-06	TIME: <u>3</u> :00 AM/PI	M	Рното ID: (Camera-F	Pic #)	1# 17	76
SITE ID (Condition-#): C	DT- <u>01</u>	LAT 410 51 51	<u>. 7</u> " Lon	16 72º 25 02.5	" LMK	G	PS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL:	]Metal ]Brick	SHAPE: 🛛 Single Circular 🗌 Double Elliptical 🗍 Triple Other:	<b>DIMENS</b> e Diameter	SIONS: r:_)5 (in)	SUBMERGED:
Moderate Substantial Other:	Dpen channel	Concrete E E	arthen	Trapezoid   I     Parabolic   T     Other:   T	Depth: Width (Top): " (Bottom):	<u>(in)</u> (in) (in)	NOT APPEICABLE
CONDITION:	ODOR: M Gas Sewage	To DEPOSITS/STAIN	s:	VEGGIE DENSITY:	PIPE BEN	THIC GROW	TH: 🕅 None
Corrosion	Sulfide	Paint Other:		Inhibited Excessive Other:	POOL QU Good Suds	JALITY: Odors Algae Sedwem	No pool Colors □Oils Floatables
POTENTIAL RESTORA	TION CANDID	ATE Discharge inve	estigation	Stream daylighting	Local stro	eam repair/out	fall stabilization
If yes for daylighting:         Length of vegetative cover from outfall:         ft       Type of existing vegetation:         Slope:       °         If yes for stormwater:         Is stormwater currently controlled?							
Yes     No     Not       OUTFALL     Her       SEVERITY:     con       (circle #)     stre	in vestigated avy discharge with a ong smell. The amou npared to the amou nam; discharge appenificant impact dowr	Area a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a hstream.	available: Small disc discharge discharge flow and a	Mey ound harge; flow mostly clear and o has a color and/or odor, the a is very small compared to the ny impact appears to be mino	d odorless. If the mount of stream's base r / localized.	) Outfall does no discharge; stair of causing any	t have dry weather ning; or appearance erosion problems.
Current Ni ama		5	4	3		2	
SKETCH/NOTES:	embonk 07-02	Privent OT-	01	Road hore reco	& orifi been notherer	alle oppy recently	- Dior de
)		H		]	Reported to	O AUTHORITIE	S: 🗌 YES 🔀 NO

Storm Water Outfalls									
WATERSHED/SUB	SHED: Gog	er Bh		DATE: <u>61410</u>	8 Asse	SSED BY:	DRB		
SURVEY REACH II	D: 6-B-06	TIME: 3:00 AM/PI	м	Рното ID: (Camera-l	Pic #)	/# /	776		
SITE ID (Condition-	t): <b>OT</b> - <u>02A</u>	LAT 41 º 51 ' 51	<u>.7</u> " Lo	NG <u>72° 25 ' 02.5</u>	_ LMK	(	GPS: (Unit ID)		
<b>BANK:</b> □LT □RT ☑ He <b>FLOW:</b> ☑ None □ Tric	ad TYPE: Closed pipe	MATERIAL: Concrete PVC/Plastic Other:	]Metal ]Brick	SHAPE:   Single     Circular   Doubl     Elliptical   Triple     Other:   Triple	<b>DIMENS</b> e Diameter	SIONS: r:(in)	SUBMERGED:		
Moderate Substantial Other:	🕅 Open channel	□ Concrete □ E I Other: ASP/IAC	arthen	Trapezoid Parabolic	Depth: Width (Top): " (Bottom):	<u>6 (in)</u> <u>) 0 (in)</u> <u>/ (in)</u>	NOT APPEICABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: K N Gas Sewage Rancid/So Sulfide Other:	DEPOSITS/STAIN       None       Oily       Flow Line       Paint       Other:	S:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BER Brown Other: POOL QU Good Suds Other:	VTHIC GRO	WTH: KÎ None e ] Green ] No pool ]Colors ]Oils ] Floatables		
ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         Image:       Image:       Storm water retrofit       Other:       Other:									
Length of vegetative cover from outrail:									
SKETCH/NOTES:	6. 50-70	s afonderend	4	3		2			
)		EBAD			REPORTED TO	O AUTHORITI	ES: YES NO		

Savara	Rank	Erneinn	
Oevele.	Dalik	CIUSIUII	

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	A					
WATERSHED/SUBS	shed: Grages B	note		DATE: <u>6</u> / 4	_/_ <u>0</u> % Asse:	SSED BY: JHW
SURVEY REACH:	<u>68-06</u>	TIME: <u>3</u> :	15 AM/PM	<b>РНОТО ID</b> (САМ	ERA-PIC#): F+(	) /# /3-81
SITE ID: (Condition-	#) START LAT 4	051 .50.2	" LONG <u>2°2</u>	4 1 55.8 11	LMK	GPS: (Unit ID)
ER	END LAT	<u>•51 •54.7</u>	" LONG <u>72_° 2</u>	<u>' 54.7"</u>	LMK	
PROCESS:	Currently unknown	BANK OF CO			oking downstroom	-)
$\square$ Downcutting	Bed scour	LOCATION:	Meander bend	Straight section	Steep slope/val	lley wall $\Box$ Other:
Widening	Bank failure	DIMENSIONS	3:			
Headcutting	Bank scour	Length (if no (	<i>GPS</i> ) LTf	and/or RT	ft Botto	om width <u>10</u> ft
Aggrading	Slope failure	Bank Ht	LT <u> \$</u> fi	and/or RT	ft Top	width <u>30</u> ft
Sed. deposition	Channelized	Bank Angle	LT <u>50</u>	and/or RT_30	° Wett	ed Width <u>8</u> ft
LAND OWNERSHIP	r: 🕅 Private 🔲 Public	Unknown	LAND COVER	: 🕅 Forest 🔲 F	ield/Ag 🗌 Deve	eloped:
POTENTIAL REST	DRATION CANDIDATE	·	a control	7 Pouls stabilization	979	
		Other		_ Dank Stabilization		
THREAT TO PROP	ERTY/INFRASTRUCTU	J <b>RE:</b> No	Yes (Describ	e):		
EXISTING RIPARIA	AN WIDTH:		25 - 50 ft	🕈 50-75ft 🔲 75-	100ft 🗌 >100	ft
EROSION SEVERITY(circle#)	Active downcutting; tall bank of the stream eroding at a fa contributing significant amou stream; obvious threat to pro	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thre	ent, active stream ely eroding at a eat to property or	Grade and width stat failure/erosion; likely scour, impaired ripar	ble; isolated areas of bank caused by a pipe outfall, loca ian vegetation or adiacent us
Channelized= 1	infrastructure.					
ACCESS:	Good access: Open area in ownership, sufficient room to materials, easy stream chan heavy equipment using exist trails.	n public o stockpile Inel access for ting roads or	Fair access: Foreste adjacent to stream. A removal or impact to I Stockpile areas small	d or developed area ccess requires tree andscaped areas. or distant from stream.	2 Difficult access. Mu other sensitive areas stockpile areas availa distance from stream equipment required	I st cross wetland, steep slope to access stream. Minimal able and/or located a great section. Specialized heavy
	5	4	1 3	)	2	1
	Bo	nd Scould			Joshse Head co	3
)					<b>Reported</b> to Au <sup>7</sup>	THORITIES 7 YES 1

Severe Bank Erosion

WATEDONED (SUD	mp. 6. 17	\		Di-Cit	, 10	
WATERSHED/SUBS	SHED: Clayes Dro	Turn 1	20	DATE: <u>&gt; / [</u>	<u></u> ASSES	SSED BY: JHW
SITE D: (Condition		1 IME: <u>3</u> :	<u>30 AM(PM)</u>	PHOTO ID (CAM)	ERA-PIC #):	0 /# / 784
ED 2	T START LAT		" LONG <u>160</u>	1.0		GPS: (Unit ID)
<u> </u>	<u>END</u> LAT		" LONG <u>* L</u> ° <u>L</u>	<u>Y' (0,9</u>	LMK	
PROCESS:	Currently unknown Bed scour Bank failure Bank scour	BANK OF CO LOCATION:   DIMENSIONS Length (if no C Bank Ht	NCERN: LT LT Meander bend : GPS/ LTft LTft	ART Both ( <i>lo</i> ) Straight section and/or RT and/or RT	oking downstream	) ley wall 🗌 Other: om width <u> ½</u> ft width 25 ft
Sed. deposition	Channelized	Bank Angle	LT_45 0	and/or RT	° Wett	ed Width 4 ft
LAND OWNERSHIP	P: APrivate	unknown	LAND COVER:	Forest TFi	eld/Ag	loped.
POTENTIAL RESTO	ORATION CANDIDATE	C: Grade	control	Bank stabilization	······································	
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🕅 No	Yes (Describ	e):		
EXISTING RIPARIA	AN WIDTH:	<b>⊠</b> ≤25 ft	25 - 50 ft	] 50-75ft   75-3	100ft 🗌 >100	ft
EROSION SEVERITY(circle#)	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or			ent, active stream ely eroding at a eat to property or	Grade and width stat failure/erosion; likely scour, impaired ripari	ole; isolated areas of bank caused by a pipe outfall, local an vegetation or adjacent use.
	5		4 3	)2	2	1
Access:	Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.         Fair access: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.         Difficult access. Must cross wetland, steep slope other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required				st cross wetland, steep slope or to access stream. Minimal able and/or located a great section. Specialized heavy	
	5	4	3	2		1
NOTES/CROSS SEC	CTION SKETCH:					
J	APPROXIMATION OF A				REPORTED TO AUT	THORITIES 🗌 YES 🗌 NO

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m				S	evere Ba	ank Erosion	ER
WATERSHED/SUBS	shed: Goges	18k		Date: <u>61</u> <u>4</u>	108	ASSESSED BY:	DEB
SURVEY REACH:	G-B-06	Time: <u>3</u> :	MSAM/PM	<b>РНОТО ID</b> (САМ	ERA-PIC #	+): DBG1/# 1	7652786
SITE ID: (Condition-	#) START LAT	1051 148,4	" LONG 77°2	+ 148.8"	LMK	GPS:	(Unit ID)
ER- <u>03</u>	END LAT_	<u> </u>	" LONG°	t tt	LMK		
PROCESS:	Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized	BANK OF CO LOCATION: DIMENSIONS Length (if no C Bank Ht Bank Angle	<b>DNCERN:</b> $\Box$ LT $ $ $\Box$ Meander bend $\exists$ $\exists$ $\exists$ d d d d d d d d	RT Both ( <i>la</i> Straight section and/or RT <u>3C</u> and/or RT <u>5</u> and/or RT <u>4</u> (we take)	ooking dow ☐ Steep s ft ft )	<i>instream)</i> slope/valley wall Bottom width Top width Wetted Width	
LAND OWNERSHIP	P: Private Public	C 🖾 Unknown	LAND COVER	Forest F	ield/Ag	Developed:	
POTENTIAL RESTO	ORATION CANDIDATE	: X Grade Other JRE: X No	control	Bank stabilization Contents of the stabilization Pe):			
EXISTING RIPARIA	AN WIDTH:	□ ≤25 ft	25 - 50 ft	] 50-75ft 🗌 75-	100ft	⊠ >100ft	
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall ban of the stream eroding at a fa contributing significant amo stream; obvious threat to pr infrastructure.	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thre infrastructure	ent, active stream ely eroding at a eat to property or	Grade and failure/eros scour, imp	width stable; isolated sion; likely caused by a aired riparian vegetati	areas of bank a pipe outfall, local on or adjacent use.
ACCESS:	5 Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile inel access for ting roads or	4 3 Fair access: Forester adjacent to stream. A removal or impact to 1 Stockpile areas small	) d or developed area ccess requires tree andscaped areas. or distant from stream.	2 Difficult ad other sens stockpile a distance fri equipment	1 ccess. Must cross we itive areas to access s reas available and/or om stream section. S required.	tland, steep slope or stream. Minimal located a great pecialized heavy
NOTES/CROSS SEC	TION SKETCH	CHREAM	5 PONTS	A Paris ID =	2)	$\frac{1}{2D}$	,
NOTES/CROSS SECTION SKETCH: STREAM ERODED AROUND FORMER DAM FORMER FOTZMING NEW CHANNEL, FORMER DAM HEIGHT = 5"							
)					Reporte	D TO AUTHORITIE	es 🗌 Yes 🗍 No

Г

				Se	evere B	ank Ero	sion	ER		
WATERSHED/SUBS	SHED: (Jogh	a Bl		DATE: 61 4	108	ASSESS	ED BY:	DER		
SURVEY REACH:	G-B-06	Тіме: <u> </u>	<u>)()</u> am/pm	РНОТО ID (САМ	ERA-PIC#	¥):	/#	187		
SITE ID: (Condition-	#) START LAT _	1-051 41.8	LONG 72° Z	4.47.6.	LMK		GPS: (U	Unit ID)		
ER- <u>04</u>	END LAT 4	1 ° 51 '41.9"	LONG72 02	1 '46,7"			,	,		
PROCESS:	Currently unknown	BANK OF CON	NCERN: DLT	RT Both (lo	oking dow	v <i>nstream)</i> slope/valle	y wall [	Other:		
U Widening	Bank failure	DIMENSIONS:								
K Headcutting	Bank scour	Length (if no G	PS) LT <u>200</u> ft	and/or RT_22	<u>^ft</u>	Bottom	n width	<u> </u>		
Aggrading	Slope failure	Bank Ht	LT <u> 4- 5</u> ft	and/or RT	<u>5</u> ft	Top wi	dth	<u> </u>		
Sed. deposition	Channelized	Bank Angle	LT <u>80-90</u>	° and/or RT <u>80</u>	<u>90</u> 0	Wetted	l Width	<u> </u>		
LAND OWNERSHIP	Private 🗌 Public	Unknown	LAND COVER	Forest Fi	eld/Ag	🔀 Develo	ped:			
POTENTIAL RESTO	DRATION CANDIDATE	: X Grade	control	Bank stabilization						
THREAT TO PROP	ERTY/INFRASTRUCTI	JRE: 📉 No	Yes (Descrit	be):						
EXISTING RIPARIA	N WIDTH:	□ ≤25 ft	🔀 25 - 50 ft [	] 50-75ft □ 75-	100ft	□ >100ft				
EROSION SEVERITY(circle#)	Active downcutting; tall ban of the stream eroding at a fa contributing significant amo- stream; obvious threat to pr	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks activ moderate rate; no thr	ent, active stream ely eroding at a eat to property or	Grade and failure/eros	l width stable sion; likely ca aired riparian	; isolated a used by a	reas of bank pipe outfall, local		
Channelized= 🔀 1	infrastructure.						regolution			
ACCESS:	Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	a public o stockpile nnel access for ting roads or	Fair access: Forester adjacent to stream. A removal or impact to I Stockpile areas small	d or developed area ccess requires tree andscaped areas. or distant from stream.	Difficult a other sens stockpile a distance fr equipment	ccess. Must itive areas to ireas availabl om stream se required.	1 cross wetla access str e and/or lo ection. Spe	and, steep slope or eam. Minimal cated a great ecialized heavy		
	5	4	3	2	2		1			
RIG HILL NACE TOINT										
)					Reporte	D TO AUTH	IORITIES	🗌 Yes 🗌 No		

						Impact	ted Buffe	er IB	į
WATERSHED/SUBSHED:	Gacaes.				DATE:	610103	ASSES	SSED BY: CM	
JRVEY REACH: AB	-01		TIME: <u>4</u>	:25_AM/PM)	Рнотс	<b>DID:</b> (Camera-P	'ic #) 💦		
SITE ID: (Condition-#)	START LA	ат <u>41_°51</u>	<u>'52.\</u> " I	LONG 72 °24	1337"	LMK		GPS: (Unit ID)	
<b>IB</b>	END LA	<u>т4/ ° 5/</u>	<u>'614</u> " I	LONG <u>72_</u> ° <u>2</u> 4	131.0"	LMK			
IMPACTED BANK:	REASON INA	ADEQUATE:	Lack of Recently Golf Cou	vegetation	o narrow ier: <u>en (</u> ther Publi	Widespread in Waach ment	ivasive pla fuml	nts andscripe	
(Facing downstream) LT Bar	nk 🗹		Ľ			:			
RT Bar	nk 🗹		Ľ			•			
DOMINANT LAND COVER: LT Ba RT Ba	Paved ink  nk	Bare ground	d Turf/lav	vn Tall grass	Shrub/so 2	crub Trees	Other		
INVASIVE PLANTS:	🗌 None	🗌 Rare	□ P	artial coverage	[] Æxt	tensive coverage	🗌 unkno	own	
STREAM SHADE PROVID	DED? 🗌 Non	e 🗹 Part	ial 🗌	] Full WETL	ands Pr	ESENT? No	🗌 Yes	Unknown	
POTENTIAL RESTORATI	ION CANDIDA	TE Activ	ve reforestati er: bank	on □Greenway c shilirathb	lesign [	] Natural regenera	ution 🗌 In	ivasives removal	
RESTORABLE AREA LT BANK RT Length (ft):		<b>REFORESTATION</b> <b>POTENTIAL:</b> ( <i>Circle</i> #)		Impacted area on pu where the riparian ar not appear to be use specific purpose; ple area available for pla	blic land ea does d for any ty of nting blic or private land that is presently used for a specific purpose; available area for planting adequate		her In that is Ia specific er ea for fe av	Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting	
				5	4	3	72)	1	
POTENTIAL CONFLICTS	WITH REFOR	ESTATION g impervious c	over □ Sev	despread invasive vere animal impact	plants s (deer, b	Potential contai eaver) DOther:	mination	Lack of sun	0
NOTES:		Both	de C	invice plat		field			

Stream Crossing SC

WATERSHED	SUBSHED: Gogles B	vook.	DA	.TE: 6	14 108	ASSE	SSED BY:	DRB
URVEY REA	сн ID: G-B-86	TIME: <u>3: 30</u>	АМ/РМ РН	ото II	): (Camera-Pi	:#)	1#	1779
SITE ID: (Con	dition-#) SC- <u>02</u> LAT	<u>41°57 '50.</u>	<u>4" LONG 72°</u>	24 '	<u>\$8.3</u> " L	MK	GPS	(Unit ID)
TYPE: 🗌 Roa	d Crossing 🔲 Railroad Crossi	ng 👿 Manmade I	Dam 🔲 Beaver D	am 🔲	Geological For	nation	Other:	
FOR ROAD/ RAILROAD	SHAPE:     # BARRELS:       Arch     Bottomless     Single       Box     Elliptical     Double       Circular     Triple       Other:     Other:		MATERIAL:ALIGNMConcreteFlow-MetalNot flOther:Do no		SNMENT:DIMEow-alignedBarrelot flow-alignedo not know		CNSIONS: (if variable, sketch) diameter:(ft) Height:(ft)	
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🔲 Downstrean	n scour hole ankment	CULV	VERT SLOPE: at ght $(2^{\circ} - 5^{\circ})$ povious $(>5^{\circ})$	Culvert la Roadway	ength: Width:	(ft) (ft) (ft)
POTENTIAL F	RESTORATION CANDIDATE	K Fish barrier re ☐ Local stream 1	moval 🗌 Culvert i repair 🖾 Other: 🖇	epair/rej Strc/m	placement 🔲 N GEOWSY	Upstream s phology	torage retro	ofit andr
IS SC ACTING	G AS GRADE CONTROL	□ No 🛛 Ye	es 🗌 Unknow	'n		and and		
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVEL	RITY: (circ	:le #)	
If yes for fish barrier	Image: Second state of the second s		A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
	U Other:		5		4 3		2	1
NOTES/SRET	CH:	stock low evel ovale	P					
Ĺ		and a second	/		REPOR	TED TO AU	THORITIES	Yes No

Stream	Cros	sing

WATERSHED	/SUBSHED: Cages			DATE: 6	14108	ASSESS	SED BY: CM	
JURVEY REA	сн <b>D:</b> 6В-6	TIME: <u>3:13</u>	AM/PM	Рното II	<b>):</b> (Camera-Pic	:#) Janavi	1# 1779	м Г
SITE ID: (Con	dition-#) SC- <u>62</u> LA	<u>ги/°61 'за</u>	<u>*</u> "Long <u></u>	<u>2°24</u> !	<u> 58.3</u> " Li	MK	GPS (Unit ID	)
TYPE: 🛃 Roa	ad Crossing 🔲 Railroad Cros	sing 🔲 Manmade I	Dam 🗌 Beave	er Dam	Geological Forr	nation 🔲 C	)ther:	
For Road/	SHAPE: Arch Bottomless Box Elliptical Circular	# BARRELS:	MATERIAL: Concrete		ALIGNMENT: Flow-aligned		PNS: (if variable, sh heter: <u> </u>	ketch ( (
KAILROAD CROSSINGS ONLY	CONDITION: (Evidence of)				/ERT SLOPE:	Culvert len; W	gth: <u>25</u> Vidth: 3	( (
	Cracking/chipping/corrosi	Ion Downstream	n scour hole ankment		ght (2° – 5 <sup>0</sup> ) ovious (>5°)	Roadway e	levation: <u>8</u>	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	repair 🗌 Culv	ert repair/re	placement 🔲 (	Jpstream stor	rage retrofit	
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unk	nown				
	EXTENT OF PHYSICAL BI	LOCKAGE:		BLC	CKAGE SEVER	UTY: (circle	#)	
If yes for fish barrier CAUSE: ☐ Drop too high Water E ☐ Flow too shallow Water I		nown Drop: <u>(in)</u> Depth:(in)	wn A structure such a road culvert on a greater stream bl upstream movem anadromous fish; passage device p		dam or order or ig the of f f ish interfere with the migratio anadromous fish.		A temporary barrier such beaver dam or a blockage the very head of a stream very little viable fish habit above it; natural barriers s as waterfalls.	
	****		nan an					
)					Repor	TED TO AUTH	iorities 🗌 Yes	

Stream Crossing SC

WATERSHED	SUBSHED: CARES			DA	те: <u>6</u>	14108	ASSE	SSED BY:	-2W
JURVEY REA	сн ID: 6В-96	TIME: <u>3</u> : 25	AM/PM	Рн	ото II	<b>):</b> (Camera-Pie	c # <b>)</b> Ca <i>no</i>	M /#	1777
SITE ID: (Con	dition-#) SC- <u>Ol</u> LAT	41051 151	🕙 " Long	<u>72°</u>	25_'	<u>이내</u> " Li	МК	GPS	(Unit ID)
TYPE: 🗌 Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beav	er D	am 🗌	Geological For	nation 🔲	•Other: 🔿	o midicality
	SHAPE:	# BARRELS:	MATERIAL:		ALIG	NMENT:	DIMENS	IONS: (if v	ariable, sketch)
	Box Elliptical	Double				ow-aligned	Barrel dia	ameter:	(ft)
FOR ROAD/	Circular	Triple	Other			n not know		Height:	(ft)
RAILROAD	Other: Undefined	Other: NOW					Colored 1		
ONLY	<b>CONDITION:</b> (Evidence of)					ERT SLOPE:	Cuivent le	width.	(ft)
UTI21	Cracking/chipping/corrosion	Downstream	n scour hole			at $(2^{\circ} - 5^{\circ})$		width.	(1t)
	Sediment deposition	Failing emb	ankment			$(2^{\circ})$	Roadway	elevation.	(ft)
							Roadway	cicvation.	(II)
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Cul	vert r	epair/re	placement 🔲	Upstream st	torage retro	ofit
🔲 no		Local stream	repair 🔲 Oth	er:					
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unl	cnow	n				
	EXTENT OF PHYSICAL BLO	CKAGE:			BLC	CKAGE SEVEI	RITY: (circ	:le #)	
	Total Partial		A structure such	as a d	am or	A total fish blocks	are on a	A temporal	ny harrier such as a
If was for		wn	road culvert on a 3rd order or			tributary that would isolate a		beaver dar	n or a blockage at
fish barrier	CAUSE:	greater stream bio upstream movem			the significant reach		of stream, e that may	m, the very head of a stream will nay very little viable fish habitat	
~	Drop too high Water Dr	rop:(in)	anadromous fish	; no fis	sh	interfere with the	migration of	of above it; natural barriers such as waterfalls	
	Other:	eptn: (m)	pubbuge device	proocr					
NOTES/SKET	<u>сн.</u>		5			4 3		2	]
TOTESSET	Chin Chin?					plan vie	5)		
X-Sect	iun					*			
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	4 2011	1							
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**Reported to authorities** Yes No

Reach Level Assessment

START       TIME: $\underline{4}$ : $\underline{50}$ AM/PM       LMK:       END       TIME: $\underline{5}$ : $\underline{05}$ AM/PM       LMK:         LAT $\underline{41} \circ \underline{51}$ ' $\underline{510}$ "       LONG $\underline{72} \circ \underline{24}$ ' $\underline{310}$ "       LAT $\underline{41} \circ \underline{51}$ ' $\underline{530}$ "       LONG $\underline{79} \circ \underline{74}$ ' $\underline{21}$ .       "	CPS ID-
LAT 41 °51 '51A " LONG 72 ° 24 '31.0" LAT4/ °51 '530 " LONG 72 ° 24 '211"	oro m.
DESCRIPTION: DESCRIPTION:	
RAIN IN LAST 24 HOURS    Heavy rain    Steady rain PRESENT CONDITIONS    Heavy rain    Steady rain    Intermit	ttent
SUPPOUNDING LAND USE: Industrial Commercial I Liker (Decidential III)	cloudy
$\Box \text{ Golf course } \Box \text{ Park } \Box \text{ Crop } \Box \text{ Pasture } \Box \text{ Other:}$	ional
AVERAGE CONDITIONS (check applicable) REACH SKETCH AND SITE IMPACT TRACKING	
<b>BASE FLOW AS %</b> $\Box$ 0-25% $\Xi$ 50%-75% Simple planar sketch of survey reach. Track locations and IDs for all sitt within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any ad	e impacts ditional
CHANNEL WIDTH       2.2-30 %       175-100%         DOMINANT SUBSTRATE       Features deemed appropriate. Indicate direction of flow         Silt/clay (fine or slick)       Cobble (2.5 - 10")         Sand (gritty)       Boulder (>10")         Gravel (0.1-2.5")       Bed rock	
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)	
AQUATIC PLANTS       Attached:       Image: The none       Image: Some image: So	
WILDLIFE IN OR       (Evidence of)         AROUND STREAM       IFish       Beaver         Spails       Other:	
STREAM SHADING (water surface) $\Box$ /Mostly shaded ( $\geq$ 75% coverage) $\Box$ Halfway ( $\geq$ 50%) $\Box$ Partially shaded ( $\geq$ 25%) 	
CHANNEL Downcutting Bed scour	
DYNAMICS Widening Bank failure	
Image: Headcutting       Image: Bank scour         Image: Headcutting       Image: Bank scour         Image: Aggrading       Image: Slope failure         Image: Sed. deposition       Image: Channelized	
CHANNEL Height: LT bank 2 (ft) (model)	
DIMENSIONS RT bank(ft)	
(FACING Width: Bottom 5 (ft))	
Top <u>12-5 (ft</u> )	
REACH ACCESSIBILITY	
Good: Open area in public ownership, sufficient room to       Fair: Forested or developed area adjacent to stream.       Difficult. Must cross wetland, steep slope, or sensitive areas to get to	
stockpile materials, removal or impact to stockpile available	
access for heavy Stockaile areas. and/or located a great	
equipment using small or distant from Specialized heavy	
stream. equipment required.	
Notes: (biggest problem you see in survey reach)	
<b>Reported to authorities</b> Yi	es 🗌 No

•

		OVERALL STREAM COND	ITION					
l	Optimal	Suboptimal	Marginal	Poor				
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
	20 19 18 17 16	15 14 /13 /12 11	10 9 8 7 6	5 4 3 2 1 0				
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
	Right Bank 10 9	8 7 6	5 4 3	2 1 0				
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
	Right Bank 10 9	8 7 6	5 4 3	2 1 0				
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION					
	Optimal	Suboptimal	Marginal	Poor				
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
Exponentia	Night Dalik IV 9	8 / 6	5 4 3 Predeminant floodalain	2 1 0				
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land				
	20 19 18 17 16	(5) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
Sub Total In-stream:       /80       +       Buffer/Floodplain:       /80       =       Total Survey Reach       /160								
	mining f					1		
--	--------------------	--	-----------------------	---------------------------------------	------------------------	-------------	------------------------------	
WATERSHED/SUBSHED:	aca 5K			DATE:	17108	Ass	ESSED BY: THW	
JRVEY REACH: 68-07	<u> </u>	<u>me: 5 : 00</u>	AM/PM	PHOTO ID: (Camera-Pic #) Coman 1#195				
SITE D: (Condition-#) START L	AT41 ° 51 '5	15" LONG	<u>n °H</u>	12.8"	LMK		GPS: (Unit ID)	
B END L	AT''	' Long_	o0	1 11	LMK	_		
IMPACTED BANK: REASON IN	IADEQUATE:	Lack of vegetati Recently planted	ion 🗹 To 1 🗍 Oth	o narrow 🖄 ier:	Widespread inv	asive p	lants	
LAND USE: Private	Institutional C	Golf Course Pa	ark Ot	ther Public				
(Facing downstream) LT Bank								
RT Bank	<u> </u>						1014	
LAND COVER: LT Park	Bare ground	Turt/lawn	I'all grass	Shrub/scruł	b Trees	Other		
BAND COVER. LI Balik						[]: [편.]	Parlander	
		Dertial as					acmischera	
	Kare				sive coverage [		nown	
STREAM SHADE PROVIDED?	ne 🖉 Partial	🗌 Full	WETL	ANDS PRES	ENT? No	T Ye	es 🗌 Unknown	
BOMPATIAL BEGTOD ATTOM CANTER								
POTENTIAL RESTORATION CANDID	ATE Active re	forestation	Breenway d	lesign 🖉 N	latural regeneration	on 🔟	Invasives removal	
	Other:							
RESTORABLE AREA	Deserves	Impacte	d area on pul	blic land Im	pacted area on either	r	Impacted area on private	
LT BANK RT	REFORESTATIO	ON not appe	ear to be used	d for any pr	esently used for a spe	ecific	encroachment or other	
Length (ft):	( <i>Circle</i> #)	specific	purpose; pler	nty of pu	irpose; available area	for	feature significantly limits	
Width (ft): <u>25</u> <u>25</u>			5					
POTENTIAL CONFLICTS WITH DEFOI			1	· · · · · · · · · · · · · · · · · · ·				
$\square$ Poor/unsafe access to site $\square$ Existin	g impervious cover	Severe anir	nal impact	s (deer, beav	ver) Other:	ination	Lack of sun	
NOTES:								
	50	Therest						
	£°,	$1 + \zeta$	3					
	2							
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1	$\leq$ $$		$\geq$					
	why Garl	N. S.	$\left  \right _{c.}$	(a)				
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Stream	Cross	sin

							Stre	am Cros	ssing SC
WATERSHED	SUBSHED:	Grades	RG		DA	TE:	14 108	ASSE	ESSED BY: DPR
URVEY REA	CHID: CB	-07	TIME: 5:00	AMPM	Рн	OTO ID	: (Camera-Pi	c #)98 (a	Malan /#
SITE ID: (Con	dition-#) SC-	0 LAT	91051:53	U" LONG 7	~~~ o	24 1	"Z\4]" L	MK	GPS (Unit ID)
TYPE: 🔀 Roa	ad Crossing [	] Railroad Cross	ing 🗌 Manmade	Dam 🗌 Beav	er Da	am 🔲	Geological Fori	nation 🔲	Other:
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: Arch Box Circular Other: CONDITION Cracking/o	Bottomless Elliptical	# BARRELS:	MATERIAL: Concrete Metal Other: n scour hole		ALIGI	NMENT: w-aligned t flow-aligned not know ERT SLOPE: t	DIMENS Barrel dia Culvert le	IONS: (if variable, sketch)         ameter:
	Sediment	deposition scribe):	∐ Failing emb	ankment			vious (>5°)	Roadway	elevation: $301$ (ft)
POTENTIAL I	RESTORATION	N CANDIDATE	☐ Fish barrier re ☐ Local stream	emoval 🗌 Cul repair 🔲 Oth	vert r er:	epair/reț	placement 🔲 🛛	Upstream s	torage retrofit
IS SC ACTING	G AS GRADE (	Control	No Y	es 🗌 Unl	now	n			
	EXTENT OF	PHYSICAL BLO	OCKAGE:	r		BLO	CKAGE SEVEI	RITY: (circ	cle #)
If yes for fish barrier	$ \begin{array}{c c} \hline \square & \square$		A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		am or der or the h t.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
<u></u>	U Other:			5		4	4 3	(	2 1
NOTES/SKET	°CH:	2017		thou	\$1. 		Brugh	Jones (	2 when outr 2 when a gift
	How	54		, IS	5	NOVO N	Repor	TED TO AU	<b>THORITIES</b> TYES NO

Reach Level Assessment RCH

SURVEY REACH ID: $GB-3$ WTRSHD/SUBSHD: $G_{a}$	225	DATE: <u>6 / 5</u>	108 Assi	ESSED BY:
START TIME: 55 AMPM LMK: 0	END TIME:*	7:25 AM/PM	LMK:	GPS ID:
LAT	LAT 410 51 19	15.5" Long 7	• <u>9</u> 1111	77 11
DESCRIPTION:	DESCRIPTION:			
RAIN IN LAST 24 HOURS 🗆 Heavy rain 🔅 Steady rain	PRESENT CONDITIONS	Heavy rain	□ Steady rain	Intermittent
□ None □ Intermittent □ Trace	□ Clear		☑ Overcast	$\Box$ Partly cloudy
SURROUNDING LAND USE:	Urban/Residential	Suburban/Res		
□ Golf course □ Park	□ Crop	□ Pasture	□ Other:	
AVERAGE CONDITIONS (check applicable)	REACH S	SKETCH AND SIT	Е ІМРАСТ ТІ	ACKING
BASE FLOW AS % 🗆 0-25% 🖾 50%-75%	Simple planar sketch o	of survey reach. Tra	ck locations and .	IDs for all site impacts
Channel Width □25-50 % □ 75-100%	within the survey rea	ich (OT, ER, IB,SC,	UT, TR, MI) as w	ell as any additional
DOMINANT SUBSTRATE         □ Silt/clay (fine or slick)       □ Cobble (2.5 -10")         ☑ Sand (gritty)       □ Boulder (>10")         ☑ Gravel (0.1-2.5")       □ Bed rock	p () equives a		Inaicate atrectio	n of flow
WATER CLARITY In Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)				
AQUATIC PLANTSAttached: In one is some is lotsIN STREAMFloating: In one is some is lots	07-20			
WILDLIFE IN OR AROUND STREAM (Evidence of) □ Fish □ Beaver □ Deer □ Snails □ Other:	TRIP			
STREAM SHADING (water surface) $\checkmark$ Mostly shaded ( $\geq$ 75% coverage)I Halfway ( $\geq$ 50%)I Partially shaded ( $\geq$ 25%)I Unshaded (< 25%)		2		
CHANNEL       Downcutting       Bed scour         DYNAMICS       Widening       Bank failure         Headcutting       Bank scour         Aggrading       Slope failure         Sed. deposition       Channelized	rahud A			
CHANNEL Height: LT bank (ft)			( po	nd
(FACING Width, Dataset To (II)		1. vm	l l	
DOWNSTREAM) WIGHT. BOTTOM (ft)	TTC	21-17	-	
iop(ft)				
Ear Forested or Difficult Must srees	- reveal most	(-LB-)	10	
Good: Open area in developed area wetland, steep slope, or	Rebris	)		
sufficient room to adjacent to stream. sensitive areas to get to		L	56-101	
stockpile materials, removal or impact to stockpile available		2007, U		
access for heavy landscaped areas. and/or located a great	101	a grant day of homeses, the spirity staff or year of draws a second as		
equipment using Stockpile areas distance from stream.	Dada .	art i		
existing roads or trails. stream. specialized neavy	I VIEW V	<u>vy</u>	A I	9
<u>5</u> <u>4</u> <u>3</u> <u>(2)</u> <u>1</u>		-		·
<b>INOTES:</b> ( <i>biggest problem you see in survey reach</i> )				
/				
		REPORT	ED TO AUTHOR	ITIES YES NO

	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 (11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Encroach-	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structuros	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on
MENT	manmade sudclutes		effect on floodplain function	floodplain function

				Storm	Water Outfall	s OT	
WATERSHED/SUBS	HED: Goge	Bk	DATE: 6	15 10%	ASSESSED BY:	DRB	
SURVEY REACH II	): (-B-06	TIME: 6:00 AM/P	м Рното ID	: (Camera-Pic #	) /#	1796	
SITE ID (Condition-#	): OT- <u>2 </u>	LAT <u>U1 ° 5   5</u> 2	. 6" LONG 72 2	19.18.7"	LMK	GPS: (Unit ID)	
BANK:           XLT         RT         Heat           FLOW:         Tricl	td TYPE:	MATERIAL:	SHAPE: ]Metal [] Circular ]Brick [] Elliptica [] Other:	Single	DIMENSIONS: Diameter: <u>2,5 (i</u>	SUBMERGED: M No Partially Fully	
Moderate Substantial Other:	Dpen channel	Concrete E	Earthen Trapezoi	d Dept <sup>c</sup> Widt " (l	h: <u>(in)</u> th (Top): <u>(in)</u> Bottom): <u>(in)</u>	NOT APPESCABLE	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: DN Gas Sewage Rancid/Sc Sulfide Other:	Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image: Deposition of the second system     Image: Deposition of the second system       Image:	IS: VEGGIE DI IN None Normal Inhibited Excessiv Other:	ENSITY: H L e H C	PIPE BENTHIC GI Brown Ora Other: POOL QUALITY: Good Odors Suds Algae Other:	ROWTH: M None nge Green No pool Colors Oils Floatables	
OTHER	Excess Trash (pape Needs Regular Mai RATION CANDID g:	ATE Discharge invo	Dumping (bulk) [ Bank Erosion [ estigation ] Stream d crofit ] Other:	Excessive Sea     Other:     aylighting	dimentation Local stream repair	r/outfall stabilization	
If yes for stormwate	y controlled?	n Type	Use description:	I:	Slope:	-	
OUTFALL SEVERITY: (circle #)	Heavy discharge with a strong smell. The amou compared to the amou stream; discharge appe significant impact dowr	Area a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a sistream.	available: Small discharge; flow mo discharge has a color and discharge is very small co flow and any impact appe	ostly clear and odorle d/or odor, the amoun ompared to the strea ears to be minor / loc	ess. If the thof m's base alized.	es not have dry weather ; staining; or appearance g any erosion problems.	
SKETCH/NOTES: His scheen j look like on inlet, but is elevated obove weeter Surface by ~1 & (at top of bul).							
)				Rep	ORTED TO AUTHOR	ITIES: YES NO	

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			Imp	acted Buf	fer IB				
WATERSHED/SUBSHED: You	es Bk		DATE: 61510	58 Asse	ESSED BY: Dたら				
JIRVEY REACH: G-B-08	TIME:	5: 45 AM/PM	Рното ID: (Camer	a-Pic #)DR	~~ /#				
SITE ID: (Condition-#) START L	AT 41°5/ 1526"	LONG 72 ° 24	1/8.7" LMK		GPS: (Unit ID)				
IB-01 END L	AT ° ' '']	Long °	''' LMK						
IMPACTED BANK:     REASON IN       Image: Ima	ADEQUATE: Lack of	f vegetation 🔲 To y planted 🛛 Oth	o narrow 🗌 Widesprea ner: Landscapha	d invasive pl	ants				
LAND USE: Private	Institutional Golf Cou	ırse Park O	ther Public	Ç.					
(Facing downstream) LT Bank									
RI Bank X	Poro ground Turf/los			0.1					
LAND COVER: LT Bank	$\square$ $\square$	wn Tail grass	Shrub/scrub Trees	Other					
RT Bank									
INVASIVE PLANTS: None	$\square$ Rare $\square$ H	Partial coverage	Extensive coverage	re 🗆 unkn	OWD				
		J Full WEIL	ANDS PRESENT? [] N	о ЦҮе	s 📋 Unknown				
POTENTIAL RESTORATION CANDIDA	ATE Active reforestat	ion Greenway o	design 🔲 Natural rege	neration 🔲 I	nvasives removal				
<b>RESTORABLE AREA</b> LT BANK RT Length (ft): $300$ $300$	<b>REFORESTATION</b> <b>POTENTIAL:</b> ( <i>Circle #</i> )	Impacted area on pu where the riparian ar not appear to be use specific purpose; ple area available for pla	iblic land Impacted area o rea does public or private ed for any presently used for nty of purpose; availab anting planting adequat	n either land that is or a specific le area for te	Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting				
<u></u>		5	4 3	<u> </u>	) 1				
POTENTIAL CONFLICTS WITH REFOR	<b>RESTATION</b> W g impervious cover Se	idespread invasive vere animal impact	plants	ontamination her:	Lack of sun				
NOTES:									
	L. C.								
	CAL								
Laur Laur THorse									
) Hover		NOU * -							

Stream	Cro	ssinc
Jugan	010	Source

Stream Crossing	SC

WATEDCHED	KUDSHED. Gama			DATE: 6	15160	ASSE	SSED DV:	
URVEY REA	CHID: CALA	TIME: 7 · )<	AM/PM	PHOTO II	<u>, Camera-Pic</u>	· #) /	1#18/12	
SITE ID: (Con	dition=#) SC-	111051 15	55" Long 7	2020	10.7" L	MK	GPS (Unit ID)	
TYPE: Roa	TYPE: Road Crossing 🔲 Railroad Crossing 🗹 Manmade Dam 📋 Beaver Dam 💟 Geological Formation 🗌 Other:							
	SHAPE:	<b># BARRELS:</b>	MATERIAL:	ALIG	NMENT:	DIMENS	IONS: (if variable, sketch)	
	Box Elliptical	Double	I I Metal		ow-aligned	Barrel dia	umeter: $1 \times 10^{-1}$ (ft)	
FOR ROAD/	Circular	Other:		o not know				
CROSSINGS	CONDITION: (Evidence of )			CULY	FDT SI ODE.	Culvert le	ength: <u>130</u> (ft)	
ONLY	Condition (Evidence of)	Downstream	n scour hole		at		Width: 15 (ft)	
	Sediment deposition	Failing emb	ankment		ight $(2^{\circ} - 5^{\circ})$		10	
	Other (describe):	λ			5v10us (>5*)	Roadway	elevation: <u>12</u> (ft)	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culv	vert repair/re	placement $\Box$	Upstream s	torage retrofit	
no no	•	Local stream	repair ZOthe	er: day)	ich ting	•	-	
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unk	nown	<u> </u>			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	OCKAGE SEVER	RITY: (circ	le #)	
	✓ Total	vn	A structure such	as a dam or	A total fish blocka	ige on a	A temporary barrier such as a	
If yes for			greater stream blocking the		tributary that would isolate a significant reach of stream,		the very head of a stream with	
fish barrier	fish barrier CAUSE: upstream				or partial blockag interfere with the	e that may migration of	very little viable fish habitat above it; natural barriers such	
	Flow too shallow Water Do	epth:(in)	passage device p	present.	anadromous fish.		as waterfalls.	
<u></u>	Other: Dam		5		4 3	)	2 1	
NOTES/SKET	СН:							
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	(best filler) (best filler)							
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L					1.2. 01			

r							
WATERSHED/SUE	BSHED: Goges	Brook	·	DATE: <u>6 / 8</u>	5 108	ASSESSED BY: PRE	
JURVEY REACH	JURVEY REACH ID: 03-08 TIME: 7: 10 AM/PM				mera-Pic #) DB(	mal# 1780/61802	
SITE ID: (Condition	<u>6</u> " LMK_	GPS: (Unit ID)					
TYPE: Industrial Commercial Residential	MATERIAL:          Plastic       [         Tires       [         Appliances       [         Automotive       [	Paper Construction Yard Waste	Metal	SOURCE: Unknown Flooding Local outfall	LOCATION:	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads):	
POTENTIAL REST	FORATION CANDIDA	TE Stream cl	eanup 🗌 Strea	am adoption segment	Removal/pr	evention of dumping	
If yes for trash or debris removal	EQUIPMENT NEEDER	D: Heavy e	quipment 🔲 T	rash bags 🗌 Unkno	wn	<b>DUMPSTER WITHIN 100 FT:</b> Yes No Unknown	
CLEAN-UP POTENTIAL: (Circle #)	WHO CAN DO IT:       Volunteers       Local Gov       Hazmat Team       Other       Hest No       Other         CLEAN-UP POTENTIAL:       A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access       A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a fow days possibly with a small backboe       A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drun or indications of hazardous materials						
	(5)		4	3	2	1	
NOTES:	IDE, BA	TH TUB,	2 - 5	5 galle	r dr	~ 5	
<u>)</u>					Reportei	D TO AUTHORITIES 🗌 YES 🗌 NO	



RCH **Reach Level Assessment** ASSESSED BY: SURVEY REACH ID: WTRSHD/SUBSHD: DATE: 6 / 4 HS BK : 30 AM/PM TIME: 10 : 10 AM/PM START TIME: 🖗 END LMK: LMK: GPS ID: Long 70 • 20 • 5/ 7" ~1 + 40 SH LAT 1000 511 12 45 Long7? 1 1 2 2 2 2 2 2 LAT ο **DESCRIPTION: DESCRIPTION:** RAIN IN LAST 24 HOURS 🗆 Heavy rain □ Steady rain PRESENT CONDITIONS □ Heavy rain Steady rain 🗆 Intermittent □ None Intermittent □ Trace ' □ Clear □ Trace □ Overcast □ Partly cloudy SURROUNDING LAND USE: Industrial □ Urban/Residential □ Suburban/Res Commercial □ Forested □ Institutional □ Golf course □ Park Crop □ Pasture □ Other: **AVERAGE CONDITIONS** (check applicable) **REACH SKETCH AND SITE IMPACT TRACKING** Simple planar sketch of survey reach. Track locations and IDs for all site impacts □ 0-25% **BASE FLOW AS %** □ 50%-75%<sup>-</sup> within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional CHANNEL WIDTH □25-50 % □ 75-100% features deemed appropriate. Indicate direction of flow DOMINANT SUBSTRATE □ Silt/clay (fine or slick) Cobble (2.5 -10")  $\Box$  Sand (gritty)  $\Box$  Boulder (>10") ☐ Gravel (0.1-2.5")  $\Box$  Bed rock WATER CLARITY I Clear Turbid (suspended matter) □ Stained (clear, naturally colored) □ Opaque (milky) □ Other (chemicals, dyes) Attached: none some lots **AQUATIC PLANTS** IN STREAM Floating:  $\Box$  none  $\Box$  some  $\Box$  lots (Evidence of) WILDLIFE IN OR Fish Beaver 🗹 Deer AROUND STREAM □ Snails □ Other:  $\square$  Mostly shaded ( $\geq$ 75% coverage) STREAM SHADING □ Halfway (≥50%) (water surface)  $\Box$  Partially shaded ( $\geq 25\%$ )  $\Box$  Unshaded (< 25%) Downcutting Bed scour CHANNEL Widening Bank failure **DYNAMICS** Headcutting Bank scour Aggrading Slope failure Unknown Sed. deposition Channelized Height: LT bank (ft) CHANNEL 1997 - S DIMENSIONS RT bank (ft)(FACING Width: Bottom (ft) DOWNSTREAM) 2 m Top (ft) **REACH ACCESSIBILITY** Fair: Forested or Difficult. Must cross Good: Open area in developed area wetland, steep slope, or public ownership, sensitive areas to get to adjacent to stream. sufficient room to Access requires tree stream. Few areas to stockpile materials, removal or impact to stockpile available easy stream channel landscaped areas. and/or located a great access for heavy Stockpile areas distance from stream. equipment using small or distant from Specialized heavy existing roads or trails. stream. equipment required. 5 4 3 **NOTES:** (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES** YES NO

		OVERALL STREAM CONDI	TION		
	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTIONMore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0	
	Right Bank 10 (9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodpiain. Stream deeply entrenched.	
	20 19 18 17 /16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0	
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0	
Sub Total In-st	ream: / <b>80</b> + B	uffer/Floodplain:/80	= Total Survey	Reach/160	

						Storn	n Water	Outfalls	ΟΤ
WATERSHED/SUBS	HED: 🚱	4655 -	SK		DATE: <u>6</u> / <u></u>	1,06	ASSES	SED BY:	VEG
SURVEY REACH II	): 68	-OQ TI	ме: <u>\\: 20</u> ам/рі	М	Рното ID: (Са	amera-Pic	#)でた(む	1# 1	751
SITE ID (Condition-#	): <b>OT</b>	2_ LA	T <u>41. 51 .41</u>	6" Lo	ING 72 . 24	<u>'59.7</u> "	LMK_		GPS: (Unit ID)
······	·····		······································						
		ΥE:	MATERIAL:	Motol	SHAPE:	Single	DIMENS	IONS:	SUBMERGED:
		Closed	PVC/Plastic	Brick	Elliptical	] Double ] Triple	Diameter	: 6 (in)	No Rortially
None Trick	kle F	oipe	Other:	<b>_</b> .	Other:	Imple		<u></u>	Fully
Moderate					Trapezoid	Der		V (in)	$\sim$
Substantial		Dpen hannel	$\Box$ Concrete $\Box$ E	arthen	Parabolic	Wic	lth (Top):	$\frac{1}{36}$ (in)	NOT APPEICABLE
			ASPA.	ALT	Other:	"	(Bottom):	4 (in)	
CONDITION:	ODC	DR: 🕅 NO	DEPOSITS/STAIN	s:	VEGGIE DENSI	ITY:	PIPE BEN	THIC GRO	WTH: 🛛 None
Chip/Cracked		lewage			∐ None ⊠Normal		Brown Other:	Orang	e 🗌 Green
Peeling Paint		ancid/Sour	Flow Line		Inhibited	-		ALITY: N	1 No pool
Corrosion		Sulfide	Paint		Excessive		Good [	Odors [	Colors Oils
Other.		Julei.			U Other:		Suds [	_ Algae _	Floatables
FOR CON	LOR:		r Brown C	Grey	Yellow G	Green 🗌 🤇	Drange 🗌	Red 🗌 Ot	her;
ONLY FLC	ATABLES:	None	e Signt Cloudin	paper, e	tc.)	paque etroleum (o	il sheen)		her:
OTHER 🔲	Excess Tra	sh (paper/pla	ustic bags)	umping	(bulk)	xcessive Se	edimentatio	)n	
CONCERNS:	Needs Reg	ular Mainten	ance 🖾 B	ank Ero	sion 🗌 O	ther: FR	05102-7	COM O	* to Stream
	D I TON						v		
POTENTIAL RESIG	DRATION	CANDIDATE	Discharge inve	estigatioi rofit	n 📋 Stream daylig	ghting [	Local stre	am repair/o	utfall stabilization
If yes for daylightin	ıg:	-				″ <u>N</u>	•		
Length of vegetative	cover fron	n outfall:	ft Type	of exist	ing vegetation:			Slope:	0
TC C									
If yes for stormwate	er:	ed? \e>	Juff Land	I ise des	cription Jul	ustrial	G.M.	aste Tr	No. Jansh
Ves No X	Not investi	gated	Area	available	enption. <u></u>	<u>v., 1. v.</u>		•	
OUTFALL	Heavy disch	arge with a dist	inct color and/or a	Small di	scharge; flow mostly c	clear and odo	less. If the	0 4 1 1	······
SEVERITY:	compared to	the amount of	normal flow in receiving	discharg	e has a color and/or o te is very small compa	odor, the amounder, the the street	Int of am's base	discharge; st	aining; or appearance
(our one ny	stream; disc significant in	harge appears f npact downstrea	to be having a am.	flow and	I any impact appears to	o be minor / lo	ocalized.	of causing ar	iy erosion problems.
		5	······································	4	<u></u> 3_		1	2	1
SKETCH/NOTES:	ño	$\langle \cdot, \cdot \rangle$	Sever PAVEMEN	r.	C)				
		- 4.14	1.						
		NK-S							
*	$\langle \cdot \rangle$	A i bra	ing t						
	Section Sectio	12	× .						

REPORTED TO AUTHORITIES: YES NO

J.

WATERSHED/SUBS	HED: GADES	RK.	DATE: 6/4 /09	ASSESSED BY:	2 SC
SURVEY REACH ID	· GBY T	IME: 1:55 AM/PM	1 PHOTO ID: (Camera-Pi	c#) \ /#	<u>~~</u> 1700
SITE ID (Condition-#)	<u>. OT-01</u> . L	AT <u>41 ° 51 142, 3</u>	5" LONG 72 ° 25 '01.3 '	' LMK	GPS: (Unit ID)
BANK:	d TYPE: Closed pipe	MATERIAL:	SHAPE: Single Metal Circular Double Brick Elliptical Triple	DIMENSIONS: Diameter: <u>(in)</u>	SUBMERGED:
Moderate Substantial Other:	Dpen channel	Concrete Ea	arthen Trapezoid D Parabolic W Other:	epth: <u>(in)</u> /idth (Top): <u>(in)</u> ' (Bottom): <u>(in)</u>	NOT APPESCABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS	S: VEGGIE DENSITY:	PIPE BENTHIC GRO Brown Orang Other: POOL QUALITY:	WTH: 🔀 None e 🔲 Green
Other:	Other:	⊠Other: R₁ ST	Other:	Good Odors Suds Algae Other:	Colors 🖾 Oils Floatables
$\begin{array}{c c} \hline OVLY & FLO \\ \hline OTHER & \Box F \\ \hline CONCERNS: & \Box F \\ \hline \end{array}$	ATABLES:   🛄 Noi Excess Trash (paper/p Jeeds Regular Mainte	ne Sewage (toilet p lastic bags) Du mance DBa	Daper, etc.)	(oil sheen) ① Ot Sedimentation	her:
OTHER FLO OTHER FLO CONCERNS: F POTENTIAL RESTO	ATABLES: Noi Excess Trash (paper/p Needs Regular Mainte RATION CANDIDAT	ne Sewage (toilet p lastic bags) Du mance Ba E M Discharge inves	paper, etc.)       Petroleum (         umping (bulk)       Excessive         nk Erosion       Other:         utigation       Stream daylighting         ofit       Other:	(oil sheen) [] Ot Sedimentation ] Local stream repair/or	her:
ONLY     FLO       OTHER     FLO       CONCERNS:     F       POTENTIAL RESTO       Ino       If yes for daylightin,       Length of vegetative of	ATABLES: Nor Excess Trash (paper/p Jeeds Regular Mainte RATION CANDIDAT g: g: over from outfall:	ne Sewage (toilet p lastic bags) Du mance Ba E M Discharge inves Storm water retro	paper, etc.)       Petroleum         umping (bulk)       Excessive         nk Erosion       Other:         unigation       Stream daylighting         ofit       Other:         off existing vegetation:	(oil sheen) [] Ot Sedimentation ] Local stream repair/or Slope:	utfall stabilization
ONLY     FLO       OTHER     FLO       CONCERNS:     FLO       CONCERNS:     FLO       POTENTIAL RESTO     No       In no     If yes for daylightin,       Length of vegetative of     If yes for stormwate       Is stormwater currentl     Yes X No	ATABLES: Nor Excess Trash (paper/p Jeeds Regular Mainte RATION CANDIDAT g: r: y controlled?	ne Sewage (toilet p lastic bags) Du mance Ba E M Discharge inves Storm water retro ft Type o Land U Area au	paper, etc.)       Petroleum i         imping (bulk)       Excessive         nk Erosion       Other:         otigation       Stream daylighting         ofit       Other:         of existing vegetation:	(oil sheen) [] Ot Sedimentation ] Local stream repair/or Slope:	utfall stabilization
ONLY       FLO         OTHER       □         CONCERNS:       □         POTENTIAL RESTO       □         □       no         If yes for daylightin,       Length of vegetative of         Length of vegetative of       Is stormwater currentl         □       Yes [No       □         OUTFALL       SEVERITY:       'circle #)	ATABLES: Nor Excess Trash (paper/p Needs Regular Mainte RATION CANDIDAT g: over from outfall: r: y controlled? Not investigated Heavy discharge with a dia strong smell. The amount compared to the amount of stream; discharge appears significant impact downstream;	ne Sewage (toilet p lastic bags) Du mance Ba TE M Discharge inves M Storm water retro ft Type c Land U Area av stinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam.	paper, etc.)       Petroleum         umping (bulk)       Excessive         nk Erosion       Other:         atigation       Stream daylighting         ofit       Other:         off existing vegetation:	(oil sheen)       Ot         Sedimentation	her: utfall stabilizationoo not have dry weather aining; or appearance y erosion problems.
ONLY       FLO         OTHER       FLO         CONCERNS:       N         POTENTIAL RESTO       No         Ino       If yes for daylightin,         Length of vegetative of       If yes for stormwate         Is stormwater currentl       Yes No       N         OUTFALL       SEVERITY:       'circle #)	ATABLES: Nor Excess Trash (paper/p Jeeds Regular Mainte RATION CANDIDAT g: sover from outfall: r: y controlled? lot investigated Heavy discharge with a dia strong smell. The amount compared to the amount c stream; discharge appears significant impact downstre 5	ne Sewage (toilet p lastic bags) Du mance Ba TE M Discharge inves Storm water retro the Type of Land U Area av stinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam.	paper, etc.)       Petroleum (         imping (bulk)       Excessive         ink Erosion       Other:         oftigation       Stream daylighting         offit       Other:         of existing vegetation:	(oil sheen)       Ot         Sedimentation       Image: Constraint of the out of tream's base / localized.       Outfall does r discharge; state of causing an	her: utfall stabilizationoo not have dry weather aining; or appearance y erosion problems1
ONLY       FLO         OTHER       FLO         CONCERNS:       N         POTENTIAL RESTO         no         If yes for daylightin,         Length of vegetative of         If yes for stormwate         Is stormwater currentl         Yes Mo         OUTFALL         SEVERITY:         /circle #)	ATABLES: Nor Excess Trash (paper/p Needs Regular Maintee RATION CANDIDAT g: wover from outfall: r: y controlled? Not investigated Heavy discharge with a dia strong smell. The amount compared to the amount of stream; discharge appears significant impact downstream; 5	ne ∐ Sewage (toilet p lastic bags) ☐ Du mance ☐ Ba TE ⊠ Discharge inves ⊠ Storm water retro ft Type o Land U Area av stinct color and/or a of discharge is significant f normal flow in receiving s to be having a eam4	paper, etc.)       Petroleum i         imping (bulk)       Excessive         ink Erosion       Other:         oftigation       Stream daylighting         offit       Other:         Jse description:       Industriet         vailable:       Small discharge; flow mostly clear and oc discharge has a color and/or odor, the am discharge is very small compared to the s flow and any impact appears to be minor of the stream daylighting is very small compared to the s flow and any impact appears to be minor of the stream daylighting is very small of the stream d	(oil sheen)       Ot         Sedimentation       Ot         Local stream repair/or       Slope:         Local stream repair/or       Slope:         I       Outfall does r         dorless. If the ount of tream's base (localized.       Outfall does r         I       Outfall does r         dorless. If the out of tream's base (localized.       Outfall does r         I       Outfall does r         Slope:       Outfall does r         I       Outf	her: utfall stabilization o not have dry weather aining; or appearance y erosion problems. 1 1 1 1 1 1 1 1 1 1 1 1 1

Stream	Cros	sinc

Stream Crossing	SC	
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WATERSHED	SUBSHED: GAGE	5		DATE	E: /	14108	ASSE	SSED BY:	DRR
URVEY REA	сн ID: GR- 0억	TIME: <u>10</u> :00	_AM/PM	Рнот	ro ID	: (Camera-Pic	:#) DRG	ser 1#	1750
SITE ID: (Con	dition-#) SC- OL LAT	410 <u>51 147</u>	<u>.</u> " Long ]	<u>1°2</u>	5.	<u>00.6</u> " LI	мк	GPS	(Unit ID)
	d Crossing Railroad Crossi	ng 🕅 Manmade	Dam 🗌 Beave	-r Dam	, <u> </u>	Geological For	nation	Other	
For Road/ Railroad	For ROAD/     Circular     Image: Circu		S: MATERIAL: Concrete Metal Other:		ALIGNMENT: Flow-aligned Not flow-aligned Do not know		DIMENSIONS: ( <i>if variable, sketch</i> ) Barrel diameter:(ft) Height:(ft)		ariable, sketch) (ft) (ft)
ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Downstrear	n scour hole ankment		CULV ] Fla ] Slig ] Ob	ERT SLOPE: t ght (2° – 5 <sup>0</sup> ) vious (>5°)	Roadway	Width: elevation:	(ft)
POTENTIAL F	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv repair 🔲 Othe	ert rep: r:	air/rep	blacement 🔲 (	Jpstream s	torage retro	ofit
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unki	nown					
If yes for fish barrier	EXTENT OF PHYSICAL BLO	CKAGE: vn op: <u>32</u> (in) epth: (in)	A structure such a road culvert on a greater stream ble upstream moveme anadromous fish; passage device p	as a dam 3rd order ocking th ent of no fish resent.	BLO or or or ne	CKAGE SEVER A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	RITY: <i>(circ</i> ge on a Id isolate a of stream, e that may migration of	A temporar beaver dan the very he very little vi above it; na as waterfal	y barrier such as a n or a blockage at ad of a stream with able fish habitat atural barriers such ls.
) Nomec/Supp	U Other:	and 2011 - Advanced	5		4	3		2	1
WEN AL-WS UNLAMP (TREES Stravis)	ROAD Madarat Kanton ISTRAILS	Road (1)4 AM	A Star	;	÷				
) 4-			A			Repor	TED TO AU	THORITIES	Yes No

Reach Level Assessment RCH

SURVEY REACH	D: <u>GB-10</u> w	TRSHD/SUBSHD:		DATE: <u>6   1</u>	108 Ass	ESSED BY:	
Start Tim	1e: <u>10</u> : <u>30)</u> (AM/PN	M LMK:	END TIME:	: <u>45</u> AM/PM	LMK:		GPS ID:
LAT4 0 51 1	42.3 " LONG	72024 152.9"	LAT 1 0 5 1	126" LONG	0 164 g	())"	-
DESCRIPTION:			DESCRIPTION:				
RAIN IN LAST 24 H	DURS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS		T Steady rai	n 🗌 İntern	vittent
□ None	Intermitten	t $\Box$ Trace		$\Box$ Trace	$\Box$ Overcast	□ Partly	r cloudy
SURROUNDING LAN	ND USE:  Industria	al 🗆 Commercial urse 🗆 Park	□ Urban/Residential □ Crop	☑ Suburban/Res	☐ Forested ☐ Other:	□ Institu	tional
AVERAGI	E CONDITIONS (cha	zck applicable)	REACH S	SKETCH AND SITE	Імраст Т	RACKING	
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	⊠ 50%-75% □ 75-100%	Simple planar sketch o within the survey rec	of survey reach. Track ach (OT, ER, IB,SC, U deamad appropriate. B	locations and T, TR, MI) as v	IDs for all si vell as any ac	ite impacts Iditional
<b>DOMINANT SUBSTR</b> Silt/clay (fine or Sand (gritty) Gravel (0.1-2.3)	ATE slick) ⊠ C □ B 5") □ B	tobble (2.5 –10") soulder (>10") ed rock	jeaures	deemed appropriate.		ster	, *** ***
WATER CLARITY Stained (clear, n Other (chemicals,	☑ Clear □Turbi naturally colored) □ dyes)	d (suspended matter) Opaque (milky)		X	heat	14	
AQUATIC PLANTS	Attached: 🗌 nor	ne 🖾 some 🗆 lots		S GNY 1	/ (JP***	$\sim \int \int$	
IN STREAM	Floating: 🖾 non	$e \square$ some $\square$ lots				1	
WILÐLIFE IN OR Around Stream	(Evidence of) ☑Fish □ Beav □ Snails ☑Othe	r: mich	~				
STREAM SHADING (water surface)	⊠ Mostly shaded □ Halfway (≥50% □ Partially shaded □ Unshaded (< 23	(≥75% coverage) %) d (≥25% ) 5%)	<1 ×1		~		
Channel Dynamics	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour	(			× .	
Unknown	Aggrading 🔀 Sed. depositio	n Slope failure					
CHANNEL	Height: LT bank	(ft)	A SA (ST. )				
DIMENSIONS	RT bank	(ft)			Marry V Subsymmetry		
(FACING DOWNSTRFAM)	Width: Bottom	(ft)			3		
	Тор	(ft)					
F	REACH ACCESSIBILI	ТУ			2		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream.	research deboring		۵۰ ۲۰ ۲۰ کرد <u>میں در ۲۰۰۰ میں میں م</u>		
existing roads or trails.	small or distant from stream	Specialized heavy		k		79	
5 4	4 <u>3</u> (2	2 1			,		
NOTES: (biggest prob	olem you see in survey	reach)					

a sort

**REPORTED TO AUTHORITIES** YES NO

	Optimal	Subortimal	Marginal	Poor
IN-STREAM	Greater than 70% of substrate	40-70% mix of stable habitat; well-	Marginai	Poor
HABITAT (May modify criteria based on appropriate habitat regime)	favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.		Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.L		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.		Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	- Over.	ALL BUFFER AND FLOODPLAI	IN CONDITION	
	Ontimal	Suboptimal	Marginal	Poor
	optimiti			· · · · · · · · · · · · · · · · · · ·
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. 8 7 6	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.543	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       (10)       9         Right Bank       (10)       9	Width of buffer zone 25-50 feet;         human activities have impacted zone         only minimally.         8       7       6         8       7       6	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       10	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. <u>8</u> 7 6 <u>8</u> 7 6 Predominant floodplain vegetation type is young forest	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.543543Predominant floodplain vegetation type is shrub or old field	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank (10) 9         Right Bank (10) 9         Predominant floodplain vegetation type is mature forest         20 19 18 17 (16 <sup>2</sup> )	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         Predominant floodplain vegetation type is young forest       11	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. <u>5 4 3</u> <u>5 4 3</u> Predominant floodplain vegetation type is shrub or old field <u>10 9 8 7 6</u>	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-outs, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       20       19       18       17       16 <sup>2</sup> Even mix of wetland and non-wetland habitats, evidence of standing/ponded water       10       10       10	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         Predominant floodplain vegetation type is young forest       15       14       13       12       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       6	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. <u>5 4 3</u> <u>5 4 3</u> Predominant floodplain vegetation type is shrub or old field <u>10 9 8 7 6</u> Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities. 2 1 0 2 1 0 Predominant floodplain vegetation type is turf or crop land 5 4 3 2 1 0 Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       20       19       18       17       16         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water       20       19       18       17       16	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6         Predominant floodplain vegetation type is young forest       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       11	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       old field         10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       10       9       8       7       6	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	Optimization         Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-outs, lawns, crops) have not impacted zone.         Left Bank (10) 9         Right Bank (10) 9         Predominant floodplain vegetation type is mature forest         20 19 18 17 (16')         Even mix of wetland and non-wetland habitats, evidence of standing/ponded water         20 19 (18) 17 16         No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         Predominant floodplain vegetation type is young forest       15         15       14       13       12         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       15       14       13       12       11         Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function       15       14	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. <u>5 4 3</u> <u>5 4 3</u> Predominant floodplain vegetation type is shrub or old field <u>10 9 8 7 6</u> Either all wetland or all non- wetland habitat, evidence of standing/ponded water <u>10 9 8 7 6</u> Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank       10       9         Right Bank       10       9         Predominant floodplain vegetation type is mature forest       20       19       18       17       16         Let unix of wetland and non-wetland habitats, evidence of standing/ponded water       20       19       18       17       16	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally. <u>8</u> 7 6 <u>8</u> 7 6 Predominant floodplain vegetation type is young forest <u>15 14 13 12 11</u> Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water <u>15 14 13 12 11</u> Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal. <u>5 4 3</u> <u>5 4 3</u> Predominant floodplain vegetation type is shrub or old field <u>10 9 8 7 6</u> Either all wetland or all non- wetland habitat, evidence of standing/ponded water <u>10 9 8 7 6</u> Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Width of buffer zone <10 feet or no riparian vegetation due human activities.         2       1       0         2       1       0         2       1       0         2       1       0         Predominant floodplain veget type is turf or crop land       veget type is turf or crop land         5       4       3       2       1         Either all wetland or all non- wetland habitat, no evidence standing/ponded water       5       4       3       2       1       0         Significant floodplain encroachment (i.e. fill materia land development, or man-ma structures). Significant effect floodplain function       Significant effect

Storm	Water	Outfalls

OT	
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WATERSHED/SUB	SHED: GATE	S B TROOK	DATE:	614108	ASSESSED BY:	DRS
SURVEY REACH I	D: (PB10	TIME::AM/	РМ РНОТО	ID: (Camera-Pic #)	TRIANON /#	1765
SITE ID (Condition-	#): OT- <u>@ </u>	LAT 410 51 13	2.1" LONG 7.2"	24.36.31	LMK	GPS: (Unit ID)
		A free con	ave 109-2			······································
BANK: LT RT He FLOW: None Trie	ckle	MATERIAL: Concrete [ PVC/Plastic ] Other:	SHAPE: Metal Circu Brick Ellip Othe	Single Ilar Double Iical Triple	<b>DIMENSIONS:</b> Diameter: <u>(in</u>	SUBMERGED:
Moderate Substantial Other:	Copen channel	Concrete Concrete Nother: Ripper Veget	Earthen Trap Paral	ezoid Dept polic Widt AMRR1005 "(E	h: $6 - 12$ (in) h (Top): $\frac{\sqrt{3}}{\sqrt{3}} \frac{15}{(in)}$ Bottom): $\frac{\sqrt{3}\sqrt{3}}{(in)} \frac{1}{(in)}$	NOT APPEICABLE
CONDITION:	ODOR: D. I Gas Sewage Rancid/So Sulfide Other:	NO <b>DEPOSITS/STAI</b>	NS: VEGGH None Norm Inhib X. Exce Other	E DENSITY: P bal [] ited P ssive [] ::	IPE BENTHIC GR         Brown       Orar         Other:         COOL QUALITY:         Good       Odors         Suds       Algae         Other:       Lawred	OWTH: ⊠ None nge □ Green □ No pool □ Colors □ Oils □ Floatables > Zoge d.
FOR FLOWING ONLYCC TU TU FLOTHERICONCERNS:I	DLOR:	Clear Brown None Slight Cloudi None Sewage (toile pr/plastic bags)	Grey 🔲 Yellow ness 🔄 Cloudy it paper, etc.) Dumping (bulk) Bank Erosion	Green On Opaque Petroleum (oil Excessive Sec Other: Petroleum	ange Red C sheen) C limentation	Dther: Dther: -ev C -cv e Stan
POTENTIAL REST	ORATION CANDID	DATE Discharge inv	vestigation 🗌 Strea	m daylighting ロ r: へのいた	Local stream repair.	/outfall stabilization
If yes for daylighti	ng: cover_from_outfall;	· ft Tvn	e of existing vegeta	tion:	Slope	0
If yes for stormwater curren	<i>ter:</i> tly controlled? Not investigated	Land	d Use description:	Residental Yacre	- Man Sole	adicisian
OUTFALL SEVERITY: (circle #)	Heavy discharge with strong smell. The amou compared to the amou stream; discharge app significant impact down	a distinct color and/or a punt of discharge is significant unt of normal flow in receiving pears to be having a nstream.	Small discharge; flow discharge has a colo discharge is very sm flow and any impact	v mostly clear and odorle r and/or odor, the amoun all compared to the strea appears to be minor / loc	ess. If the t of m's base alized.	es not have dry weather staining; or appearance any erosion problems.
Strengt /Norma		5	4	3	2	1
SKETCH/NOTES:		ATE C (POWDED	A			AN
<u>)                                    </u>	~~~.	<u> </u>	Λ	REP	ORTED TO AUTHORI	ITIES: 🗌 YES 🗌 NO
T	1	RICHLE	OUT M			

				Impacte	d Buffer
WATERSHED/SUBSHED:	The second se	-	DATE: 6	14 108	ASSESSED BY:
DRVEY REACH: GB -10	TIME:	: 5 AM/PM	Рното П	D: (Camera-Pic	#) Como 1# 1763
SITE ID: (Condition-#) START LA	T 4/1 ° 5/20 J' 1	LONG 7.2 °_211	14251		GPS: (Unit ID)
IB- OI END LA	T 41° 51'31.7"	ONG 77° 74	142.711		
			100		
IMPACTED BANK:     REASON INA       LT     RT     Both	DEQUATE: Lack of	vegetation Too y planted VOth	o narrow	Widespread inva	asive plants
LAND USE: Private Ir	nstitutional Golf Cou	urse Park Ot	her Public		
(Facing downstream) LT Bank					
RT Bank					
DOMINANT Paved	Bare ground Turf/lav	wn Tall grass	Shrub/scrut	Trees	Other
RT Bank					
INVASIVE PLANTS:		Partial coverage			
SIKEAM SHADE PROVIDED? [] None	e Martial L	J Full WETL	ANDS PRESI	ENT? [] No	UNKnown
POTENTIAL RESTORATION CANDIDAT	TE Active reforestat	ion 🔲 Greenway d	lesign 🗗 N	latural regeneratio	on 🔲 Invasives removal
RESTORABLE AREA		Impacted area on put	plic land	nacted area on oither	Imported area or private
LT BANK RT Length (ft): $250$ $200$	<b>REFORESTATION</b> <b>POTENTIAL:</b> ( <i>Circle</i> #)	where the riparian are not appear to be used specific purpose; pler area available for plan	a does pu d for any pro nty of pu nting pla	pacted area of entite blic or private land the esently used for a spe rpose; available area anting adequate	at is land where road; building ecific encroachment or other for feature significantly limits available area for planting
		5	4	(3)	2 1
POTENTIAL CONFLICTS WITH REFORE	<b>ESTATION</b> Winnervious cover Se	idespread invasive p vere animal impact	plants 🔲 s (deer, beav	Potential contamiver)  Other:	ination 🔲 Lack of sun
NOTES: Buffer from G.	B coordinate	to SC			
1					
	·				,

	Stream	Crossir	-
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Stream Crossing	SC	
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WATERSHED/SUBSHED:       DATE:       D/1/2/2%       ASSESSED BY:         JURVEY RRACH ID:       (-1/2/4)       TIME:       ::::::::::::::::::::::::::::::::::::
URVEY REACH ID:       GAM D       TIME:       I:       I: <thi:< th="">       I:       <th< td=""></th<></thi:<>
SITE ID: (Condition-#)       SC       LAT       Image: Single and constraint of the single and co
TYPE:       Road Crossing       Railroad Crossing       Manmade Dam       Geological Formation       Other:         FOR ROAD/ RAILROAD       Dox       Elliptical       Single       Concrete       Flow-aligned       Barrel diameter:       Puice         CrossTINCS       Other:       Other:       Other:       Do not know       Culvert length:       Puice         Construct       Construct       Failing embankment       Downstream scour hole       Flat       Slight (2° - 5°)       Obvious (>5°)       Roadway elevation:       Culvert length:       Widh:       Puice         Mannade       Construct       Issight (2° - 5°)       Obvious (>5°)       Roadway elevation:       Culvert repain/replacement       Upstream storage retrofit         In o       Icocal stream repair       Other:       Other:       BLOCKAGE SEVERITY: (circle #)         If yes for       Flow too shallow Water Drop:       G(in)       A structure such as a dam or road culver on a 3rd order or and adomous fish.       A temporary barrier such as a dam or road culver on a 3rd order or and adomous fish.       A temporary barrier such as a dam or road culver on a 3rd order or and adomous fish.       A temporary or a blobakage da a stead was or andomous fish.         If yes for       Flow too shallow Water Drop:       G(in)       A structure such as a dam or road culver ton a 3rd order or and adomous fish.       A temporary or
FOR ROAD/ RAILROAD       SHAPE: Arch Botomless Box Elliptical       # BARRELS: Single Double Circular       # BARRELS: Single Double Double Double Other:       ALIGNMENT: Flow-aligned Do not know       DIMENSIONS: (if variable, sket Barrel diameter: 2012 Height: 2012 Double Double Dother:         CROSSINGS ONLY       Other:       Other:       Other:       Converter Dother:       Not flow-aligned Do not know         CROSSINGS ONLY       Construction Construction Sediment deposition Dother (describe):       Downstream scour hole Failing embankment       Culvert stope: Dobious (>5°)       Culvert length: Width:       Culvert length: Width:         POTENTIAL RESTORATION CANDIDATE In no       Fish barrier removal Local stream repair       Culvert repair/replacement       Upstream storage retrofit         If yes for fish barrier       Total Doty too shallow       Partial Partial Deproteo high Water Drop:       No       Yes       Unknown         If yes for fish barrier       Flow too shallow Water Depth:       (in)       A structure such as a dam or nead culvert on 3/d order or andomous fish.       A total fish blockage on a tributary that would isolate a swerfalls.       A temporary barrier such baser dam or a blockag they whated a stream or ad admonus fish.         MOTES/SKETCH:       Other:       S       4       3       2       1
Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         If yes for       Total (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):         If yes for       Contract:       Cause:       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe):       Image: Contract (describe): <t< td=""></t<>
Image: No       □ Local stream repair       □ Other:         IS SC ACTING AS GRADE CONTROL       □ No       □ Yes       □ Unknown         If yes for fish barrier       □ Total       □ Partial       □ A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or road culver or no and corder or greater stream blocking the very head of a stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or road culver or passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or road culver or passage device present.       A structure such as a dam or road culver or a stream, or partial blockage that may interfere with the migration of anadromous fish.       A structure such as a dam or anadromous fish.       A temporary are such as a dam or anadromous fish.         Image: Dot too bigh       Water Drop:       6 (in)       6 (in)       Passage device present.       A structure such as a dam or anadromous fish.       A structure such as a dam or anadromous fish.       A structure such as a dam or anadromous fish.         Image: Dot too bigh       Image: Dot too bigh       Image: Dot too bigh       Image: Dot too big
IS SC ACTING AS GRADE CONTROL IN O Yes Unknown          IS SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       Total       Partial         Total       Partial       A structure such as a dam or greater stream blocking the upstream movement of anadromous fish, no fish passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or greater stream blocking the upstream movement of anadromous fish.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or greater stream blocking the upstream movement of anadromous fish.       A temporary barrier such as a dam or greater stream blocking the upstream movement of anadromous fish.       A temporary barrier such as a dam or a blockage that may interfere with the migration of anadromous fish.       A temporary barrier such as a dam or anadromous fish.         Other:       5       4       3       2       1         NOTES/SKETCH:       Mattrue Matrue Mattrue Mattrue Matrue Mat
EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)         Total       Partial         Temporary       Unknown         If yes for       A structure such as a dam or orad culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish; no fish passage device present.       A total fish blockage that may interfere with the migration of anadromous fish.         Other:       5       4       3       2       1         NOTES/SKETCH:       WMACH, is sh. MASHAMMAMAMASSAMA       MMSSAMA       MMSSAMA
NOTES/SKETCH:
Notes/Sketch: Williegh is shirabler and plassic
First reck biddurs
Reported to Authorities Tyes

## Utility Impacts

WATERSHED/SUBS	HED: GAGES BK	DATE:	MIDS	ASSESSEI	BY: DE	B	
SURVEY REACH ID	: GB-10	Тіме: <u>  </u> : !	S_AM/PM	Рното ID: (С	amera-Pic	#)	1# 176 2
SITE ID: (Condition-#	) UT- <u>0 </u> Lat	11051 .32	2.4" LONG 72	·24 ·42.7	" LMK:		GPS: (Unit ID)
							J
Түре:	MATERIAL:	LOCATION:	POTEN	TIAL FISH BARR	IER:	PIPE D	IMENSIONS:
Leaking sewer	Concrete	☐ Floodplain	🗌 Yes	🗌 No		Diamete	er:in
Exposed pipe	Corrugated metal	Stream bank				Length e	exposed: <u>ft</u>
Exposed manhole	$\square$ Smooth metal	Above stream	n CONDI	FION: Dioin	t failure	☐ Pipe	corrosion/cracking
NEW CROSSING	$\overrightarrow{\mathbf{N}}$ Other:	Other: Ran	T Prote	ective covering bro	ken		hole cover absent
WI JURPAR OF A	- MUNILNO, N	Strail 20	🗛 🔄 Othe	<u>r: 0000 +</u>	suent a	<u>8.55/5</u>	thrubs .
			rle Brown 🗍 I	t Prouvin 🗍 Valla			
EVIDENCE OF							_ Other:
DISCHARGE:	DEPOSITS None	Tampons/To	ilet Paper	ime 🗌 Surface o	$\Box$ Other:		er.
1	17	1					<b></b>
POTENTIAL RESTO	RATION CANDIDATE [	Structural repa	irs 🔲 Pipe test	ing 🔲 Citizen ho	otlines 🔲 D	ry weathe	er sampling
🕅 no		Fish barrier re	moval 🔲 Other				
If yes to fish barrier, N	Water Drop: (in	)					
UTILITY IMPACT	Section of pipe undermined by	erosion and could	A moderately long	section of nine is	Small section	n of exposed	d pipe, stream bank near the
SEVERITY:	collapse in the near future; a pi the bed or suspended above th	pe running across e stream: a long	partially exposed b	but there is no	pipe is stable	e; the pipe is nly a small r	across the bottom of the
(Circle #)	section along the edge of the s	tream where nearly	immediate threat to undermined and b	hat the pipe will be reak in the	exposed; the	pipe is exp	osed but is reinforced with
	manhole stack that is located in	n the center of the	immediate future.	The primary concern	fish moveme	l it is not cau nt: a manhc	using a blockage to upstream ble stack that is at the edge of
	stream channel and there is ev	idence of stack	large debris during	y be punctured by a large storm event.	the stream a	nd does not	extend very far out into the
Leaking= 5	5		4	3	2	i channei.	
NOTES:							
	1	age a	in pip	~			
		\$		Rep	ORTED TO L	OCAL AUT	THORITIES 🗌 Yes 🗍 No
						<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	
Ϋ́,		$\langle \rangle = \langle \rangle$					



UT

Stream	Cros	sind

Stream Crossing	SC	
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r							
WATERSHED	/SUBSHED: Laver tankerhi	Dosen	I	DATE: <u>6</u>	15 108	ASSE	SSED BY: 6A JS, B7
URVEY REA	<u>. СН ID: LTR-03</u>	TIME: <u>4</u> : <u>2</u>	) AM/EM) I	Рното II	<b>):</b> (Camera-Pie	c#)	30 1# 31
SITE ID: (Con	dition-#) SC0/ LAT	<u>41 ° 49 '27.</u>	<u>2 " LONG 72</u>	<u>° 29 '</u>	<u>15%</u> " L	MK	GPS (Unit ID)
	d Crossing Dailroad Crossing	ng 🕅 Manmad-	Dom D Doorro	Dom 🗖	Goolgainel F	motion 🗖	Othern
		#BARRELS.	MATERIAL.		NMENT.		Unter:
	Arch Bottomless	Single	Concrete		ow-aligned	Barrel dia	meter: (ft
EOD DOID	Box Elliptical	Double	🔲 Metal	🗌 No	ot flow-aligned		Height:(ft
RAILROAD	Other:	Other:	Other:		Do not know		
CROSSINGS	<b>CONDITION:</b> (Evidence of)			CULV	CULVERT SLOPE.		ength:(ft
ONLY	Cracking/chipping/corrosion	Downstream	n scour hole	🔲 Fla	at		Width:(ft
	Sediment deposition	🗌 Failing emb	ankment		ght $(2^{\circ} - 5^{\circ})$		
	Other ( <i>describe</i> ):				wious (~5 )	Roadway	elevation:(f
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culver	t repair/re	placement [] [	Jpstream st	orage retrofit
no		Local stream	repair 🔲 Other:	A .		_	U I
IS SC ACTING	G AS GRADE CONTROL		es Unkno	own			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLC	CKAGE SEVEI	RITY: (circ	le #)
	Total Partial	<i>u</i> n	A structure such as	a dam or	A total fish blocka	ige on a	A temporary barrier such as
If ves for		v11	road culvert on a 3rd	d order or	tributary that wou	ld isolate a	beaver dam or a blockage at
fish barrier	CAUSE:	(in)	upstream movemen	it of	or partial blockag	e that may	very little viable fish habitat
	Flow too shallow Water Dr	$\frac{\text{op:}}{\text{woth:}}  (in)$	anadromous fish; no passage device pres	o fish sent.	interfere with the anadromous fish.	migration of	above it; natural barriers suc as waterfalls.
	Other:	F ()	(5)	•	4 3		γ 1
NOTES/SKET	CH:		<u>Č</u> 2		·		
)					Danca	TED TO	
					KEPOR	TED TO AUT	

START       THE 4: CLART WALL       THE AND CLART WALL       THE 4: CLART	SURVEY REACH IN: LTR-03 WIDSHN/SUBSHD.	Reach Level Assessment
RAIN IN LAST 24 HOURS       Heavy rain       Steady rain       The committent       The committent       The committent       Steady rain       Intermittent         ESQ000       Intermittent       The commercial       The commercial       The commercial       Steady rain       Intermittent         SURROUNDING LAND USES:       Industrial       Commercial       C	START       TIME: 4:04 AM/PA       LMK:         START       TIME: 4:04 AM/PA       LMK:         Lat 4( ° 49 '20.5"       LONG 77 ° 79 '41.5"         Description: Trated v. 110 PUNT FULCT	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
SURROUNDING LAND USE:       Industrial       Commercial       Urban/Residential       Suburban/Res       Of Ortes:       If Suburban/Res       Of	RAIN IN LAST 24 HOURS       □ Heavy rain       □ Steady rain         None       □ Intermittent       □ Trace	PRESENT CONDITIONS       Image: Heavy rain       Image: Steady rain       Image: Intermittent         Image: Clear       Image: Trace       Image: Overcast       Image: Partly cloudy
AVERAGE CONDITIONS (check applicable)       REACH SKETCH AND SITE INFACT TRACKING         BASE FLOW AS %       0-025%       050%-75%         CHANNEL WIDTH       0-25%       0-75%-100%         DOMINART SUBSTRATE       Cobble (2.5-10")       Strate derived appropriate. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach. Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and IDE for all site impacts within the survey reach (Track locations and track locations and track locations and track	SURROUNDING LAND USE:  Industrial Golf course Park	□ Urban/Residential □ Suburban/Res ☑ Forested □ Institutional □ Crop □ Pasture ☑ Other: ⊣ gh w@y
BASE FLOW AS %       D 0-25%       D 09%-75%         CHANNEL WIDTH       D 25-50 %       D 75-100%         DOMINANT SUBSTRATE       D 510/chy (Ine or slick)       D Cobble (2.5 - 10°)         DS Silvichay (Ine or slick)       D Cobble (2.5 - 10°)       D Cobble (2.5 - 10°)         D Gravel (0.1-2.5')       D Bed rock       D Cobble (2.5 - 10°)         WAJER CLARITY       D Clear (Thurbid Gaugended matter)       D Clear (10°)         Channel       Gravel (0.1-2.5')       D Bed rock         WAJER CLARITY       Clear (Thurbid Gaugended matter)       Clear (10°)         Channel       Gravel (0.1-2.5')       B Boulder (-10°)         Other (nemical: dyc)       Gravel (0.1-2.5')       B Boulder (-10°)         Other (nemical: dyc)       Gravel (0.1-2.5')       B Boulder (-10°)         Other (nemical: dyc)       Gravel (0.1-2.5')       B Boulder (-10°)         Multiple IN CAR       Float (10°)       Gravel (10°)       Gravel (10°)         MULLIPE IN CAR       Mostly shaded (275% coverage)       Float (10°)       Gravel (10°)         STREAM SILADIC       Hardwy (S0%)       Gravel (10°)       Gravel (10°)       Gravel (10°)         Duesholos (coverable)       Gravel (10°)       Gravel (10°)       Gravel (10°)       Gravel (10°)         Three (10°)<	AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
DOMINANT SUBSTRATE Silvicial (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Cobble (2.5 - 10") $\blacksquare$ Silvical (fine or slick) $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Silvical (fine or $\blacksquare$ some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Solutions: $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Solutions: $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Solutions: $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Some $\blacksquare$ lots $\blacksquare$ Solutions: $\blacksquare$ Solutions Son	Base Flow as %         □         0-25%         □         50%-75%           Channel Width         □         25-50 %         □         75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
WATER CLARITY       Clear       Turbid (suspended matter)         Stained (clear, naturally colored)       Opaque (milky)         Other (clearnicals, dyet)       September 2         MAQUATIC PLANTS       Attached:       Done         IN STREAM       Floating:       Done         WIDLIFE IN OR       Generation       Sonder (Clearnicals, dyet)       September 2         Moothy Stream       Frish       Beaver       Deer         Stream       Snails       Other:       Stream         Moothy Stream       Partially shaded (25%)       Coverage)         NYAMICS       Height:       Downcutting       Bed sour         Dynamics       Wideling       Bank failure         Unknown       Scd. deposition       Channelized         CHANNEL       Downcutting       Bed sour         Dynamics       Width:       Both         Motty Staded (25%)       (ft)         Channelized       Cover         Channelized       Cover         Operations       RT bank $\frac{4}{1.5}$ (ft)         Difficult Must cross or equiper treating and cover treati	DOMINANT SUBSTRATE         Silt/clay (fine or slick)       Cobble (2.5 -10")         Sand (gritty)       Boulder (>10")         Gravel (0.1-2.5")       Bed rock	DAM WATER RUNNING OVER IF Rocky { } }
AQUATIC PLANTS       Attached: $\square$ none       some $\square$ tots         IN STREAM       Floating: $\square$ none       some $\square$ tots         WILDLIFE IN OR $\square$ fish $\square$ Scaver $\square$ Deer         AQUATIC PLANTS $\square$ total $\square$ fish $\square$ Scaver $\square$ Deer         ANDUND STREAM $\square$ Snails $\square$ other: $\square$ Snails $\square$ other: $\square$ Mostly shaded (>25%) $\square$ Downeuting $\square$ Bank failure $\square$ Bank failure $\square$ Midwining $\square$ Bank failure $\square$ Bank failure $\square$ Bank failure $\square$ Unknown $\square$ Sed. deposition $\square$ Channelized $\square$ Morth $\square$ Sed. deposition         CHANNEL $\square$ Sed. deposition $\square$ Channelized $\square$ Morth $\square$ Morth $\square$ Unknown $\square$ Sed. deposition $\square$ Channelized $\square$ Morth $\square$ Morth $\square$ Op $\_ \_ \square \subseteq (ft)$ $\square$ Morth $\square$ Morth $\square$ Morth $\square$ Morth $\square$ Downeuting $\square$ Sed. deposition $\square$ Channelized $\square$ Morth $\square$ Morth $\square$ Morth $\square$ Downeuting $\square$ Sed. deposition $\square$ Channelized $\square$ Morth $\square$ Morth $\square$ Dimensio	WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes) Somewhort cloudy	Marked TO Hare TO STREP ON CLIFF WALL WILL GPS AT TOPSIC
WILDLIFE IN OR AROUND STREAMEvidence of p Fish $\square$ Beaver Smails $\square$ Other:Defer $\square$ Smails $\square$ Other:Defer $\square$ Smails $\square$ Other:Defer $\square$ Smails $\square$ Other:STREAM SHADING $\square$ $\square$ Haffway ( $\leq 50\%$ ) $\square$ Unshaded ( $< 25\%$ ) $\square$ Haffway ( $\leq 50\%$ ) $\square$ Unshaded ( $< 25\%$ ) $\square$ Haffway ( $\leq 50\%$ ) $\square$ Unshaded ( $< 25\%$ ) $\square$ Haffway ( $\leq 50\%$ ) $\square$ Unshaded ( $< 25\%$ ) $\square$ Haffway ( $\leq 50\%$ ) $\square$ Unshaded ( $< 25\%$ ) $\square$ Solp failure $\square$ Bank failure $\square$ Bank failure $\square$ Bank failure $\square$ Bank failure $\square$ Bank scour $\square$ Slop failure $\square$ Slop failure 	AQUATIC PLANTSAttached:InonesomelotsIN STREAMFloating:Inonesomelots	Dysig Steel
STREAM SHADING $\square$ Mostly shaded ( $\geq 75\%$ coverage) $\square$ Mostly shaded ( $\geq 25\%$ ) $\square$ Partially shaded ( $\geq 25\%$ ) $\square$ Unshaded ( $\leq 25\%$ ) $\square$ Downcutting $\square$ Downcutting $\square$ Bank scour $\square$ Unknown $\square$ Aggrading $\square$ Bank scour $\square$ Unknown $\square$ Aggrading $\square$ Slope failure $\square$ Good: Open area in $\square$ Bank $\square$ Slope failure         public ownersh	WILDLIFE IN OR ☐ Fish ☑ Beaver ☑ Deer AROUND STREAM ☐ Snails □ Other:	Remains and Land Conce
CHANNEL       Downcutting       Bed scour       CHANNEL       Downcutting       Bank failure         DYNAMICS       Headcutting       Bank failure       Channelized       Channelized       Channelized         Unknown       Sed. deposition       Channelized       Channelized       Channelized       Channelized         CHANNEL       Height: LT bank $2.5$ (ft)       Channelized       Channelized       Channelized         CHANNEL       Height: Bottom $2.0$ (ft)       Top $2.5$ (ft)       Channelized       Channelized         Good: Open area in public ownership, sufficient to stream, equipment using existing roads or trails.       Difficult. Must cross equipment equived.         Stockpile areas, so at a distant from stream.       Stockpile areas, so at a distant from stream.       Specialized heavy equipment equived.       Bank K         10       5.       4       (3.)       2       10       Stockpile areas, so at a distant from stream.         5.       4       (3.)       2       10       Stockpile areas, so at a distant from stream.       Stockpile areama, so at a distant	✓ Mostly shaded (≥75% coverage) STREAM SHADING □ Halfway (≥50%) □ Partially shaded (≥25%) □ Unshaded (<25%)	6ft 2,5th FNS17 OF DAM
CHANNEL DIMENSIONSHeight: LT bank RT bank $2.5$ (ft) $4.5$ (ft) $724$ marine service $724$ marine serviceCHANNEL DIMENSIONSHeight: LT bank RT bank $2.5$ (ft) $4.5$ (ft) $724$ marine service $724$ marine service $724$ marine serviceDIMENSIONS (FACING 	CHANNEL       Downcutting       Bed scour         DYNAMICS       Widening       Bank failure         Headcutting       Bank scour         Unknown       Aggrading       Slope failure	20FE 44E 2FE
FACING DOWNSTREAM)       Width:       Bottom       20       (ft)         Top       25       (ft)         REACH ACCESSIBILITY       Difficult. Must cross wetland, steep slope, or sensitive areas to get to stockpile materials, pays stream channel access for heavy guipment using       Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas. Small or distant from stream.       Difficult. Must cross wetland, steep slope, or sensitive areas to get to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.       How may approximate to stock pile available and/or located a great distance from stream. Specialized heavy equipment required.       How may approximate to stream.       Bank         5       4       3       2       1       Tot during the may approximate to stream. Specialized heavy equipment required.         5       4       3       2       1       Tot during the may approximate to stream. Specialized heavy equipment required.         5       4       3       2       1       Tot during the may approximate to stream. Specialized heavy equipment required.         5       4       3       2       1       Tot during the may approximate to stream. Specialized heavy equipment required.         5       4       3       2       1       Tot during the may approximate to stream. Specialized heavy equipment required.         5       4 </td <td>CHANNELHeight: LT bank<math>2.5</math> (ft)DIMENSIONSRT bank<math>4.5</math> (ft)</td> <td>K K Prata ( Perone WATER )</td>	CHANNELHeight: LT bank $2.5$ (ft)DIMENSIONSRT bank $4.5$ (ft)	K K Prata ( Perone WATER )
REACH ACCESSIBILITYGood: Open area in public ownership, sufficient room to stockpile materials, aasy stream channel access for heavy equipment using existing roads or trails.Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.Bank543210Source Topic duffic from Stream. Specialized heavy equipment required.543210Source Topic duffic from Stream. Specialized heavy equipment required.543210Source Topic duffic from Stream. Specialized heavy equipment required.543210Topic duffic from Stream. Specialized heavy equipment required.543210Topic duffic from Stream. Specialized heavy equipment required.55576780 <td><math display="block">\frac{\mathcal{F}ACING}{\mathcal{D}OWNSTREAM}</math> Width: Bottom <math>\frac{2O}{2S}</math> (ft) Top <math>2S</math> (ft)</td> <td>A de la /td>	$\frac{\mathcal{F}ACING}{\mathcal{D}OWNSTREAM}$ Width: Bottom $\frac{2O}{2S}$ (ft) Top $2S$ (ft)	A de la
Good: Open area in public ownership, sufficient room to stockpile materials, 	REACH ACCESSIBILITY	R. With (AB)
Backgroup in the sequence of th	Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channelFair: Forested or developed area adjacent to stream.Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available andscaped areas.	4.0 PRIFORMENT BONYMENT Walford BANK
NOTES: (biggest problem you see in survey reach) * STORM WOTCR COTCH BOSIN FOR 7-84 HighWoy TOWOFF	Stockpile areas     distance from stream.       sequipment using     small or distant from     Specialized heavy       sexisting roads or trails.     stream.     2       5     4     (3)     2	$\frac{10}{10} = 50\% = \frac{2}{10} \frac{1}{100} \frac{1}{10$
J.	NOTES: (biggest problem you see in survey reach) * STOIM WOTCR COTCL BOSIN FOR	7-84 Highway RUNOFF

		OVERALL STREAM CONDI	ITION	
	Optimal	Suboptimal	Marginal	Poor
)IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 (9-)	8 7 6	5 4 3	2 1 0
<b>T</b>	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12(11)	10 9 8 7 6	5 4 3 2 1 0
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
Sub Total In-str	ream: $53/80 + Bi$	uffer/Floodplain: <u>58</u> /80	= Total Survey	Reach _/   / /160

			Stor	rm Water Outfalls	ΟΤ
WATERSHED/SUBSHE	D: LOWOR TO	ok, River	DATE: 61510	<b>Assessed by:</b>	15 RT. 6A
SURVEY REACH ID:	LTR-03 TI	ME: <u>4: 24</u> AM/RM	Рното ID: (Camera-Pi	c#) 27 1#	<del>-</del>
SITE ID (Condition-#): (	DT- <u>O(</u> LA	т <u>41 ° 44 '73%</u> "Lo	DNG 720 29 3/4	' LMK	GPS: (Unit ID)
BANK: XLT RT Head FLOW: None X Trickle	TYPE:	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE:   Single     Circular   Double     Elliptical   Triple     Other:	<b>DIMENSIONS:</b> Diameter: <u>(in)</u>	SUBMERGED:
Moderate Substantial Other:	Copen channel	Concrete Earthen	□ Trapezoid D □ Parabolic W □ Other:	epth: <u>(in)</u> /idth (Top): <u>(in)</u> ' (Bottom): <u>(in)</u>	NOT APPEICABLE
CONDITION: None Chip/Cracked	ODOR: NO	<b>DEPOSITS/STAINS:</b> None         Qily         Flow Line	VEGGIE DENSITY: None Normal	PIPE BENTHIC GRO	DWTH: 🕅 None ge 🔲 Green
Corrosion	Sulfide	Deint	Immonted     Excessive     Other:	POOL QUALITY: [ Good Odors [ Suds Algae [ Other:	X No pool Colors ☐Oils ☐ Floatables
For FLOWINGCOLOR TURBINONLYFLOATOTHERExc CONCERNS:Nec	Clear DITY: Clear None ABLES: None ess Trash (paper/pla eds Regular Mainten	r Brown Grey Slight Cloudiness Sewage (toilet paper, e stic bags) Dumping ance Bank Ero	Yellow       Green         Cloudy       Opaque         tc.)       Petroleum         (bulk)       Excessive         sion       Other: Pol	Orange □ Red □ O (oil sheen)   □ O Sedimentation しんひん	ther:
POTENTIAL RESTORA	TION CANDIDATE	Discharge investigation	n 🗌 Stream daylighting   🛱 Other: (JK70Min	□ Local stream repair/o JATES	outfall stabilization
If yes for daylighting: Length of vegetative cov	er from outfall:	ft Type of exist	ing vegetation:	Slope:	o
If yes for stormwater: Is stormwater currently c Yes No Not	controlled?	Land Use des Area available	cription: e:		
OUTFALL He SEVERITY: con (circle #) str	avy discharge with a dist ong smell. The amount of npared to the amount of eam; discharge appears nificant impact downstrea	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	ischarge; flow mostly clear and or ge has a color and/or odor, the am ge is very small compared to the s d any impact appears to be minor	dorless. If the nount of tream's base / localized. Outfall does discharge; s of causing a	not have dry weather staining; or appearance any erosion problems.
SKETCH/NOTES:		4	3	Z	<u> </u>
	J-84 RU 70 7 SlvDg	mall gous 70, ziver, silfy c Bottom.	Renentions Po / orange / Rus	1N) -7 Pon 17 -7 71+ick	
)			R	REPORTED TO AUTHORIN	ries: 🗌 yes 🗌 no

Reach Level Assessment

SURVEY REACH	1D:M W	TRSHD/SUBSHD:	I.T.V. Run	DATE: <u>61</u>	Assessed By	:
START TIM	1e: <u>/:<u>52</u>-am/pr</u>	и LMK:	END TIME:	<u>3 : 40</u> AM/PM	LMK:	GPS ID:
LATA OHA !	36.0" LONG	12 0 246 124.4 "	LAT 41 º 49 '	37.4 " LONG 7	2027 153.5"	
DESCRIPTION:	alit to pr	chr	DESCRIPTION: SA	CAM DAINE	LADO THAD	
RAIN IN LAST 24 HO	DURS 🗆 Heavy rain	🕱 Steady rain	PRESENT CONDITIONS	5 🛛 Heavy rain	□ Steady rain □ Inte	rmittent
		$t \square Trace$			Overcast Par	tly cloudy
SURROUNDING LAN	D USE: 🗌 Industria	$\Box Commercial$	Urban/Residential	Suburban/Res	□ Forested □ Inst	itutional
AVERAGI	E CONDITIONS (cha	ck applicable)	REACH	SKETCH AND SU	TE IMPACT TRACKING	<u>NO</u>
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ick locations and IDs for al	l site impacts
CHANNEL WIDTH	□25-50 %	₩75-100%	within the survey re	each (OT, ER, IB,SC,	UT, TR, MI) as well as any	additional
DOMINANT SUBSTR	ATE	-		A second appropriate.	A A A A A A A A A A A A A A A A A A A	
$\Box$ Silt/clay (fine or $\Box$ Sand (gritty)	slick)	obble $(2.5 - 10")$			9101 9101	
Gravel (0.1-2.5	5") 🗆 B	ed rock		ADM TO A	STO.	and a start of the
Wamp Crame		4	-	e e e e e e e e e e e e e e e e e e e	8	52 5
<b>WATER CLARITY</b> Stained <i>(clear m</i> )	$\Box$ Clear $\Box$ I urbi	u (suspended matter)			and the second sec	
$\Box$ Other (chemicals,	dyes)	- Ladao (unità)		hoł	San S	
AOUATIC PLANTS	Attached: nor	ne 🗆 some 🗆 lots	-	J.S	(MOR)	
IN STREAM	Floating: 🗌 non	e $\Box$ some $\Box$ lots		4 145	1/25th Hurston ( ) Awards	of the States
WILDLIFE IN OR	(Evidence of)	1	- X	(ð')		HIND )
AROUND STREAM	☐ Fish Ø Beav	r: Deer	5 /	126.00	Louw up	ZBED.
	Mostly shaded	(>75% coverage)	1 3	S. W. C. L.	(mars) -	1.1
STREAM SHADING	Halfway (≥50%	( <u>)</u> ()	19/2	and SF		and the second s
(water surface)	$\Box$ Partially shaded $\Box$ Unshaded (< 2)	d (≥25% ) 5%)	I STAT	V Hill		
			14 14	The Will IS	il -	
CHANNEL	Widening	Bed scour	Letter had	* T20	possis	IE NEW R
DYNAMICS	Headcutting	Bank scour			N	
Unknown	Aggrading	Slope failure		modey	Kana Julia Yung	· ····································
	Sed. depositio	n Channelized		76-1	· • •	
CHANNEL	Height: LT bank	(ft)	C		all and	î.
DIMENSIONS	RT bank	<u> </u>	- SK	100	vin.	
(FACING DOWNSTRFAM)	Width: Bottom	(ft)	L.	5 X.	07-07 will	
	Тор	(ft)	30	and the second se	See 200	
F	REACH ACCESSIBILI	T¥	2) (X)		O ZO	~
Good: Open area in	Fair: Forested or developed area	Difficult. Must cross			7105	
public ownership, sufficient room to	adjacent to stream.	sensitive areas to get to		- A.	est les	
stockpile materials,	Access requires tree removal or impact to	stream. Few areas to stockpile available	1.01k	ZX	1 Contraction	
easy stream channel access for heavy	landscaped areas.	and/or located a great	E-18.14-	mulment	( ).	(JUNT)
equipment using	small or distant from	uistance from stream. Specialized heavy	mudeu	DIT	da D	JT-03 ,1
S	stream.	equipment required.			, , , , , , , , , , , , , , , , , , ,	LANNY
NOTES: (biggest prob	t 3 olem you see in survev	<u> </u>	1 POWIN	74 <u>14</u>		4
	, ···,	/				
				REPOR	TED TO AUTHORITIES	YES NO
				INEI OK	IO ROTHONITES	I A LO AL YINU

	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infracture tree	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field Wenipard True	Predominant floodplain vegetation type is turf or crop land	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	
	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0	
Sub Total In-str	ream: <u>47</u> /80 + Br	uffer/Floodplain: <u>34</u> /80	= Total Survey	Reach <u>/160</u>	

				Storm Water Outfalls				
WATERSHED/SUBSI	IED:			DATE: 6 / 4 / 0% ASSESSED BY:				
SURVEY REACH ID	MA- 51 1	ГІМЕ: <u>2:30</u> ам/рм	$\hat{\mathbf{v}}$	Рното ID: (Camera-Pi	c #)	/# 24	· · · · · · · · · · · · · · · · · · ·	
SITE ID (Condition-#):	OT1	LAT 4 0 49 36.1	L" Loi	NG 12 ° 24 163 1	' LMK	G	<b>PS:</b> (Unit ID)	
BANK: LT RT Head FLOW: None Trick	TYPE: Closed pipe	MATERIAL: Concrete IN PVC/Plastic IF Other:	Metal <sup>°</sup> Brick	SHAPE: Single Circular Double Elliptical Triple Other:	DIMENS	SIONS: r: <u>3 (in)</u>	SUBMERGED:	
Moderate  Substantial  Other:	Dpen channel	Concrete Ea	rthen	Trapezoid   D     Parabolic   W     Other:   "	epth: /idth (Top):_ ' (Bottom):_	<u>(in)</u> (in) (in)	NOT APPEICABLE	
CONDITION:	ODOR: NC Gas Sewage Rancid/Sour	DEPOSITS/STAINS	:	VEGGIE DENSITY: None Normal Inhibited	PIPE BEN Brown Other: POOL OI	THIC GROW	TH: None	
Other:	Other:	☐ Paint ☐Other:		Excessive Other:	Good Odors Ociors Oi Suds Algae Floatables		Colors Oils Floatables	
FOR COLO FLOWING TURE ONLY FLOA	DR:   Classification     BIDITY:   No     TABLES:   No	ear Brown Gr ne Slight Cloudines ne Sewage (toilet p	rey [] ss [] paper, etc	Yellow Green Cloudy Opaque C.) Petroleum (	Orange	Red 🗌 Othe	<u>r:</u>	
OTHER $\Box$ E: $\bigcirc$ ONCERNS: $\Box$ N	ccess Trash (paper/p eeds Regular Maint	enance Bar	ımping ( nk Erosi	bulk)  Excessive	Sedimentati	on		
POTENTIAL RESTOR	AATION CANDIDA	<b>FE</b> Discharge invest	tigation ofit	Stream daylighting [	Local str	eam repair/out	fall stabilization	
If yes for daylighting Length of vegetative co	; over from outfall;	ft Type o	of existin	ng vegetation:		Slope:	0	
If yes for stormwater Is stormwater currently	: controlled? ot investigated	Land U Area av	Jse descr vailable:	ription:				
OUTFALL F SEVERITY: C (circle #)	leavy discharge with a d trong smell. The amount ompared to the amount tream; discharge appear ignificant impact downst	istinct color and/or a of discharge is significant of normal flow in receiving s to be having a ream.	Small disc discharge discharge flow and a	charge; flow mostly clear and od has a color and/or odor, the am is very small compared to the st any impact appears to be minor /	lorless. If the ount of tream's base localized.	Outfall does not discharge; stain of causing any e	have dry weather ing; or appearance erosion problems.	
SKETCH/NOTES	5	4		3		2	1	
				K	EFORIED IC	AUTHORITIES		

C

	Storm Water Outfalls		
WATERSHED/SUBSH	IED:		DATE:// ASSESSED BY:
SURVEY REACH ID:	MAR-DI	ТІМЕ: <u>1:45</u> ам/рм	Рното ID: (Camera-Pic #) 30 /#
SITE ID (Condition-#):	OT- <u>02</u>	LAT <u>41 • 44 • 36</u> ,2	_"LONG 72 • 26 · 2. " LMK GPS: (Unit ID)
BANK: LT RT Heac FLOW: None Trickl Moderate Substantial	e TYPE:	MATERIAL: Concrete M PVC/Plastic B Other: Concrete E Ear	SHAPE:       Single       DIMENSIONS:       SUBMERGED:         fetal       Circular       Double       No         crick       Elliptical       Triple       Diameter:(in)       Partially         Other:       Fully         then       Parabolic       Model
U Other:	channel	Other:	$\square \text{ Other:} \qquad " (Bottom): \qquad (in) \\ \blacksquare \text{ Other:} \qquad " (Bottom): \qquad (in) \\ \blacksquare \text{ Other:} \qquad " (Bottom): \qquad (in) \\ \blacksquare \text{ Other:} \qquad \square
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: D No Gas Sewage Rancid/Sou Sulfide Other:	D DEPOSITS/STAINS:	VEGGIE DENSITY:       PIPE BENTHIC GROWTH:       None         Normal       Orange       Green         Inhibited       Other:       POOL QUALITY:       No pool         Other:       Suds       Algae       Floatables         Other:       Other:       Suds       Algae       Floatables
FOR     COLO       FLOWING     TURB       ONLY     FLOA       OTHER     Exponential       CONCERNS:     No       POTENTIAL RESTOR     no       If yes for daylighting       Length of vegetative of	DR:     CI       IDITY:     N       TABLES:     N       access Trash (paper/ ceds Regular Main       ceds Regular Main       cation Candida       cation Candida	ear Brown Gree one Slight Cloudines one Sewage (toilet pr plastic bags) Dun tenance Ban TE Discharge invest Storm water retro	ey       Yellow       Green       Orange       Red       Other:         s       Cloudy       Opaque         aper, etc.)       Petroleum (oil sheen)       Other:         nping (bulk)       Excessive Sedimentation         k Erosion       Other:         igation       Stream daylighting       Local stream repair/outfall stabilization         fit       Other:
If yes for stormwater         Is stormwater currently         Yes       No         OUTFALL       H         SEVERITY:       C         (circle #)       s	controlled? ot investigated leavy discharge with a trong smell. The amount ompared to the amound tream; discharge appea ignificant impact downs	Land U: Area av distinct color and/or a to f discharge is significant of normal flow in receiving rs to be having a tream.	se description:
SKETCH/NOTES:	3	4	5 2 1
,			REPORTED TO AUTHORITIES: YES NO

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F				Storm Water	Outfalls	ΟΤ		
WATERSHED/SUBSH	ED:		DATE:/	DATE:// ASSESSED BY:				
SURVEY REACH ID:	MT2-01	ТIME: <u>3</u> : 00 АМ/РМ	Рното ID: (Са	amera-Pic#) 3	/#			
SITE ID (Condition-#);	от- <u>15</u>	LAT 4 • 36.	"LONG 12 . 24	<u>'R.2</u> " LMK_	GI	<b>PS:</b> (Unit ID)		
BANK: LT RT Head FLOW: None Trickle Moderate Substantial	TYPE: Closed pipe	MATERIAL: Concrete I PVC/Plastic I Other: Concrete Ea	SHAPE:     Image: Shape image:	Single <b>DIMENS</b>   Double Triple Diameter Depth:	IONS: : <u>/// (in)</u> (in)	SUBMERGED: No Partially Fully		
Other:	channel	Other:	☐ Parabolic ☐ Other:	Width (Top):	(in)	NOT APPEICABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: [] N [] Gas [] Sewage [] Rancid/So [] Sulfide [] Other:	NO <b>DEPOSITS/STAINS</b> None Oily Flow Line Paint Other:	: VEGGIE DENSI	Image: Pipe Ben           Image: Pipe Ben	THIC GROW	TH: DNone Green No pool Colors Ooils Floatables		
FOR     COLO       FLOWING     TURBI       ONLY     FLOAT       OTHER     Ex       CONCERNS:     Ne	R: 1 C CANDID	Clear       Brown       Gr         None       Slight Cloudine         None       Sewage (toilet p         r/plastic bags)       Du         ntenance       Bai         ATE       Discharge invest	ey Yellow G ss Cloudy O paper, etc.) Pe imping (bulk) E: nk Erosion Ot tigation Stream daylic	reen Orange paque paque troleum (oil sheen) xcessive Sedimentatic ther:	Red Other	ri Nil stabilization		
$\square$ no If yes for daylighting:		Storm water retro	ofit Other:					
Length of vegetative co	ver from outfall:	ft Type c	of existing vegetation:		Slope:	0		
If yes for stormwater: Is stormwater currently Yes No No	controlled? t investigated	Land U Area av	Jse description:			×		
OUTFALL     H       SEVERITY:     st       (circle #)     st	eavy discharge with a rong smell. The amo impared to the amou ream; discharge app gnificant impact down	a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a nstream.	Small discharge; flow mostly c discharge has a color and/or or discharge is very small compar flow and any impact appears to 3	clear and odorless. If the dor, the amount of red to the stream's base b be minor / localized.	Outfall does not discharge; stain of causing any e	have dry weather ing; or appearance prosion problems.		
SKETCH/NOTES:					<u>.</u>	1		
	Do inde	prod Dry		<b>Β</b> ΕΡΟΡΤΕD ΤΟ	) <b>4</b> 1/THODITIE			

C.

				Sto	orm Water	<sup>-</sup> Outfalls	OT	
WATERSHED/SUB	SHED: MIDLE Ton	Kellasosen R.V.	142	DATE: 6/4/0	25 ASSE	SSED BY .	16 / A	1
SURVEY REACH I	D:MTR-01 TI	ME::AM/PM	1	Рното ID: (Camera-l	Pic #)	/#	JJ, GAF	-
SITE ID (Condition-	4): <b>OT</b> - <u>04</u> L	AT <u>41 ° 49 '38</u>	L" Lo	NG 1/ 027. 1577	_" LMK		GPS: (Unit ID)	
BANK: LT ART He FLOW: None Trice	ad TYPE:	MATERIAL:	Metal Brick	SHAPE:   Single     Circular   Doubl     Elliptical   Triple     Other:	DIMENS e Diamete	SIONS: r:2(in)	SUBMERGED:	
Moderate Substantial Other:	Open     channel	Concrete Ea	arthen	Trapezoid  Parabolic  Other:	Depth: Width (Top): " (Bottom):	<u>(in)</u> (in) (in)	NOT APPESCABLE	
CONDITION:	ODOR: No	<b>DEPOSITS/STAINS</b> None Oily Flow Line	5:	VECGIE DENSITY:	PIPE BEN Brown Other:	NTHIC GRO	DWTH: None ge 🔲 Green	2
Corrosion Other:	Sulfide	Dur Plow Line Paint Other:		Infinited     Excessive     Other:	POOL Qu	JALITY: [ Odors [ Algae [	☑ No pool □Colors  □Oils □ Floatables	
FOR FLOWINGCon Tun Tun ONLYONLYFLOOTHER CONCERNS:I	LOR: Clea RBIDITY: Non DATABLES: Non Excess Trash (paper/pla Needs Regular Mainter	r 🔄 Brown 🔄 Gi e 🔄 Slight Cloudine e 🔄 Sewage (toilet p astic bags) 🔤 Du ance 🔤 Ba	rey [ ess [ paper, et umping ( unk Eros	Yellow     Green       Cloudy     Opaque       Cloudy     Petroleum       (bulk)     Excessive       ion     Other: A	Orange (oil sheen) e Sedimentati BS fige	Red 🖸 O 🗖 O on From y	ther: ther: 'ard - Un known	Purposs
POTENTIAL RESTO	PRATION CANDIDATI	E Discharge inves	stigation ofit	Stream daylighting	Local str	eam repair/o	outfall stabilization	
If yes for daylightin	ng:							-
Length of vegetative	cover from outfall:	ft Type of	of existir	ng vegetation:		Slope:	0	
If yes for stormwate Is stormwater current Yes No	er: ly controlled? Not investigated	Land U Area a	Use desc vailable:	ription:				
OUTFALL SEVERITY: (circle #)	Heavy discharge with a dist strong smell. The amount of compared to the amount of stream; discharge appears significant impact downstree	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	Small dis discharge discharge flow and a	charge; flow mostly clear and e has a color and/or odor, the a e is very small compared to the any impact appears to be mino	odorless. If the mount of stream's base r / localized.	Outfall does discharge; s of causing a	not have dry weather taining; or appearance ny erosion problems.	
Curran (Ni carro	5	4		3		2	1	<u>]</u>
SKETCH/HUTES;								
					REPORTED TO	O AUTHORIT	TIES: YES NO	

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	MODE						
WATERSHED/SUE	SHED: TAWLEAHOC	isen River	DATE:	DATE: <u>614</u> 108 ASSESSED BY:			
JURVEY REACH I	D:MTR-01	<b>ТІМЕ:</b> :_ <i>8</i> 0_АМ/РМ	Рното ID: (Camera-Pic #) 2 / /#				
SITE ID: (Condition	9-#) <b>TR-<u>∩</u> </b> LAT <u>ℓ</u>	11 • 49 • 36.0 " LON	<u>6 28 · 22</u>	<u>.</u> " LMK	GPS: (Unit ID)		
TYPE: ☐ Industrial 〕∑Commercial ☐ Residential	MATERIAL: Plastic Ger(1) Pa Tires Co Appliances Ya Automotive Ot	per Metal Instruction Medical Ind Waste her:	SOURCE:	LOCATION: Stream Riparian Are Lt bank Rt bank	a LAND OWNERSHIP:		
POTENTIAL REST	CORATION CANDIDATE [	☐ Stream cleanup	am adoption segment	t 🗌 Removal/pre	evention of dumping		
If yes for trash or debris removal	EQUIPMENT NEEDED : WHO CAN DO IT: ? (	Heavy equipment I T	rash bags ⊠Unkno Gov (□Hazmat Te	own	DUMPSTER WITHIN 100 FT:		
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., than two pickup truck loads) loca inside a park with easy access	A large amount of trash, of with easy access. Trash a long period of time but few days, possibly with a s	or bulk items, in a small a may have been dumped o it could be cleaned up i small backhoe.	A large amount area, where acc or indications of	t of trash or debris scattered over a large cess is very difficult. Or presence of drums hazardous materials		
NOTES:	BILE PLOSTIC 55 SOLION BOZREL / DRUM						
	DO NUT	D ZYKO KNOW IF	BOZZUL	C B Seck Reported	ROROPEN		

WATERSHED/SUI	sshed: Miroole To	inkerhoosen TRN	. DATE: <u>6 / 4</u>	108	ASSESSED BY: JS, 6A, 7K
<b>JURVEY REACH</b>	D: MTR-01	TIME: <u>2</u> : <u>3-6</u> AM/PM	1 PHOTO ID: (Car	mera-Pic #)	1# 28,29
SITE ID: (Condition	14) TR- <u>01</u> Lat	<u>41 • 44 · 363 " Lor</u>	G <u>72 ° 24 ' 15."</u>	'' LMK	GPS: (Unit ID)
<b>TYPE:</b> Industrial Commercial Kesidential	MATERIAL:	Paper I Metal Construction Medical Yard Waste FERCE POSTS Other: BLANN DEBRIS	SOURCE:	LOCATION:	LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 2 6-3
POTENTIAL REST	ORATION CANDIDATE	Stream cleanup Stre	eam adoption segment	Removal/prev	vention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED : Who can do it:	Heavy equipment	Trash bags 🗌 Unkno Gov 🔲 Hazmat Tea	wn am 🗌 Other	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e than two pickup truck loads) I inside a park with easy acces	A large amount of trash, with easy access. Trash a long period of time bu few days, possibly with a	or bulk items, in a small ar- may have been dumped ov t it could be cleaned up in small backhoe.	ea ver a a A large amount area, where acce or indications of l	of trash or debris scattered over a large ess is very difficult. Or presence of drums nazardous materials
NOTES:	VE WERE -	TOLD BY NEIGH	3 Das of si	2 TE THAT	Verian DPW
	CAME OJT	TO REMOVE R	seaves dam	J. DEEP	is was piled
	ON EITHE	e side of s s remarks e	Tream chai	nnel. Del iners. D	eris on resident
- 	Side wa	5 LEFT.		<b>R</b> EPORTED	

WATERSHED/SUB	shed: Missle	Tankerhoose	N RIVER	DATE: <u>6</u> /	4108	ASSESSED BY: 5 GA	
JURVEY REACH I	D: MTTZ-01		<u> 3 : 20</u> ам/рм	РНОТО ID: (Ca	mera-Pic #)	/#	
SITE ID; (Condition-#) TR- <u>D'5</u> LAT <u>4/ ° 49 ' 360</u> "LONG <u>72 ° 25 '0054</u> " LMK GPS: (Unit ID)							
Type:       MATERIAL:       Source:       Location:       Land Ownership:         Industrial       Plastic       Paper       Metal       Unknown       Stream       Public       Unknown         Commercial       Tires       Construction       Medical       Flooding       Riparian Area       Private         Automotive       Other:       Stream       Illegal dump       Illegal dump       Illegal output       AMOUNT (# Pickup truck loads):         Automotive       Other:       Stream       Illegal output       Illegal output       Illegal output       Illegal output       Illegal output						ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 2 0 - 3	
POTENTIAL REST	ORATION CANDID	ATE Stream c	leanup 🗌 Stre	am adoption segment	Removal/pr	evention of dumping	
If yes for trash or debris removal	EQUIPMENT NEED	ED: Heavy of Volunte	equipment 🔲 T	Frash bags ☑ Unkno Gov ☑ Hazmat Te	own am 🗌 Other	DUMPSTER WITHIN 100 FT:	
CLEAN-UP POTENTIAL: (Circle #)	A small amount of tras than two pickup truck lo inside a park with easy	sh (i.e., less bads) located access A large with ea a long few da	e amount of trash, o asy access. Trash period of time but ys, possibly with a s	or bulk items, in a small a may have been dumped o i it could be cleaned up in small backhoe.	A large amour ver area, where ac or indications c	t of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials	
	(5)		4	3	2	1	
NOTES: PRÉ (NORED AND SUNK INTO THE RINCE BOTTOM PRÉ (NORED AND SUNK INTO THE RINCE BOTTOM							
		uckets 7	0702 1	MAYBE MOT	26 Reported	D TO AUTHORITIES 🗌 YES 💆 NO	

Reach Level Assessment RCH

START TIM	e: 3 : 4.5 AM/PN	T LMK:	END TIME:	<u>4:10</u> AM/PM	= 1  LMK:	5 + GPC GPS I
LAT 41 º 49 · 1	37.4" LONG 7	2.27 '555"	LAT 410 49	37.4 " LONG 7	2027 50	<u>).9</u> "
DESCRIPTION: 470	ZANAN DNID	es in The	DESCRIPTION:	mul Door C.	1 Junn	
	Lect (	Branch	/⊻			I
RAIN IN LAST 24 HO	urs 🗆 Heavy rain	🕅 Steady rain	PRESENT CONDITIONS	Heavy rain	□ Steady rai	n 🗆 Intermittent
□ None					Overcast	Partly cloud
SURROUNDING LANI	DUSE:	l 🗆 Commercial arse 🗆 Park	□ Urban/Residential □ Crop	Suburban/Res	□ Forested Ø-Other: //r	□ Institutional
AVERAGE	CONDITIONS (che	ck applicable)	REACH	SKETCH AND SI	ГЕ ІМРАСТ Т	RACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% ☑ 75-100%	Simple planar sketch within the survey re features	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	ck locations and UT, TR, MI) as v Indicate directi	IDs for all site impa vell as any additiona ion of flow
DOMINANT SUBSTRA Silt/clay (fine or sild) Sand (gritty) Gravel (0.1-2.5)	ATE slick)	obble (2.5 –10") oulder (>10") ed rock		TF T		
WATER CLARITY	Clear □Turbia aturally colored) □ dyes)	d (suspended matter) Opaque (milky)				
AQUATIC PLANTS IN STREAM	Attached: 🗹 nor Floating: 🗹 non	$\begin{array}{c c} \square \text{ some } \square \text{ lots} \\ \blacksquare \text{ some } \square \text{ lots} \\ \end{array}$				
Wildlife in or Around Stream	(Evidence of) □ Fish □ Beav □ Snails □ Othe	rer 🗹 Deer r:				
STREAM SHADING (water surface)	☐ Mostly shaded ☑ Halfway (≥50% ☐ Partially shaded ☐ Unshaded (< 2:	(≥75% coverage) ` %) d (≥25% ) 5%)	SI/D	200d	-{ 	
CHANNEL	Downcutting	Bed scour		pro		
DYNAMICS	Widening	Bank failure				
Unknown	Aggrading Sed. depositio	Bank scour Slope failure Channelized	Lawr			
	Height: LT bank	3 (ft)		$\sum_{i=1}^{n}$	1-42	
DIMENSIONS	RT bank	(ft)		encode (State Processory or	S.	
(FACING DOWNSTREAM)	Width: Bottom	(ft)	4	1 1 20	2 3	
2 5 11 115 1 115 1 115 1 11 1 1 1 1 1 1	Тор	(ft)	_ × /		E S	
B	EACH ACCESSIBILI	ТУ		Z W		
Good: Open area in public ownership, sufficient room to	Fair: Forested or developed area adjacent to stream. Access requires tree	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to		MAN	1.7	
easy stream channel access for heavy equipment using existing roads or trails.	removal or impact to landscaped areas. Stockpile areas small or distant from stream	stockpile available and/or located a great distance from stream. Specialized heavy equipment required				
5	4 (3)	2 1		photo		
NOTES: (biggest prob	olem you see in survey	reach)		¥		

	Optimal	Suboptimal	Marginal	Poor	
-STREAM ABITAT ay modify teria based appropriate	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
bitat regime)	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0	
EGETATIVE ROTECTION score each ank, determine ides by facing ownstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3		
BANK EROSION facing lownstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN	High flows (greater than bankfull) able	High flows (greater than bankfull) able	High flows (greater than bankfull)	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	
CONNECTION	entrenched.	deeply entrenched.	Stream deeply entrenched.	Stream deeply entrenched.	
Connection	entrenched.	deeply entrenched.	Stream deeply entrenched.	Stream deeply entrenched.	
CONNECTION	enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI	(15) 14 13 12 11 ALL BUFFER AND FLOODPLA	Stream deeply entrenched.	Stream deeply entrenched.	
CONNECTION	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 Over	deeply entrenched. (15) 14 13 12 11 ALL BUFFER AND FLOODPLA Suboptimal	Stream deeply entrenched. 10 9 8 7 6 IN CONDITION Marginal	Stream deeply entrenched.	
CONNECTION VEGETATED BUFFER WIDTH	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI Optimal Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	(15)       14       13       12       11         (ALL BUFFER AND FLOODPLA         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	10       9       8       7       6         10       9       8       7       6         IN CONDITION       Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Stream deeply entrenched.	
CONNECTION VEGETATED BUFFER WIDTH	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	deeply entrenched.         (15) 14       13       12       11         call       BUFFER AND FLOODPLA         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6	10       9       8       7       6         10       9       8       7       6         IN CONDITION       Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.       5       4       3	Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
CONNECTION VEGETATED BUFFER WIDTH	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 <b>Over</b> <b>Over</b> Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9	(15)       14       13       12       11         RALL BUFFER AND FLOODPLA         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         8       7       6	Stream deeply entrenched.         10       9       7       6         IN CONDITION         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.       5       4       3         5       4       3       3       3	Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.         2       1       0         2       1       0	
CONNECTION VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest	Image: second	Stream deeply entrenched.         10       9       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       old field	Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
CONNECTION VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION	to enter floodplain. Stream floodplain. Stream floodplain         20       19       18       17       16         OVEI         Over the stream floodplain         Width of buffer zone >50 feet, human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.         Left Bank 10 9         Right Bank 10 9         Predominant floodplain vegetation type is mature forest         20       19       18       17       16	(15)       14       13       12       11         (ALL BUFFER AND FLOODPLA         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         9       7       6         9       7       6         9       7       6         15       14       13       12       11	Marginal         10       9       7       6         IN CONDITION       Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.       3         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       10       9       8       7       6	Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.         2       1       0         2       1       0         2       1       0         2       1       0         2       1       0         1       0       2         2       1       0         1       0       2         1       0       0	
CONNECTION VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI Utility of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	deeply entrenched.         (15)       14       13       12       11         call       BUFFER AND FLOODPLA         Suboptimal         Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         9       7       6         15       14       13       12       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       15       14       13       12       11	Stream deeply entrenched.         10       9       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       6       10       9       8       7       6	Stream deeply entrenched.         5 4 3 2 1 0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.         2       1       0         2       1       0         2       1       0         Predominant floodplain vegetation type is turf or crop land       0         (5)       4       3       2       1       0         Either all wetland or all non-wetland habitat, no evidence of standing/ponded water       1       0	
CONNECTION VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI OVEI Uidth of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water 20 19 18 17 16	benefit hooppain:       order ooppain:       order hooppain: <td< td=""><td>Stream deeply entrenched.         10       9       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       10       9       8       7       6</td><td>Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone &lt;10 feet: little or no riparian vegetation due to human activities.</td>         2       1       0         2       1       0         2       1       0         2       1       0         2       1       0         2       1       0         2       1       0         C       4       3       2       1       0         Either all wetland or all non-wetland habitat, no evidence of standing/ponded water         5       4       3       2       1       0</td<>	Stream deeply entrenched.         10       9       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       10       9       8       7       6	Stream deeply entrenched.         5       4       3       2       1       0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.	
CONNECTION VEGETATED BUFFER WIDTH FLOODPLAIN VEGETATION FLOODPLAIN HABITAT FLOODPLAIN ENCROACH- MENT	to enter floodplain. Stream flot deeply entrenched. 20 19 18 17 16 OVEI OVEI Uidth of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Predominant floodplain vegetation type is mature forest 20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water 20 19 18 17 16 No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	(15)       14       13       12       11         (15)       14       13       12       11 <b>Suboptimal</b> Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.         8       7       6         8       7       6         9       7       6         15       14       13       12       11         Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water         15       14       13       12       11         Minor floodplain encroachment in the form of fill material, land development, or manmade structures but not effecting floodplain function	Stream deeply entrenched.         10       9       7       6         IN CONDITION         Marginal         Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.         5       4       3         5       4       3         Predominant floodplain vegetation type is shrub or old field       10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water       10       9       8       7       6         Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function       7       6	Stream deeply entrenched.         5 4 3 2 1 0         Poor         Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.         2 1 0         Predominant floodplain vegetation tupe is turf or crop land         (5) 4 3 2 1 0         Either all wetland or all non-wetland habitat, no evidence of standing/ponded water         5 4 3 2 1 0         Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function	

					Sto	rm Water	Outfalls	ΟΤ
1	WATERSHED/SUBS	HED: Middle	Tank		DATE: 614108 ASSESSED BY: FriEnds			
	SURVEY REACH ID	: MTR 02	TIME: 4:19_AM/PM		Рното ID: (Camera-P	ic #)	/#	, , , , , , , , , , , , , , , ,
	SITE ID (Condition-#)	): <b>OT</b>	LAT41 049 .37	<u>', \</u> " Lo	NG72 º 27 · 58.9	" LMK_	(	GPS: (Unit ID)
	BANK: ULT URT Hea FLOW: None Trick	d TYPE:	MATERIAL:	]Metal ]Brick	SHAPE: Single Circular Double Elliptical Triple	<b>DIMENS</b> Diameter	IONS: : <u>14 (in)</u>	SUBMERGED: No Partially Fully
	Moderate Substantial Other:	Dpen channel	Concrete I I	Earthen	□ Trapezoid □ □ Parabolic v □ Other:	Depth: Vidth (Top): " (Bottom):	<u>(in)</u> (in) (in)	NOT APPENCABLE
	CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: M N Gas Sewage Rancid/Sc Sulfide Other:	IO <b>DEPOSITS/STAIN</b> ☐ None ☐ Oily ur ☐ Flow Line ☐ Paint ☐ Other:	NS:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	EGGIE DENSITY:       PIPE BENTHIC GH         None       Brown       Oral         Normal       Other:       Other:         Inhibited       POOL QUALITY:       Good         Excessive       Good       Odors         Other:       Suds       Algae		WTH: None Green No pool Colors Oils Floatables
	FOR     COL       FLOWING     TUR       ONLY     FLO       OTHER     I       CONCERNS:     I	OR: C BIDITY: C ATABLES: C Excess Trash (paper Needs Regular Main	Clear     Brown     Clear       None     Slight Cloudin       None     Sewage (toiler       Vone     Sewage (toiler       r/plastic bags)     Intenance	Grey [ ness [ t paper, e Dumping Bank Eros	Yellow Green C Cloudy Opaque tc.) Petroleum (bulk) Excessive sion Other:	Orange	Red [] Oth	ier: ier:
	POTENTIAL RESTO	RATION CANDID	ATE Discharge invo	estigatior	n 🗌 Stream daylighting	Local stre	am repair/ou	utfall stabilization
	If yes for daylightin, Length of vegetative of If yes for stormwate	g: cover from outfall: r:	ft Type	e of existi	ing vegetation:		Slope:	0
	Is stormwater currentl	y controlled?	Land	Use des	cription:			
	Yes       No       Not investigated         OUTFALL       Heavy discharge with         SEVERITY:       compared to the amou         (circle #)       stream; discharge app         significant impact dow		Area a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a istream.	Area available tinct color and/or a of discharge is significant nomal flow in receiving to be having a am.		dorless. If the nount of stream's base / localized.		iot have dry weather ining; or appearance y erosion problems.
	SKETCH/NOTES:			1	ر. 		<u>.</u>	<u> </u>
					I	Reported to	) AUTHORITI	es: 🗌 yes 🗌 no



WATEDSHED	SUBSHED Middle To	als.		DATE: 10	111/05	ASSE	SSED DV: Columb	
WATERSHED/SUBSHED: $7777200$ ( $100$ ) WATERSHED/SUBSHED: $7777200$ (Assessed by: $777700$ ) WRVEY REACH ID: NTR : $977200$ (TIME: $977200$ ) PHOTO ID: (Camera-Pic #) /#								
SITE ID: (Con	$\frac{1}{1} \frac{1}{1} \frac{1}$	41 049 137.	4 " LONG	2027 1	<0.9" L	<u>о пу</u> МК	GPS (Unit ID)	
				<u> </u>				
TYPE: ZROA	ad Crossing 🔲 Railroad Crossi	ng 🔲 Manmade I	Dam 🗌 Beave	er Dam 🔲	Geological For	mation 🔲	Other:	
For Road/ Railroad Crossings	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		NMENT: ow-aligned of flow-aligned o not know	DIMENSI Barrel dia Culvert le	ONS: (if variable, sketch) meter:(ft) Height: $\frac{1-5.5'}{\beta-4.0'}$ (ft) ngth: (ft)	
ONLY	Cracking/chipping/corrosion Sediment deposition	e of) orrosion Downstream scour hole n Dif Failing embankment			CULVERT SLOPE: $\square$ Flat $\square$ Slight (2° – 5°) $\square$ Obvious (>5°)		Width: $L = \frac{3}{13}$ (ft) R = 13 Roadway elevation: $\frac{1}{2}$ (ft)	
POTENTIAL H	RESTORATION CANDIDATE	Fish barrier re	repair 🗌 Culv	ert repair/re r:	placement 🔲 🛛	Upstream st	orage retrofit	
IS SC ACTING	G AS GRADE CONTROL	No Ye	es 🗌 Unki	nown				
	EXTENT OF PHYSICAL BLO	CKAGE:	[	BLC	CKAGE SEVER	RITY: (circl	'e #)	
If yes for fish barrier	CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	wn 	A structure such a road culvert on a greater stream blo upstream moverm anadromous fish; passage device p	as a dam or 3rd order or ocking the ent of no fish resent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.		
			5		4 3	<u>.</u>	2 1	
					REPOR	TED TO AUT		
							1	
	Reach Level Assessment RCH							
---	--							
SURVEY REACH ID: MTZ-OF WTRSHD/SUBSHD: 11	DATE: 61 510 ASSESSED BY:							
START         TIME: 12 : 45 AM/RD         LMK:           LAT_41 °_49 '35.7."         LONG 72 ° 27 '5.8"	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
DESCRIPTION: - Throad Road Culverer	DESCRIPTION: Contexence of Tank & Clark Snock							
RAIN IN LAST 24 HOURS       Heavy rain       Steady rain         None       Intermittent       Trace	PRESENT CONDITIONS          ☐ Heavy rain         ☐ Steady rain         ☐ Intermittent         ☐ Clear         ☐ Overcast         ☐ Partly cloudy							
SURROUNDING LAND USE: A Industrial PAC Commercial	□ Urban/Residential ⊠ Suburban/Res ⊠ Forested □ Institutional □ Crop □ Pasture □ Other:							
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING							
Base Flow as %         □ 0-25%         □ 50%-75%           CHANNEL WIDTH         □25-50 %         □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow							
DOMINANT SUBSTRATESilt/clay (fine or slick)Sand (gritty)Gravel (0.1-2.5")Bed rock								
WATER CLARITY Q Clear □Turbid (suspended matter) □ Stained (clear, naturally colored) □ Opaque (milky) □ Other (chemicals, dyes)	gricovs							
AQUATIC PLANTS       Attached: In none in some in lots         IN STREAM       Floating: In none in some in lots	true worky som							
WILDLIFE IN OR AROUND STREAM Share Stream Deer Snails Other: Touch Stream	15 2							
STREAM SHADING (water surface) $\square$ Mostly shaded ( $\geq$ 75% coverage) $\square$ Halfway ( $\geq$ 50%) $\square$ Partially shaded ( $\geq$ 25%) $\square$ Unshaded (<25%)								
CHANNEL     Downcutting     Bed scour       DYNAMICS     Widening     Bank failure       Headcutting     Bank scour	E'st contra							
Unknown Aggrading Slope failure Channelized	the start from the start of the							
CHANNEL Height: LT bank $\frac{7.5}{100}$ (ft)	£ 1687 mile 2/587 3.52							
(FACING Width: Bottom 15.5 (ft))	1 Berry							
Top <u>15.5</u> (ft)	( mover)							
REACH ACCESSIBILITY	X. M.							
Good: Open area in public ownership, sufficient room to stockpile materials.         Fair: Forested or developed area adjacent to stream.         Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to	) (D) y							
easy stream channel access for heavy equipment using evisting roads or trails small or distant from evisting roads or trails	1.9							
(5) 4 3 2 1	A A							
NOTES: (biggest problem you see in survey reach)	TUNNEL RUDD DOVAR CUIVERT							
	Reported to Authorities I Yes							

		OVERALL STREAM COND	TION			
×	Optimal	Suboptimal	Marginal	Poor		
)IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6.	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0		
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water Either all wetland or all r wetland habitat, no evide standing/ponded water			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Sub Total In-stream: $\frac{139}{180}$ + Buffer/Floodplain: $\frac{70}{180}$ = Total Survey Reach $\frac{139}{160}$						

Reach Level Assessment RCF
SURVEY REACH ID: MID-OH WIRSHD/SUBSHD: MiDDle Tonk, R. DATE: 615108 ASSESSED BY:
START     TIME:     1:49 AM/PM     LMK:     END     TIME:     2:52 AM/PM     LMK:     GPS II       LAT     49 '44.4"     LONG     12.37 '26.4"     LAT     LAT     49 '44.6"     LONG     12.6 '57.1"     GPS II       DESCRIPTION:     Convergence     Clark brock + Tank     Tank     Description:     Convergence     Clark brock + Tank     Description:
RAIN IN LAST 24 HOURS       Heavy rain       Steady rain       Steady rain       PRESENT CONDITIONS       Heavy rain       Steady rain       Intermittent         None       Intermittent       Trace       Clear       Trace       Overcast       Partly cloudy
SURROUNDING LAND USE:  Industrial  Commercial Urban/Residential Suburban/Res Golf course Park Crop Pasture  Other:
AVERAGE CONDITIONS (check applicable) REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS %       0-25%       50%-75%         CHANNEL WIDTH       25-50 %       375-100%    Simple planar sketch of survey reach. Track locations and IDs for all site impact within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE            Silt/clay (fine or slick)          Cobble (2.5 - 10")            Sand (gritty)          Boulder (>10")            Sand (gritty)          Bed rock
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)
AQUATIC PLANTS       Attached: Inone I some I lots         IN STREAM       Floating: Inone I some I lots
WILDLIFE IN OR AROUND STREAM (Evidence of) Signals (Deer Snails (Other: Sondard) (RAUSDA)
STREAM SHADING (water surface) $\square$ Mostly shaded ( $\geq$ 75% coverage) $\square$ Halfway ( $\geq$ 50%) $\square$ Partially shaded ( $\geq$ 25%) $\square$ Unshaded ( $<$ 25%)
CHANNEL     Downcutting     Bed scour       DYNAMICS     Widening     Bank failure       Headcutting     Bank scour       Aggrading     Slope failure
Sed. deposition Channelized MUCh SOUNCE QUE SWITT
CHANNEL Height: LT bank 3.0 (ft)
UMENSIONS KI DANK (tt) (FACING Width: Bottom // St (tt)
DOWNSTREAM) Top 1887 (ft)
REACH ACCESSIBILITY
Good: Open area in public ownership, sufficient room to stockpile materials,       Fair: Forested or developed area adjacent to stream.       Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream.
easy stream channel access for heavy equipment using existing roads or trails. Stockpile areas small or distant from stream. Specialized heavy equipment required. 15 fr
5     4     3     2     1       NOTES: (biggest problem you see in survey reach)
Reported to Authorities TY Ves Mr

OVERALL STREAM CONDITION						
<u></u>	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>net</u> pew fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 (19/ 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0		
	Right Bank (10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 (19)18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0		
<b>D</b>	Kight Bank 107 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	d Either all wetland or all non- wetland habitat, evidence of standing/ponded water Standing/ponded water			
	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Sub Total In-stream: $\frac{77}{160}$ + Buffer/Floodplain: $\frac{76}{160}$ /80 = Total Survey Reach $\frac{153}{160}$						

		Re	each Level As	sessment	RCH
SURVEY REACH	D: MT2-9 WTRSHD/SUBSHD: Min	- Takahar P	DATE: 614/3	5108 Asses	SED BY:
)	F: 5 : 65  AM/PM LMK:	END TIME: 1	· 17 AM/PM		15, GA, 1C/
LAT 4 10 49 1	174" LONG 71. 0 27+ 9.5"	LAT41 º 49 '2	Zh" LONG F	20 77143	
DESCRIPTION: 5	TRAM DNIDE TENTALOOD	DESCRIPTION:	1. D. 1 /1		
			UNEL KU DI	ICAM LIV	2010
RAIN IN LAST 24 HO	URS  Heavy rain  Steady rain	PRESENT CONDITIONS	□ Heavy rain	□ Steady rain	
SURROUNDING LAN	$D \text{ USE: } \Box \text{ Industrial } \Box \text{ Commercial}$	Urban/Residential Y	Suburban/Res	Forested	Partly cloudy     Institutional
	Golf course Park Goils	□ Crop	☐ Pasture	Other: Wer	AND
AVERAGE	CONDITIONS (check applicable)	REACH S	KETCH AND SIT	E IMPACT TR	ACKING
BASE FLOW AS %		Simple planar sketch o	f survey reach. Trac	k locations and IL	Ds for all site impacts
CHANNEL WIDTH	□25-50 % ☑ 75-100%	<u>features a</u>	eemed appropriate.	Indicate arrection	of flow
DOMINANT SUBSTR	ATE $(2.5 - 10'')$	4-02 -VA(	CW AVL		Tupher
Sand (gritty)	$\Box \text{ Boulder } (>10")$	5-10	29 P 107-0	54	CARD
Gravel (0.1-2.5	$(5'')$ $\Box$ Bed rock			50	-04
WATER CLARITY	Clear DTurbid (suspended matter)	VI 00 -	( lima	J.	•
$\Box$ Stained (clear, n	aturally colored)	691	100 Page		
	ayes)		5 5 12-01		
AQUATIC PLANTS	Attached: 🗹 none 🗆 some 🗆 lots	0	ĺ	4	
IN STREAM	Floating: Inone L some L lots		*	1	SWAND SANDY
WILDLIFE IN OR	☐ Fish  ☐ Beaver  ☑ Deer		1-07		wenter
	Snails Other: ROCCOGN		UT		
STREAM SHADING	☑ Mostly shaded (≥75% coverage) □ Halfway (>50%)		2. 		(Sewal
(water surface)	$\Box$ Partially shaded ( $\geq 25\%$ )	50		:	N/ A
	□ Unshaded (< 25%)		K .		"Sport
CHANNEL	Downcutting Bed scour	D 1-4	, ) or->		TC-07
DYNAMICS	Headcutting	0,	$\int V$	Er.	10 1015 Prost
Unknown	Aggrading Slope failure	- Maria	/		Bruz
	Sed. deposition Channelized	-	or -2	(	~ 5000
CHANNEL	Height: LT bank(ft)		12-2 TR-2	The suggestion of the second sec	
DIMENSIONS	RT bank $(ft)$	and the second se	d e t	12.03	
(FACING DOWNSTREAM)	Width: Bottom(ft)	× 4		proving	
	Top(ft)	3,29		"CIM	1.4 -
R	EACH ACCESSIBILITY	TK-1 700			XST FOR
Good: Open area in public ownership	developed area wetland, steep slope, or		-	/	r lar
sufficient room to	adjacent to stream. sensitive areas to get to stream. Few areas to		۲ ر	Spr Tonlo	C
easy stream channel	removal or impact to stockpile available	01- 7	66	R' Harrison	and the second s
access for heavy	Stockpile areas distance from stream.	1	<i>`</i>	**	1 Frank
existing roads or trails.	small or distant from Specialized heavy				
5	<u>3</u> 2 1		Λ	- Contraction - Contraction	A
NOTES: (biggest prob	Tem you see in survey reach)		71		
)					
			~		
			REPORT	ED TO AUTHORI	TIES YES NO

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OVERALL STREAM CONDITION						
\	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0		
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0		
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 (13)/12 11	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0		
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10/9 8 7 6	5 4 3 2 1 0		
<b>Fub Total</b> In-stream: $\frac{115}{80}$ + Buffer/Floodplain: $\frac{149}{80}$ = Total Survey Reach $\frac{94}{160}$ /160						

			Sto	rm Water Outfa	
WATERSHED/SUBSHED: Middle Took River			DATE: 61510	ASSESSED B	KIR JY (AP)
SURVEY REACH ID: M	TIZ-09 TI	ME: 10: 05AM/PM	<b>Рното ID:</b> (Camera-Pi	ic#) 4/ /#	0,0001
SITE ID (Condition-#): OT	- <u>10</u> LA	T 410 49.27 3" LO	ONG 72 · 27 · 54. D'	/ '' LMK	GPS: (Unit ID)
	antigeness of the sector of				
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete Metal VC/Plastic Brick Other:	SHAPE: Single Circular Double Elliptical Triple	DIMENSIONS:	SUBMERGED:
Substantial Other:	Open channel	Concrete Earthen Other:	Trapezoid D Parabolic W Other:	Depth:(in Vidth (Top):(in " (Bottom):(in	n) NOT APPENCABLE n)
CONDITION:	<b>ODOR:</b> NO Gas Sewage	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC ( Brown D O Other:	GROWTH; None range 🗌 Green
Corrosion	Sulfide	Paint Other:	Excessive     Other:	POOL QUALITY Good Odor Good Alga Other:	:
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:					
POTENTIAL RESTORATIO	ON CANDIDATE	Discharge investigatio	n 🗌 Stream daylighting	Local stream rep	air/outfall stabilization
If yes for daylighting:	<u> </u>	-			
Length of vegetative cover	from outfall:	ft Type of exist	ting vegetation:	Slop	oe:o
If yes for stormwater: Is stormwater currently cont	trolled? vestigated	Land Use des Area availabl	scription:		_
OUTFALL Heavy SEVERITY: (circle #) Heavy strong compa stream signific	discharge with a dist smell. The amount o ared to the amount of a discharge appears cant impact downstrea	inct color and/or a f discharge is significant normal flow in receiving to be having a am.	lischarge; flow mostly clear and or ge has a color and/or odor, the an ge is very small compared to the s d any impact appears to be minor	dorless. If the nount of stream's base / localized.	does not have dry weather ge; staining; or appearance ing any erosion problems.
	5	(4)	3	2	1
SKETCH/NOTES: BLACK pipe Coming From Desidence / Driveway ON					
WORDEN AVE. Undere OF purpose.					
IS this legal?					
		Silty Disch	Konze/ Brown	J	
)		U	Ą	REPORTED TO AUTHO	

Storm	Water.	Outfalle
VIO III	v v ator	Vullana

# ΟΤ

WATERSHED/SUBSHED: Middle Tank			DATE: 614106 ASSESSED BY: Friends		
SURVEY REACH ID: MTR 09 TIME: 5:15 AM(PM)			PHOTO ID: (Camera-Pic #)	1# 48	
SITE ID (Condition-#):	DT- <u>Ol</u> LA	т41049 135.7" L	ONG 72027 154.5"	LMK GPS: (Unit ID)	
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single	DIMENSIONS: SUBMERGED:	
Substantial	Open channel	Concrete Earthen	☐ Trapezoid Deptl ☐ Parabolic Widtl ☐ Other: "(E	n:(in) h (Top):(in) NOT APPEICABLE Rottom):(in)	
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: MNO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY:       P         None       []         Normal       []         Inhibited       P         Excessive       []         Other:       []	IPE BENTHIC GROWTH: None Brown Orange Green Other: OOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:	
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:					
<b>POTENTIAL RESTOR</b> no If yes for daylighting:	ATION CANDIDATE	Discharge investigati	on  Stream daylighting  I Other:	Local stream repair/outfall stabilization	
Length of vegetative cov	ver from outfall:	ft Type of exis	ting vegetation:	Slope:°	
If yes for stormwater: Is stormwater currently of Yes No No	controlled? t investigated	Land Use de Area availat	scription:		
OUTFALL     He       SEVERITY:     str       (circle #)     str	eavy discharge with a disti ong smell. The amount of mpared to the amount of i eam; discharge appears t inificant impact downstrea	nct color and/or a discharge is significant normal flow in receiving o be having a m.	discharge; flow mostly clear and odorle rge has a color and/or odor, the amount rge is very small compared to the strear nd any impact appears to be minor / loca	ss. If the of m's base alized. Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.	
	5	4	(3)	2 1	
SKETCH/NOTES:			Repo	ORTED TO AUTHORITIES: 🗌 YES 🗌 NO	

Storm	Water	Outfalls
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	s s carcos	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

WATERSHED/SUBSHED: Middly Tank			DATE: 614 108	ASSESSED BY:	Friends
SURVEY REACH ID: MTR 09 TIME: 5:32 AM/PM		Рното ID: (Camera-Pic	<b>PHOTO ID:</b> ( <i>Camera-Pic</i> #) /# 50		
SITE ID (Condition-#):	ОТ- <u>02</u> La	т <u>41 ° 49 '34,3 "</u>	LONG 72 ° 27 ' 2.1 "	LMK_	GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickl	TYPE: Closed pipe	MATERIAL: Concrete Met PVC/Plastic Bric Other:	SHAPE: ☑ Single al ☐ Circular ☐ Double k ☐ Elliptical ☐ Triple ☐ Other:	DIMENSIONS: Diameter: (in)	SUBMERGED:
Moderate Substantial	Open channel	Concrete Earthe	en Trapezoid De Parabolic Wi Other: "	pth: <u>(in)</u> dth (Top): <u>(in)</u> (Bottom): <u>(in)</u>	NOT APPENCABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: 🛛 No Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GRO Brown Orang Other: POOL QUALITY: Good Odors Suds Algae Other:	WTH: 2 None ge Green No pool Colors Oils Floatables
FOR       COLOR:       Image       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization					
If yes for daylighting Length of vegetative co If yes for stormwater	ver from outfall:	ft Type of ey	sisting vegetation:	Slope:	°
Is stormwater currently	controlled?	Land Use	description:		
OUTFALL SEVERITY: (circle #)	eavy discharge with a dist trong smell. The amount of ompared to the amount of ream; discharge appears I gnificant impact downstrea	Area avails inct color and/or a f discharge is significant normal flow in receiving to be having a am.	able: all discharge; flow mostly clear and odc harge has a color and/or odor, the amo harge is very small compared to the str and any impact appears to be minor / l	orless. If the ount of eam's base localized.	not have dry weather aining; or appearance ny erosion problems.
Skerou/Norse	5	4	(3)	2	1
)			Re	EPORTED TO AUTHORIT	IES: 🗌 YES 🗌 NO

				Storm	Water Outfall	s <b>OT</b>
WATERSHED/SUBSHI	ED: Middl	e Tonk	DATE: 6	14/08	ASSESSED BY:	Fridude
SURVEY REACH ID:	MT12 09	TIME: 5 : 40 AM/PN	A) Рното П	D: (Camera-Pic #		
SITE ID (Condition-#):	от- 03	LAT 4 049 133.	"LONG Ze	27 152911		GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle Moderate	TYPE:	MATERIAL: Concrete PVC/Plastic Other:	SHAPE: Metal Circula Brick Z Elliptic Other:	Single r Double al Triple	DIMENSIONS: Diameter: (ir	SUBMERGED: No Partially Fully
Substantial Other:	Open channel	Concrete E	arthen Irapezo Parabol	lic Widt	h: <u>(in)</u> :h (Top): <u>(in)</u> Bottom): <u>(in)</u>	NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: M N Gas Sewage Rancid/So	DEPOSITS/STAINS           Mone           Oily           Flow Line	S: VEGGIE I None Normal Inhibite	DENSITY: P	'IPE BENTHIC GR         Brown       Orat         Other:         'OOL OUALITY'	COWTH: None
Corrosion	Sulfide	Definit Other:	Excessi     Other:	ve	Good Odors Good Algae Other:	Colors Oils Floatables
FOR FLOWINGCOLOR TURBLONLYFLOATOTHER CONCERNS:Exa Ne	R: C DITY: C ABLES: C Cess Trash (paper eds Regular Main	Clear   Brown   G     None   Slight Cloudin     None   Sewage (toilet     r/plastic bags)   D     ntenance   Ba	irey Yellow ess Cloudy paper, etc.) umping (bulk) ank Erosion	Green On Opaque Petroleum (oil Excessive Sec Other:	range Red () sheen) () dimentation	Other: State
· · · · · · · · · · · · · · · · · · ·						
POTENTIAL RESTORA	ATION CANDID	ATE 🗌 Discharge inve	stigation 🗌 Stream	daylighting	Local stream repair	outfall stabilization
no		Storm water retr	rofit Other:			
<i>If yes for daylighting:</i> Length of vegetative cov	ver from outfall:	ft Type	of existing vegetatic	on:	Slope:	0
If yes for stormwater:						
Is stormwater currently	controlled?	Land	Use description:			
Yes No No	t investigated	Area a	available:			
OUTFALL     He       SEVERITY:     sta       (circle #)     sta	eavy discharge with a rong smell. The amou impared to the amou ream; discharge appe gnificant impact dowr	a distinct color and/or a unt of discharge is significant nt of normal flow in receiving ears to be having a istream.	Small discharge; flow r discharge has a color a discharge is very small flow and any impact ap	nostly clear and odorie nd/or odor, the amoun compared to the strea pears to be minor / loc	ess. If the t of m's base alized. Outfall doe discharge; of causing	es not have dry weather staining; or appearance any erosion problems.
		5 4	1	3	2	(1)
SKETCH/NOTES:						
)				REP	ORTED TO AUTHOR	ITIES: YES NO

				Storm Water	Outfalls OT
WATERSHED/SUBS	HED: Midd	« Tank	DATE: Le	14108 ASSE	SSED BY:
SURVEY REACH II	: MTR 04	TIME:AM/P	м <b>Рното ID</b>	: (Camera-Pic #)	/#
SITE ID (Condition-#	: OT- <u>인닉</u>	LAT''	'' LONG°	'" LMK	GPS: (Unit ID)
		S/A SC-01			
BANK: LT RT Hea FLOW: None Trick	d TYPE:	MATERIAL:	SHAPE: Metal Circular Brick Elliptical Other:	Single DIMENS Double Triple Diameter	SIONS: SUBMERGED: r. <u>(in)</u> Partially Fully
Moderate Substantial Other:	Open channel	Concrete E F	Earthen Trapezoi	d Depth: Width (Top): " (Bottom):	(in) (in) NOT APPEICABLE (in)
CONDITION: None Chip/Cracked Peeling Paint	ODOR: 2 1 Gas Sewage	NO DEPOSITS/STAIN	NS: VEGGIE DI	ENSITY: PIPE BEN Brown Other:	NTHIC GROWTH: Mone
Corrosion	Corrosion     Sulfide     Paint       Other:     Other:     Other:		Excessive     Other:	e Good Suds Other:	JALITY: J/No pool Odors Colors Oils Algae Floatables
FOR FLOWING ONLYCOITUR FLOOTHER CONCERNS:	OR:	Clear Brown Clear None Slight Cloudir None Sewage (toilet er/plastic bags) I intenance B	Grey Yellow [ ness Cloudy [ t paper, etc.) C Dumping (bulk) [ Bank Erosion [	Green Orange Opaque Petroleum (oil sheen) Excessive Sedimentati Other:	Red Dother:
POTENTIAL RESTO	RATION CANDIE	DATE Discharge invo	estigation 🗌 Stream d trofit 🛛 Other:	aylighting 🗌 Local stre	eam repair/outfall stabilization
If yes for daylightin, Length of vegetative of	g: over from outfall	:ft Type	of existing vegetation	:	Slope:°
If yes for stormwate Is stormwater currentl	r: y controlled? Not investigated	Land Area	Use description: available:		
OUTFALL SEVERITY: (circle #)	Heavy discharge with strong smell. The amount compared to the amount stream; discharge app significant impact dow	a distinct color and/or a ount of discharge is significant unt of normal flow in receiving pears to be having a instream.	Small discharge; flow mo discharge has a color and discharge is very small co flow and any impact appe	stly clear and odorless. If the l/or odor, the amount of ompared to the stream's base ars to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	n ann an a	5	4 3	3	2 1
SKETCH/NOTES:					
<u>)</u>				REPORTED TO	DAUTHORITIES: YES NO

				Storm Water	Outfalls OT		
WATERSHED/SUBSH	ED: Middl	e Tank	DATE:	/ 0 S Asses	SED BY: Friends		
SURVEY REACH ID:	MTR 09	TIME: 5 : 53 AM/PM	Рното ID: (Са	amera-Pic #)	/#		
SITE ID (Condition-#):	от- <u>25</u>	LAT 41 0 49 131.3	"Long 72 • 27	' <u>55-0</u> " LMK_	GPS: (Unit ID)		
BANK: □LT ☑RT □ Head FLOW: □ None □ Trickl	TYPE: Closed pipe	MATERIAL:	SHAPE: Metal Grick Circular Srick Circular Circular Other:	Single <b>DIMENSI</b> ] Double   Triple Diameter:	IONS: SUBMERGED: ↓ (in) Partially □ Fully		
Moderate Substantial Other:	Dpen channel	Concrete Ea	rthen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	(in) (in) NOT APPEICABLE (in)		
CONDITION: None Chip/Cracked Peeling Paint	ODOR: M Gas Sewage	DEPÓSITS/STAINS ☐ None ☐ Oily ur ☐ Flow Line	: <b>VEGGIE DENSI</b> None Yormal Inhibited	ITY: PIPE BEN Brown Other:	THIC GROWTH: IN None		
Corrosion Other:	Dirrosion     Image: Source of the source of t		Excessive Other:	Good [ Suds ] Other:	ALITY: V No pool Odors Colors Oils Algae Floatables		
FOR FLOWINGCOLOFLOWINGTURBONLYFLOAOTHEREx CONCERNS:No	FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
POTENTIAL RESTOR	ATION CANDID	ATE Discharge inves	tigation 🗌 Stream daylig ofit 🛛 🗌 Other:	ghting 🗌 Local stre	am repair/outfall stabilization		
Length of vegetative co         If yes for stormwater.         Is stormwater currently         Yes       No         No       No	Length of vegetative cover from outfall:      ft       Type of existing vegetation:      Slope:      °         If yes for stormwater:						
OUTFALL     F       SEVERITY:     C       (circle #)     S	eavy discharge with a trong smell. The amou ompared to the amour tream; discharge appe gnificant impact down	distinct color and/or a int of discharge is significant it of normal flow in receiving ears to be having a stream.	Small discharge; flow mostly c discharge has a color and/or or discharge is very small compar flow and any impact appears to	clear and odorless. If the dor, the amount of red to the stream's base be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.		
SKETCH/NOTES:		<u> </u>	3	2	(1_)		
) ·				Reported to	AUTHORITIES: 🗌 YES 🗌 NO		

WATERSHED/SUBSHED:       Middle       Middle       Mit       DATE:       J. J	Storm Water Outfalls OT						
SURVEY REACH ID:       //frschool       TIME:       (a):       04       AM/M       PHOTO ID:       (Camera-Pic #)       /#       50         SITE ID (Condition.#):       OT-       0       LAT       1.25.5       "LONG 72.0.2.7.54.9."       LMK       GPS:       (Unit II         BANK:       //       Head       TYPE:       MATERIAL:       SHAPE:       Single       Dimensions:       SUBMERGI         Diversion       Other:       Other:       Other:       Double       Diameter:       0       No         Partially       Other:       Other:       Other:       Depth:       (in)       Partially         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       No       Partially         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       No       No         None       Other:       Other:       Other:       Pire BENTHIC GROWTH:       Non         Substantial       Other:	and DATE: 614108 Assessed BY:	Friends					
SITE ID (Condition.#): OT-@@       LAT 1 • 40 · 29.5 " LONG 7.2 • 27 · 54.9 "       LMKGPS: (Unit II         BANK:       TYPE:       MATERIAL:       SHAPE:       Single       DIMENSIONS:       SUBMERGI         Closed       pipe       Other:       MATERIAL:       SHAPE:       Single       Dimensions:       SUBMERGI         No       Dimensions:       Other:       Other:       Other:       Double       Diameter:       0         Moderate       Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Pariablic         Substantial       Other:       Other:       Other:       Width (Top):       (in)       Not Appendent         Other:       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Not Appendent         Other:       Open       Concrete       Earthen       Diameter:       (in)       Not Appendent         Other:       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Not Appendent         Other:       Open       Concrete       Barbown       Depostrs/STAINS:       VEGGIE DENSITY:       PIPE BENTHIC GROWTH:       Non         Sulfide       Swage <t< td=""><td><u>(5:04 АМ/РМ)</u> <b>РНОТО ID:</b> (<i>Camera-Pic</i> #) /#</td><td>576</td></t<>	<u>(5:04 АМ/РМ)</u> <b>РНОТО ID:</b> ( <i>Camera-Pic</i> #) /#	576					
BANK:       TYPE:       MATERIAL:       SHAPE:       Single       DIMENSIONS:       SUBMERGE         LT       RT       Head       Closed       Concrete       Brick       Circular       Double       Dimeter:       No         Prow:       Moderate       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Partially         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Not Artescar         Substantial       Open       Concrete       Earthen       Trapezoid       Depth:       (in)       Not Artescar         Other:       Ober:       Other:       Width (Top):       (in)       Not Artescar         Mone       Gas       None       None       Brown       Orange Green       Other:         Pecling Paint       Rancid/Sour       Paint       Excessive       Other:       Pool QualITY:       No pool         Other:       Subjact       Paint       Excessive       Other:       Other:       Other:         Concret:       Subjact       Other:       Other:       Other:       Other:       Other:       Other:       Other:         Pool QualITY:       None	•49 129.5" LONG 72 • 27 154.9" LMK	GPS: (Unit ID)					
BANK:       TYPE:       MATERIAL:       SHAPE:       Single       DIMENSIONS:       SUBMERGI         LT       RT       Head       Concrete       Metal       Circular       Double       Double       No         FLOW:       Closed       pipe       Other:       Other:       Double       Diameter:       No         Moderate       Other:       Other:       Other:       Other:       Width (Top):       Image: No         Moderate       Other:       Other:       Other:       Width (Top):       No       No         Other:       Obox       Obox       No       Brown       Other:       Width (Top):       No         Mone       Gas       None       Sewage       Oily       Normal       Brown       Orage Geod       Good       Other:         Peeling Paint       Rancid/Sour       Flow Line       Inhibited       Brown       Orage Geod       Good       Other:         Other:       Other:       Other:       Other:       Other:       Suddors       Good       Other:         Pool QUALITY:       None       Sight Cloudness       Cloudy       Opaque       Other:       Suddors       Clouds       Good       Other:         O							
FLOW:       Image: Closed pipe       Other:       Image: Closed pipe	TERIAL: SHAPE: Single DIMENSIONS:	SUBMERGED:					
Pipe       Other:       Dipote       Input in the input intent input intent in the input intent input intent intent input intent inten	2 C/Plastic Brick Elliptical Triple Diameter: $(i)$	$\square$ No					
Moderate       Open       Concrete       Earthen       Trapezoid       Depth:       (in)         Other:       Other:       Other:       Width (Top):       (in)         Other:       '' (Bottom):       (in)         Moderate       Other:       '' (Bottom):       (in)         Other:       '' (Bottom):       (in)         Other:       '' (Bottom):       (in)         Mone       Gas       '' (Bottom):       (in)         Other:       ODOR:       None       '' (Bottom):       (in)         Peeling Paint       Rancid/Sour       Flow Line       Inhibited       Pool QUALITY:       No pool         Other:       Sulfide       Paint       Other:       Other:       Other:       Pool QUALITY:       No pool         Other:       Sulfide       Paint       Other:       Other:       Other:       Other:         For       CoLor:       Clear       Brown       Greey       Yellow       Green       Orange       Red.       Other:         FlowING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimenta	Other:	Fully					
Substantial       Open       Concrete       Earthen       Parabolic       Width (Top):       Im       NOT APPECAN         Other:       Other:       Other:       Other:       Width (Top):       Im       NOT APPECAN         CONDITION:       ODOR:       No       DEPOSITS/STAINS:       VEGGIE DENSITY:       Pipe BENTHIC GROWTH:       Non         One       Gas       None       One       One       One       Other:       Pipe BENTHIC GROWTH:       Non         Other:       Goad       Oily       None       One       Other:       Other:       Pipe BENTHIC GROWTH:       Non         Corrosion       Gas       Other:       Other:       None       Other:       Other:       Other:         Other:       Suffide       Paint       Excessive       Brown Orange       Green       Other:         Other:       Other:       Other:       Other:       Suds Alage       Floatables         Other:       Sight Cloudiness       Cloudy       Opaque       Orange       Red       Other:         FloatAbles:       None       Slight Cloudiness       Cloudy       Opaque       Other:       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)	Trapezoid Depth (in)	$\sim$					
CONDITION:       ODOR:       No       DEPOSITS/STAINS:       VEGGIE DENSITY:       PIPE BENTHIC GROWTH:       Non         Mone       Gas       None       Mone       Other:       None       Brown       Orange       Green         Chip/Cracked       Sewage       Oily       Normal       Other:       Pool QUALITY:       No pool         Peeling Paint       Rancid/Sour       Flow Line       Inhibited       Pool QUALITY:       No pool         Corrosion       Sulfide       Paint       Excessive       Good       Odors       Colors       Good       Odors       Colors       Colors:       Colors       Colors:       Colors:       Colors:       Colors:       Colors:       Colors:       Color:       Color: </td <td>Differ Depth</td> <td>NOT APPEICABLE</td>	Differ Depth	NOT APPEICABLE					
CONDITION:       ODOR:       No       DEPOSITS/STAINS:       VEGGIE DENSITY:       PIPE BENTHIC GROWTH:       Non         Mone       Gas       None       None       None       Brown       Orange       Green         Chip/Cracked       Sewage       Oily       Normal       Other:       Other:       Other:       Pool QUALITY:       No pool         Corrosion       Sulfide       Paint       Excessive       Good       Odors       Colors       Colors         Other:       Other:       Other:       Other:       Other:       Other:       Good       Other:       Sulfide         PLOWING       Other:       Other:       Other:       Other:       Other:       Other:         Flow/ING       TURBDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         ONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Tyre of existing vegetation:	Other: " (Bottom):(in)						
Image: Source       Image: Source<	<b>POSITS/STAINS:</b> VEGGIE DENSITY: PIPE BENTHIC G	OWTH: 🗍 None					
Peeling Paint Rancid/Sour Flow Line   Corrosion Sulfide   Other: Other:   Other: Other:     Point   Other:     Other:     Point   Inhibited   Pool QUALITY:   Inhibited   Bood   Other:     Inhibited   In	Vone $\square$ None $\square$ Brown $\square$ Ora	ige 🔲 Green					
Corrosion       Sulfide       Paint       Excessive       Good Godors Colors         Other:       Other:       Other:       Other:       Good Godors Colors       Good Godors Colors         For       CoLor:       Vellow       Green       Orange Red       Other:         Flowing       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         In no       Storm water retrofit       Other:       Other:       Other:	Flow Line Inhibited Pool Ottat ITV:						
Other: Other:   Slight     For   FLOWING   TURBIDITY:   None   Slight Cloudiness   Cloudy   Opaque     FLOATABLES:   None   Sewage (toilet paper, etc.)   Petroleum (oil sheen)   Other:     OTHER   Excess Trash (paper/plastic bags)   Dumping (bulk)   Excess Trash (paper/plastic bags)   Dumping (bulk)   Excessive Sedimentation   ONCERNS:   Needs Regular Maintenance   Bank Erosion   Other:     POTENTIAL RESTORATION CANDIDATE   Discharge investigation   Storm water retrofit   Other:     If yes for daylighting:   Length of vegetative cover from outfall:     ft	$\begin{array}{c c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \\ \end{array} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \begin{array}{c} \\ \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \\ \\ \end{array} $	$\square$ Colors $\square$ Oils					
FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other:   FLOWING FLONTABLES: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation ONCERNS: Needs Regular Maintenance Bank Erosion Other: Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Storm water retrofit Other: If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation: Storm:	U Other:	Floatables					
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque       Opaque         ONLY       FLOATABLES:       None       Slight Cloudiness       Cloudy       Opaque       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation       Other:         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         In no       Storm water retrofit       Other:       Other:       Storm water retrofit       Other:         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Storm:       <							
OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:         POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         Ino       Storm water retrofit       Other:       If yes for daylighting:         Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Storm:	Brown       Grey       Yellow       Green       Orange       Red.         Slight Cloudiness       Cloudy       Opaque         Sewage (toilet paper, etc.)       Petroleum (oil sheen)       I	Other:					
POTENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilizat         no       Storm water retrofit       Other:         If yes for daylighting:       Length of vegetative cover from outfall:       ft       Type of existing vegetation:       Storm:	ags)       Dumping (bulk)       Excessive Sedimentation         Bank Erosion       Other:						
If yes for daylighting: Length of vegetative cover from outfall: ft Type of existing vegetation:	Discharge investigation  Stream daylighting  Local stream repair Storm water retrofit  Other:	outfall stabilization					
Length of vegetative cover from outfall: ft Type of existing vegetation global states of the state of the sta							
	ft Type of existing vegetation:Slope:	o					
If yes for stormwater							
Is stormwater currently controlled? Land Use description:	Land Use description:						
Yes   No   Not investigated   Area available:	Area available:						
OUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Small discharge; flow mostly clear and odorless. If the discharge is very small compared to the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.       Outfall does not have dry weath discharge; staining; or appearar of causing any erosion problem:	or and/or a rge is significant flow in receiving a Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	s not have dry weather staining; or appearance any erosion problems.					
5 4 3 2 1	4 (3) 2	1					
Sketch/Notes:							
Reported to authorities: Yes	Reported to author	TIES: 🗌 YES 🗌 NO					

Storm	Water	Outfalls
VOUH.	a a con	Vuuana

1	(	)	]	Γ

WATERSHED/SUBSHE	D: Middle T	ante	DATE: (0/ 5	10 8 Asses	SSED BY: 75 TA TK (+		
SURVEY REACH ID:	MTR-09 TH	ME: 9 : 49 AM/PM	Рното ID: (Cam	PHOTO ID: (Camera-Pic #) 1 /# /			
SITE ID (Condition-#):	DT-04 LA	T 41 0 49 1267	"LONG 720 77 14	313" LMK	GPS: (Unit ID)		
BANK: LT RT Head FLOW: None	TYPE: Closed	MATERIAL: Concrete M PVC/Plastic Br Other:	SHAPE: Si etal Circular D ick Elliptical T Other:	ngle <b>DIMENS</b> Double Triple Diameter	SIONS: SUBMERGED: 2 (m) Partially Fully		
Moderate Substantial Other:	Dpen channel	Concrete Eart	hen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	(in) (in) (in) NOT APPE CABLE		
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSIT	Y: PIPE BEN Brown Other: POOL QU Good Suds Other:	<b>THIC GROWTH:</b> None         Orange       Green         JALITY:       No pool         Odors       Colors       Oils         Algae       Floatables		
For FLOWINGCOLOR TURBINONLYTURBINOTHERExc CONCERNS:CONCERNS:Near	Clear       DITY:       None       ABLES:       None       Sess Trash (paper/pla       Segular Mainten	Brown       Grey         Slight Cloudiness         Sewage (toilet pa         stic bags)       Dum         ance       Bank	y Yellow Gree Cloudy Opa per, etc.) Petro nping (bulk) Exc c Erosion Othe	en Orange que oleum (oil sheen) essive Sedimentatio er:	Red 🗌 Other:		
POPENTIAL RESTORATION CANDIDATE       Discharge investigation       Stream daylighting       Local stream repair/outfall stabilization         No       Storm water retrofit       Other:         If yes for daylighting:       If yes for daylighting:							
Length of Vegetative cov         If yes for stormwater:         Is stormwater currently c         Yes       No         No       No	er from outfall: controlled?	ft Type of Land Us Area ava	existing vegetation: e description: ilable:		Slope:°		
OUTFALL He SEVERITY: col (circle #) sig	avy discharge with a disti ong smell. The amount of mpared to the amount of r eam; discharge appears t nificant impact downstrea	nct color and/or a discharge is significant normal flow in receiving o be having a m.	mall discharge; flow mostly clea scharge has a color and/or odor scharge is very small compared ow and any impact appears to b	ar and odorless. If the r, the amount of I to the stream's base e minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.		
SKETCHAIOTTO	5	4	3		2 1		
J.				Reported to	DAUTHORITIES: 🗌 YES 🛃 NO		

			S	Storm Water Outf	alls <b>OT</b>
WATERSHED/SUBSH	ED: Missle	Tonk Run	DATE: 6/5/	04 Assessed i	BY: K TO LODD
SURVEY REACH ID:	WR-09 TI	ME: 9 : 5 AM/PM	Рното ID: (Camero	$\frac{1}{2}$	<u></u> #
SITE ID (Condition-#):	OT-09 L	AT 41 . 49 . 267	"LONG 720 27 . KH	S" LMK	GPS: (Unit ID)
· · · · · · · · · · · · · · · · · · ·	<u></u>				
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete M PVC/Plastic Br Other:	SHAPE: Singletal Circular Dou rick Elliptical Tripl	e <b>DIMENSIONS:</b> ble le Diameter: <u>2</u>	SUBMERGED: No (im) Partially Fully
Moderate Substantial	Open channel	Concrete Eart	hen Trapezoid Parabolic Other:	Depth:( Width (Top):( " (Bottom):(	in) in) NOT APDESCABLE
CONDITION: None Chip/Cracked	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC	GROWTH: None Drange Green
Corrosion	Sulfide	Paint Other:	Excessive Other:	Good Odd Suds Alg	ors Colors Oils ae Floatables
For       CoLor:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         ONLY       FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         CONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:					
POTENTIAL RESTOR	ATION CANDIDATI	E Discharge investin	gation 🗌 Stream daylighting it 🛛 🗍 Other:	g 🔲 Local stream rej	pair/outfall stabilization
If yes for daylighting: Length of vegetative co	ver from outfall:	ft Type of	existing vegetation:	Slo	pe:°
If yes for stormwater: Is stormwater currently Yes No No	controlled? t investigated	Land Us Area ava	e description:		
OUTFALL     He       SEVERITY:     cc       (circle #)     st	eavy discharge with a dist ong smell. The amount of mpared to the amount of eam; discharge appears inificant impact downstre	tinct color and/or a of discharge is significant normal flow in receiving to be having a am.	mall discharge; flow mostly clear an scharge has a color and/or odor, the scharge is very small compared to t ow and any impact appears to be mi	nd odorless. If the e amount of he stream's base nor / localized.	does not have dry weather rge; staining; or appearance sing any erosion problems.
Suppor Diagon	5	4	3	2	1
SKETCH/INOTES:				Deces	
/				KEPORTED TO AUTH	ORTFIES: YES NO

				S	Severe B	lank Eros	ion	ER
WATERSHED/SUB	SHED: Middle -	Tamla		DATE: 6/4	108	ASSESSE	DBY:	Princels
SURVEY REACH:	MTR 09	TIME: (0 :)	OC AM/PM	PHOTO ID (CAN	AERA-PIC	#)·	/#	I THENOLE
SITE ID: (Condition	-#) STARTLAT	1 049 129.1	"LONG 72 ° 2	7 1 54/911			<b>TPS</b> • (1)	
ER-ØI	FND LAT	0 1		<u> </u>		`	<b>JE 3:</b> (0)	nit ID)
PROCESS:	Currently unknown Bed scour Bank failure Bank scour	BANK OF CO LOCATION: DIMENSIONS Length (if no (	PNCERN: $\square$ LT [ $\square$ Meander bend [ :: GPS) LT $20$ ft	RT Both ( Straight section and/or RT	looking doy	<i>wnstream)</i> slope/valley Bottom	wall 🗌 width	Other:ft
Aggrading	Slope failure	Bank Ht	ET <u>Q</u> ft	and/or RT	<u>&gt;ft</u>	Top wid	lth	ft
Sed. deposition	Channelized	Bank Angle	CTC	and/or RT	°	Wetted	Width _	ft
LAND OWNERSHI	P: Private Public	c 🔲 Unknown	LAND COVER:	Forest I	Field/Ag	Develop	ed:	
POTENTIAL REST	ORATION CANDIDATE	C: Grade	control	Bank stabilizatio	n			
THREAT TO PROP	ERTY/INFRASTRUCT	URE: $\square$ No	Ves (Describ	е).				
EXISTING RIPARI	AN WIDTH.	M-25 A			1000			
		<u> </u>			-100ft	□ >100ft		
EROSION SEVERITY(circle#)	of the stream eroding at a fa contributing significant amo stream; obvious threat to pr	ks on both sides ast rate; erosion unt of sediment to operty or	Pat downcutting evide widening, banks active moderate rate; no thre	nt, active stream ely eroding at a at to property or	Grade and failure/ero	d width stable; i sion; likely cau	isolated are sed by a pi	eas of bank pe outfall, local
Channelized= 1	infrastructure.						regetation	
ACCESS:	Good access: Open area in ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile nnel access for ting roads or 4	4 [3] Fair access: Forested adjacent to stream. Ac removal or impact to la Stockpile areas small	or developed area cess requires tree andscaped areas. or distant from stream.	2 Difficult a other sens stockpile a distance fi equipmen 2	1 access. Must cr sitive areas to a areas available rom stream sec t required.	ross wetlan access strea and/or loca stion. Spec	d, steep slope or am. Minimal ated a great ialized heavy
NOTES/CROSS SEC	TION SKETCH:				<i>Lu</i>	<u>_</u>		
)					D			

Stream Crossing

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WATERSHED	SUBSHED: MICAU	RNN		DA	ге: <u>() / 4</u>	103	ASSE	SSED BY:	Viends
URVEY REA	CHID: MTR 09	TIME::	_AM/PM	Рно	DTO ID: (Cam	era-Pic	: #)	/#	
SITE ID: (Con	$\frac{\text{dition-\#}}{5/8} \frac{\text{SC-}}{5/8}$	019128 013 TV	<u>'/</u> " Long /	00	<u>97 :54.3 "</u>	LN	MK	GPS (U	nit ID)
TYPE: 🗌 Roa	d Crossing 🔲 Railroad Crossi	ng 🔲 Manmade	Dam 🗌 Beav	/er Da	ım 🗌 Geologi	cal Form	nation M	Other:	
For Road/ Railroad	SHAPE:         Arch       Bottomless         M Box       Elliptical         Circular       Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		ALIGNMENT: Flow-aligner Not flow-al Do not kno	ed igned w	DIMENS Barrel dia	IONS: (if varia imeter: Height:	<i>ble, sketch)</i> (ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🗌 Downstrean 🗍 Failing emb	n scour hole ankment		CULVERT SL Flat Slight (2° – Obvious (>	<b>OPE:</b> 5 <sup>0</sup> ) 5 <sup>°</sup> )	Culvert le Roadway	mgth: Width: elevation:	(ft)
POTENTIAL F	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culv repair 🔲 Oth	vert re er:	epair/replacemer	nt 🗌 U	Jpstream st	orage retrofit	
IS SC ACTING	G AS GRADE CONTROL	No Ye	es 🗌 Unk	nown	14" d	vod			
If yes for fish barrier	EXTENT OF PHYSICAL BLO         Total       Partial         Temporary       Unknow         CAUSE:       Drop too high       Water Dr         Flow too shallow       Water De         Other       Other	CKAGE: vn op: (in) epth: (in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a da 3rd ord locking nent of ; no fish present	BLOCKAGE am or A total fi der or tributary the significa or partia interfere anadrom	SEVER sh blockaç that wouk nt reach o I blockage with the n nous fish.	ITY: (circ ge on a d isolate a f stream, e that may nigration of	<i>le #)</i> A temporary ba beaver dam or the very head c very little viable above it; natura as waterfalls.	rrier such as a a blockage at if a stream with fish habitat I barriers such
			5		4	3		2	1
NOTES/SKET	СН:							· ·	
						Report	TED TO AUT	THORITIES 🗌	YES NO

WATERSHEDSUBSIED:       Mitback       Intel:       1:2:1/2:4       Assessed in::       Style       Style       Intel:       Style       Intel:       Style						Stre	am Cros	ssing	SC	1
URYEY REACH ID: YCK1 - O?       TIME: 1 : 52_AM/PM       PHOTO ID: (Canacra-Pic #)       /#         STE ID: (Canacra-Pic #)       SC 01       LAT '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1 - '(1	WATERSHED	SUBSHED: Missle to	NL, River		ATE: 6	15108	ASSE	SSED BY:	75.7K.	LA TOP
SITE ID: (Condition-3): SC: 01	URVEY REA	CH ID: MT12-09	TIME: <u>1</u> : 52	АМ/РМ Р	ното ID	: (Camera-Pi	с#) З	/#	20/01/0	
TYPE:       Road Crossing       Hailroad Crossing       Mammade Dam       Beaver Dam       Geological Formation       Other:         StLAPE:       Battentise       Battentise       MATERIAL:       MATERIAL:       MATERIAL:       DIMENSIONS: (Grandahd, sketch)         Book       Circular       Divide:       Other:       Double       Do not know       Burrel diamotar:       (R)         Crossing:       Concrete       Concrete       Concrete       Concrete       Concrete       Caldvert length:       (R)         Crossing:       Concrete       Do not know       Caldvert length:       (R)         Crossing:       Concrete       Domot know       Caldvert length:       (R)         Crossing:       Concrete       Domot know       Caldvert length:       (R)         Crossing:       Concrete       Domot know       Caldvert length:       (R)         Scatter:       Scatter:       Domot know       Concrete       Domot know         Sc	SITE ID: (Con	ndition-#) SC- <u>07</u> LAT	41 . 49 .26	<u> 기</u> " Long <u>92</u>	· 27.	<u>54.3</u> " L	мк	GPS	(Unit ID)	
TYPE: DR Road Crossing Interesting Interesting										
FIARE :       #LARELS:       MATERIAL:       ALCOMMENT:       Barel diameted, sketch         FOR ROAD       Circular       Double       Concerte       Monet:       Double       Monet:       Barel diameted:       Mither:       Mither	TYPE: X Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade I	Dam Beaver	Dam 🗌	Geological For	mation 🗌	Other:		
CMOSSINGS ONLY CONDITION: (Fidence of) Control [Catchingchinging/corrosine] Downstream scour hole Cuty Filta [Catchingchinging/corrosine] Downstream scour hole Statiunt deposition = Pailing embankment Cuty Filta [Catching Chinging Catching Chinging Chinging Catching Chinging Chinging Catching Chinging Catching Chinging Catching Chinging Chingin	For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIGI Flo No Do	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: ( <i>if v</i> a umeter: Height:	ariable, sketo	<i>ch)</i> _(ft) _(ft)
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         po       Local stream repair       Other:         IS C ACTING AS GRADE CONTROL       No       Yes       Unknown         ExtENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)       A total fish blockage on a tockage on a tod color or greater stream blocks pite in a do color or greater stream blocks pite in a do color or greater stream blocks pite fish blockage on a tockage on a tod color or greater stream blocks pite fish blockage on a tockage on a tod color or greater stream blocks pite fish blockage on a tod color or greater stream blocks pite fish blockage on a tod color or greater stream blocks pite fish blockage on a tod color or greater stream blocks pite fish blockage on a tod color or greater stream blocks pite fish blockage that near town how or prediction of a stream, possed environment of an advormous fish.         Bio Other:       5       4       3       2       1         Notes/SKETCH:       5       4       3       2       1	CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🔲 Downstream	n scour hole ankment	CULV Fla	ERT SLOPE: t ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	Culvert le Roadway	ength: Width: elevation:	10 3	_(ft) _(ft) (ft)
Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle h)         Total       Partial       Astructure such as a dam or or grates reseam blocking the grater steam blocking the grater steam blocking the grater steam blocking the grater steam blocking the grater dam or above th nabala disoute a dam or or grate blockage that may interfere with the migration of a stream with babala disoute a dam or grate blockage that may interfere with the migration of a stream with above th nabala disoure it. Tatura barriers such as a dam or grate blockage that may interfere with the migration of a stream with above th nabala disoure it. Tatura barriers such as a dam or or grate blockage that may interfere with the migration of a stream with above th nabala disoure it. Tatura barriers such as a dam or or partial blockage that may interfere with the migration of a stream with above the nabala disoure it. Tatura barriers such as a dam or or partial blockage that may interfere with the migration of a stream with above the nabala disoure it. Tatura barriers such as a dam or or partial blockage that may interfere with the migration of a stream with above the nabala disoure it. Tatura barriers such as a definition of the stream of the stream barriers such as a definition of the migration of a stream with the stream barriers such as a definition of the stream of the stream barriers such as a definition of the stream of the stream of the stream with the stream barriers such as a definition of the stream with the stream with the stream with the stream of the stream with the stream barriers such as a definition of the stream with the stream	POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culver epair 🔲 Other:	t repair/rep	placement 🔲 🛛	Upstream si	torage retro	ofit	
EXTENT OF PHYSICAL BLOCKAGE:       Partial         Total       Partial         Tomporary       Unknown         If yes for       A studiore such as a dam or grader sitean blockage on a studiorer or grader sitean blockage to a standard to distant or a blockage to a standard blockage to a standard blockage to a standard blockage to a standard blockage to the standard blockage	IS SC ACTIN	G AS GRADE CONTROL		es 🗌 Unkno	wn					
A structure such as a dam or road outwert on a 3rd order or grade stream blockage on a significant reach of stream, or parial blockage that may a structure such as a dam or road outwert on a 3rd order or gradial stream with the migration of a str		EXTENT OF PHYSICAL BLO	CKAGE:	r	BLO	CKAGE SEVEI	RITY: (circ	le #)		
	If yes for fish barrier	CAUSE: Drop too high Water Do Flow too shallow Water Do	vn rop: (in) epth: (in)	A structure such as a road culvert on a 3ro greater stream block upstream movement anadromous fish; no passage device pres	a dam or I order or ting the t of fish tent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Ild isolate a of stream, e that may migration of	A temporar beaver dan the very he very little vi above it; na as waterfal	y barrier such n or a blockag ad of a strean able fish habit ntural barriers s.	as a e at n with tat such
NOTES/SKETCH:	Januar	U Other:		5	4	1 3		2	1	
Reported to Authorities TYES NO	NOTES/SKET	ΥCΗ:								
						REPOR	TED TO AU	THORITIES	VES I	]No

Stream	Cross	sinc
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Stream Crossing	SC
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WATEDCHED	Verinerien, haissla T	N SDIEL		Dim	. /	FINA	1.000		K Yr (AD
URVEV REA	CHID: MATO-DG	TIME: 12:12	} > ~ ~ ~ / DN #	DATE	<u>- 6</u>	$\frac{1}{5}$ $\frac{1}{0}$	ASSE	SSED BY:	DJJGAT
SITE ID: (Con	$\frac{1}{100.\text{ for } 100.\text{ for } 100. for $	41 . 44:16	4" LONG 1	201-	2 11	5b''	<u>т)</u> ИК	$\frac{2}{1}$ GPS	(Unit ID)
		<u></u>							(0/// 12)
TYPE: 🗌 Roa	ad Crossing 🕅 Railroad Crossi	ng 🗌 Manmade	Dam 🔲 Beave	er Dam		Geological Form	nation 🔲	Other: 7	Pails to Trail
	SHAPE:	<b># BARRELS:</b>	MATERIAL:	A	LIGN	IMENT:	DIMENS	IONS: (if v	ariable, sketch)
	Arch Bottomless	Single	Concrete		Flov	w-aligned	Barrel dia	meter:	(ft)
FOR ROAD/	Circular	Triple	Metal		] Not	flow-aligned		Height:	5 st (ft)
RAILROAD	Other:	Other:	Stone Black	<u>5</u>				.1	615
ONLY	<b>CONDITION:</b> (Evidence of)					ERT SLOPE:	Cuivert le	mgtn: Width	$\underline{(\pi)}$
	Cracking/chipping/corrosion	Downstrear	n scour hole		] Fiat ] Slig	ht $(2^{\circ} - 5^{\circ})$		wiuni.	<u>25. (11)</u> 3.54
	Other ( <i>describe</i> ): BIOCHA		bankment		] Obv	vious (>5°)	Roadway	elevation:	(ft)
		TNDIE		I					
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🕱 Culv	ert repa	ir/rep	lacement 🔲 U	Jpstream st	orage retro	ofit
no no			repair 🗌 Othe	er:					
IS SC ACTING	G AS GRADE CONTROL	$\nabla N_0 \Box Y$	es 🗌 Unk	nown					
	EXTENT OF PHYSICAL BLC	CKAGE:	<u> </u>	]	BLOG	CKAGE SEVER	ITY: (circ	le #)	
	Temporary Unknow	wn	A structure such a	as a dam	or	A total fish blocka	ge on a	A temporar	ry barrier such as a
If yes for			greater stream blo	3rd order ocking the	or e	tributary that woul significant reach c	d isolate a f stream,	beaver dan the very he	n or a blockage at ad of a stream with
fish barrier	Drop too high Water Di	rop: (in)	upstream movem anadromous fish:	ent of no fish		or partial blockage	e that may	very little vi	iable fish habitat
	Flow too shallow Water D	epth: (in)	passage device p	resent.		anadromous fish.	ingration of	as waterfal	lls.
)	Other:		5		4	3		2	1
NOTES/SKET	CH:								
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A	· · · · · · · · · · · · · · · · · · ·					REPORT	FED TO AUT	THORITIES	
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Stream Crossing

WATEDSUED	KUPSHED. WOOL -TO	N_N		DATE: /	16 100	Acce		41/1 11
URVEY REA	CH ID: $M(0 - 1)9$	TIME: $11 \pm 12$	AM/PM	<u>рното П</u>	<u>(Camera-Pi</u>	r #) (0	. <u>55ED BY:</u> // /#	LID LID
SITE ID: (Con	dition-#) SC- $64$ LAT	41 . 49 . 22	b" LONG F	10271	45.6" L	<u>ик</u>	GPS	$\frac{1}{1}$ (Unit ID)
<u> </u>								
TYPE: Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beave	er Dam 🔲	Geological For	nation	Other:	
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIG Flo No Do	NMENT: ow-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if v ameter: Height:	<u>44 10 14</u> (1
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n Downstream Failing emb	n scour hole ankment	CULV X Fla Sli Ob	<b>TERT SLOPE:</b> tt ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	Culvert le Roadway	ength: Width: elevation:	<u> </u>
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🛛 Culv repair 🔲 Othe	ert repair/rep r:	placement 🔲 🛛	Jpstream s	torage retr	ofit
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unki	nown				
	EXTENT OF PHYSICAL BLC	OCKAGE:		BLO	CKAGE SEVER	RITY: (circ	le #)	
lf yes for fish barrier	CAUSE: Drop too high Water D	wn rop: (in) epth: (in)	A structure such a road culvert on a greater stream blo upstream movem anadromous fish; passage device p	as a dam or 3rd order or ocking the ent of no fish resent.	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	ige on a Id isolate a of stream, e that may migration of	A tempora beaver dar the very he very little v above it; n as waterfa	ry barrier such as n or a blockage a ead of a stream w iable fish habitat atural barriers sud lls.
<u>)</u>	Aller: Why Jock	al or	5	4	4 3		$\binom{2}{2}$	1

WATERSHED/SUB	shed: Middle Thi	nh	DATE:	1.08	Assessed BY: Friends
JURVEY REACH I	D: MTRON TI	ме: <u>5:30</u> ам/М	Рното ID: (Ca	mera-Pic #)	1# 49
SITE ID: (Condition	#) TR- <u>01</u> LAT <u>41</u> .	49 .34,5 " LONG	372 · 27 · 55	<u>9</u> " LMK	GPS: (Unit ID)
TYPE: Industrial Commercial Kesidential	MATERIAL:         Plastic       Paper         Tires       Constr         Appliances       Yard V         Automotive       Other:	_ Metal uction _ Medical Vaste Tannis βαlls	SOURCE: Unknown Flooding Ullegal dump Local outfall	LOCATION:	$\begin{array}{c} \text{LAND OWNERSHIP:} \\ \square \text{Public} & \square \text{Unknown} \\ \hline & \text{Private} \\ \hline \\ \text{AMOUNT (# Pickup truck loads): } \\ \hline & 1 \\ \hline & 1 \\ \hline & 0 \\ \hline \end{array}$
POTENTIAL REST	ORATION CANDIDATE $\square$	tream cleanup 🔲 Strea Dther:	m adoption segment	Removal/pre	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED:	Heavy equipment 🗹 Tr	rash bags 🗌 Unkno Gov 🔲 Hazmat Te	wn am 🗌 Other	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, o with easy access. Trash m a long period of time but few days, possibly with a si	r bulk items, in a small an hay have been dumped o it could be cleaned up ir mall backhoe.	A large amount area, where acc or indications of	t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials
NOTES:	5	4	3	2	1
				REPORTED	TO AUTHORITIES 🗌 YES 🗌 NO

WATERSHED/SUI	sshed: Middy T	inh	DATE: 614	108	ASSESSED BY: FELE-DJ
SURVEY REACH	D: MTR 09 TI	me: <u>5:32</u> am/PMj	Рното ID: (Ca	mera-Pic #)	<i>I# 5</i> ]
SITE ID: (Condition	<i>n#)</i> Т <u>R-02</u>   Lat <u>4)</u> °	49 134.3 " LONG	<u>572027.56</u>	<u>.  </u> " LMK	GPS: (Unit ID)
TYPE: ☐ Industrial ☐ Commercial ☑ Residential	MATERIAL:         Plastic       Paper         Tires       Construction         Appliances       Yard W         Automotive       Other:	Metal uction Medical Vaste	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Are Lt bank Rt bank	AMOUNT (# Pickup truck loads):
POTENTIAL REST	FORATION CANDIDATE S	tream cleanup 🔲 Strea	am adoption segment	Removal/pre	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED : H WHO CAN DO IT:	Heavy equipment 🔲 T	rash bags 🛛 Unkno Jov 🔲 Hazmat Te	wn am 🗌 Other	<b>DUMPSTER WITHIN 100 FT:</b>
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, o with easy access. Trash r a long period of time but few days, possibly with a s	or bulk items, in a small ar may have been dumped ov it could be cleaned up ir mall backhoe.	A large amount ver area, where acc or indications of	t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials
Nome	5	4	3	2	1
INUTES:					
)				Reported	TO AUTHORITIES YES NO

WATERSHED/SUB	SHED: MITHE	Any KNUS	2	DATE: <u>6/</u> 2	10-6	ASSESSED BY: TRIENDS				
JURVEY REACH I	D: MTR-09	TIME: 10 : 13	AM/PM	Рното ID: (Camera-Pic #) 5 /#						
SITE ID: (Condition-	#) TR- <u>03</u> LAT <u>4</u>	1.49.267	"LONG	12.0 27 . 521	''' LMK	GPS: (Unit ID)				
TYPE: Industrial Commercial Residential	MATERIAL: Plastic Pa Tires Co Appliances Ya Automotive Oth	per IM nstruction IM rd Waste her:	etal [ edical [ [	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION:	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): / 07				
POTÉNTIAL REST	ORATION CANDIDATE [	Stream cleanup	Stream	n adoption segment	Removal/pro	evention of dumping				
If yes for trash or debris removal	EQUIPMENT NEEDED : Who can do it:	Heavy equipmer	nt 🔲 Tra Local Go	ish bags □ Unkno ov □ Hazmat Te	wn am 🗌 Other	DUMPSTER WITHIN 100 FT:				
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., I than two pickup truck loads) loca inside a park with easy access	A large amount of with easy access a long period of few days, possibl	of trash, or t . Trash ma time but it ly with a sma	bulk items, in a small ar y have been dumped ov could be cleaned up in all backhoe.	ea /er area, where ac or indications o	t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials				
NOTES:	5	4	<u></u>	3	2	1				

WATERSHED/SUB	shed: Misole	Tonk-	River	DATE: <u>6</u> / 6	5108	ASSESSED BY: JS P. GA JK			
JURVEY REACH I	D: MTR-09	Тіме	. <u>/0: 55</u> ам/рм	Рното ID: (Ca	PHOTO ID: (Camera-Pic #) 8, 9 /#				
SITE ID: (Condition	-#) TR- <u>04</u> I	ат <u>41° 4</u>	9.'24.5." LON	G <u>72 ° 27 ' 48</u>	<u> 3</u> " lmk_	<b>GPS:</b> (Unit ID)			
TYPE: Industrial Commercial Residential	MATERIAL: Plastic Tires Appliances Automotive	<ul> <li>Paper</li> <li>Construction</li> <li>Yard Wast</li> <li>Other:</li> </ul>	Metal on Medical e	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION: Stream Riparian Ard Lt bank Rt bank	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): Z 07 3			
POTENTIAL REST	ORATION CANDIDA	ATE Strea	m cleanup 🔲 Stre r:	am adoption segment	Removal/pr	evention of dumping			
If yes for trash or debris removal	EQUIPMENT NEEDE WHO CAN DO IT:	D: A Hear	vy equipment T nteers Local (	`rash bags □ Unkno Gov □ Hazmat Te	am 🗌 Other	DUMPSTER WITHIN 100 FT:			
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash than two pickup truck loa inside a park with easy a	h (i.e., less ads) located access fer	large amount of trash, of th easy access. Trash i long period of time but w days, possibly with a s	or bulk items, in a small a may have been dumped o it could be cleaned up ir small backhoe.	A large amour area, where ac or indications c	t of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials			
NOTES:	5 	5 OF T TIRE	(1) >EBEIS / >, STUMP	3 Lerarces/L S	2	1			
·					Reportei				

### Storm Water Outfalls

WATERSHED/SUBSHI	ED:				DATE: //	ASSESSED BY:				
SURVEY REACH ID:		Тім	IE:AM/P	М	<b>Рното ID:</b> (Camera-Pic ;	<i>#)</i> /#				
<b>SITE ID</b> (Condition-#):	OT	LAT	<u> </u>	_"Lo	ONG''	LMK	GPS: (Unit ID)			
BANK:           LT         RT         Head           FLOW:         Trickle	TYPE:		MATERIAL: Concrete PVC/Plastic Other:	]Metal ]Brick	SHAPE:     Single     DIMENSIONS:     SUBMERGEN       al     Circular     Double     No       k     Elliptical     Triple     Diameter: (in)     Partially       Other:     Fully					
<ul> <li>Moderate</li> <li>Substantial</li> <li>Other:</li> </ul>	Open channel		Concrete E	Earthen	$ \begin{array}{c cccc} \square & Trapezoid & Depth: (in) \\ \square & Parabolic & Width (Top): (in) \\ \square & Other: " (Bottom): (in) \end{array} $					
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: Gas Sewage Rancid/S Sulfide Other:	NO our	DEPOSITS/STAIN OIL	IS:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC GI Brown Ora Other: POOL QUALITY: Good Odors Suds Algae	ROWTH:       None         nge       Green         No pool       Oils         Colors       Oils         Floatables			
FOR COLO	R:	Clear	Brown	Grey	☐ Yellow ☐ Green ☐ G	Drange 🗌 Red 🔲	Other:			
FLOWING TURB	DITY:	None	Slight Cloudin	ness	Cloudy Opaque					
ONLY FLOAT		None	Sewage (toile	t paper, o	(t, u) Petroleum (o	il sheen)	Other:			
OTHER $\Box$ ExCONCERNS: $\Box$ Ne	eds Regular Ma	er/plas intena	nce	Jumping Bank Erc	sion Other:	edimentation				
	~					1				
POTENTIAL RESTOR	ATION CANDI	DATE	☐ Discharge inv	estigatio trofit	n [] Stream daylighting []	Local stream repai	r/outfall stabilization			
If ves for davlighting										
Length of vegetative co	ver from outfal	1:	ft Type	e of exist	ting vegetation:	Slope	:°			
If yes for stormwater. Is stormwater currently	controlled? t investigated		Land Area	l Use des availabl	scription: le:		_			
OUTFALL H SEVERITY: (circle #)	eavy discharge with rong smell. The am ompared to the amo ream; discharge ap gnificant impact doo	n a distin ount of c ount of no pears to wnstrear	nct color and/or a discharge is significant ormal flow in receiving b be having a m.	Small d dischar dischar flow an	lischarge; flow mostly clear and odo ge has a color and/or odor, the amo ge is very small compared to the str d any impact appears to be minor / I	rless. If the unt of eam's base ocalized.	bes not have dry weather e; staining; or appearance g any erosion problems.			
		5		4	3	2	1			
Sketch/Notes:					Ri	EPORTED TO AUTHOI	RITIES: 🗌 YES 🗌 NO			

Severe Bank Erosion

ER

SURVEY REACH:       TIME:	WATERSHED/SUBS	HED:							DATE	:/	/	Asses	SED BY:	
STEID: (Condition-P)       START LAT       •	SURVEY REACH:			Тім	E:	:	AM/PM		Рнот	o ID (CA	AMERA-PIC #	#):	/#	
ER	SITE ID: (Condition-#	<b>#)</b>	START LAT		•	"	LONG		•	••	LMK		<b>GPS:</b> (U	nit ID)
PROCESS:       Currently unknown       BANK OF CONCERN:       LT       RT       Both (looking downstream)         Downcutting       Bank failure       Downcutting       Bank failure       Downstream)       Dotter:         Midening       Bank failure       Length (if no GPS) LT n and/or RT ft       Botter and/or RT ft       Botter with the fit         Aggrading       Stope failure       Bank Angle       LT and/or RT ft       Botter with the fit         LAND OWNERSHIP:       Private       Public       Unknown       LAND COVER:       Forest       Field/Ag       Developed:         POTENTIAL RESTORATION CANDIDATE:       Grade control       Bank stabilization	ER	-	END LAT	0	,	••	LONG	0	'	"	LMK			
PROCESS:       Currently unknown       BANK OF CONCERN:       I T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T       T </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>_</th> <th></th> <th></th> <th></th> <th></th> <th></th>									_					
□ Downcutting       □ Bed scour       Diversion       Diversion       Steep soper vary wait       Other.         □ Widening       □ Bank scour       IndexNotON:       Implementation       Implement	PROCESS:	Current	ly unknown	BAN	K OF (		CERN:	LT	RT	Both	(looking dov	vnstream)	) av. vva11 🔽	Othom
□ Bark failure       □ Bark failure       □ Distributions         □ Aggrading       □ Bark failure       □ Bark Ht       □ T	Downcutting	В	ed scour	DDD	ATION			bena [		gnt sectio	n 🗀 Steep	stope/vall		] Other:
□ Hadcutting       □ Bank Accour       Englin (in vol0 / s) E1	U Widening	В	ank failure	Long	h (if n	NS:	DC) IT	ft	and/	от DT	ft	Botto	m width	ft
Aggrading       Side tailure       Sink Angle       III       IIII       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Headcutting		ank scour	Bank	Ht	001	з) LI LT	n ft	and/o	or RT	ft	Ton w	vidth	n ft
Land OWNERSHIP:       Private       Public       Unknown       LAND COVER:       Freest       Field/Ag       Developed:         POTENTIAL RESTORATION CANDIDATE:       Grade control       Bank stabilization       Other:         THREAT TO PROPERTY/INFRASTRUCTURE:       No       Yes (Describe):       Existing RIPARIAN WIDTH:       255 f.       25 - 50 f.       575 f.       75-100 f.       >100 f.         EROSION       Active downculing: tail banks on bub sides or the steam eroling at fast rate: erosio controling: significant amound of sediment to indicate a cost or infrastructure.       Per downculing: tail banks on bub sides or threat the property or infrastructure.       Orade and widht stable: isolated areas of bank fatule costs or threat to property or infrastructure.       Grade and widht stable: solated areas of bank fatule costs or threat to property or infrastructure.       Grade and widht stable: solated areas of bank fatule costs.         Channetized       1       Fat access: forestat of outwoet or and and the infrastructure.       The steam ending at a fat ace. sois or threat to property or infrastructure.       The steam cost on steam. Mining to the steam steam. Stockpile areas available and uncertaint steam. Stockpile areas available and to backpile areas available and the steam. Steam sector. Specialized heavy equipment using existing road or and to backpile areas availabl			lope failure	Bank	Angle		LT	n	and/o	or RT	ît	Wette	ed Width	ft
LAND COVER:       Protect       Protect <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>OVED</th> <th></th> <th>·····</th> <th>] E: -1-1/A</th> <th></th> <th></th> <th></th>								OVED		·····	] E: -1-1/A			
POTENTIAL RESTORATION CANDIDATE:       Grade control       Bank stabilization         No       Other:       Other:         THREAT TO PROPERTY/INFRASTRUCTURE:       No       Yes (Describe):         EXISTING RIPARIAN WIDTH:       \$\geq 25\$ ft       25 - 50 ft       50 - 75 ft       75 - 100 ft       >100 ft         EROSION       Active downcutting tail basics on bath addes of the stream eroding at a fast rate: erosion stream, obvious threat opporty or lineary toxicate the stream widening, banks actively eroding at a mount of sedimento in stream, obvious threat to property or infrastructure.       Grade and width stable: isolated areas of bank failure tension; barrier, obvious threat to property or infrastructure.       Grade and width stable: isolated areas of bank failure tension; barrier, obvious threat to property or infrastructure.       Grade and width stable: isolated areas of bank followed areas available and of sedimento infrastructure.         Channetized=       1       5       4       3       2       Officult access. Must for several and public ownership, sufficient oom to stockpile areas mailed and and followed areas available and to costs of the very equipment using existing roads or the several area mailed and followed caread distance from stream section. Specialized heavy equipment using existing roads or traits.       5       4       3       2       1         NOTES/CROSS SECTION SKETCH:       Notes/CROSS SECTION SKETCH:       1       1       1       1	LAND OWNERSHIP	: 🗋 Pr	ivate 🗌 Public	εЦt	Jnknov	wn	LANDC	OVER:		rest	Field/Ag		loped:	
THREAT TO PROPERTY/INFRASTRUCTURE:       No       Yes (Describe):         EXISTING RIPARIAN WIDTH:       25 ft       25 - 50 ft       50-75 ft       75-100 ft       >100 ft         EROSION SEVERITY(circleft)       Active downcutting: tail banks on both sides of the stream could of sedime anould of sedime to stream: obvious fireat to property or infastructure       Pat downcutting evident, active stream widening banks actively eroding at a scour, impaired fipatian vegetation or adjacent use.       Grade and width stable: isolated areas of bank failure/erosion: likely caused by a pipe outfail, local scour, impaired fipatian vegetation or adjacent use.         ACCESS:       Good access. Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails:       Fair access: Forested or developed area adjacent to losteam. Access requires it ter removal or impact to landscaped areas. Stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.         Sockpile areas Sterrers       4       3       2       1         NOTES/CROSS SECTION SKETCH:       Sockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.       1	POTENTIAL RESTO	ORATIO	n Candidate	:	☐ Gra ☐ Otł	ade c her:	control	Γ	Bank	stabilizat	ion			
EXISTING RIPARIAN WIDTH:      225 ft       _ 25 - 50 ft       _ 50-75 ft       _ 75-100 ft       _ > 100 ft         EROSION SEVERITY(circlef)       Active downcutting: tail banks on both sides of the sizean coding at last rate: erosion target in building significant anound of sediment steam; obvious threat to properly or infrastructure.       Pat downcutting evident, active stream mederain rate: no threat to properly or infrastructure.       Crade and width stable: isolated areas of bank failure/erosion: likely caused by a pipe outfall, local scorr, impaired ripatan vegetation or adjacent use.         ACCESS:       5       4       3       2       1         Good access: Open area in public wearship, sufficient room to stockpile materiae, easy stream channel access for trails.       Fair access: Forested or developed areas stockpile areas available and/or tocated a great stockpile areas small or distant from stream.       Difficult access. Music rooss weat and stockpile areas available and/or tocated a great stockpile areas small or distant from stream.       Stockpile areas available and/or tocated a great stockpile areas available and/	THREAT TO PROPE	erty/I	NFRASTRUCTU	URE:	No	[	Yes (	Describ	e):					
EROSION SEVERITY(circle#)       Active downcutling: tall banks on both sides of the stream eroding at a fast rate: erosion channelized = 1       Pat downcutling evident, active stream widening, banks actively eroding at a mitastructure.       Grade and width stable: isolated areas of bank falure/erosion: likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.         Access:       5       4       3       2       1         Access:       Good access: Open area in public materials, easy stream channel access for heavy equipment using existing roads or trails.       Fair access: forested or developed area of inpact to landscaped areas. Stockpile areas small or distant from stream.       Difficult access. Must cross welland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream.         NOTES/CROSS SECTION SKETCH:       5       4       3       2       1	EXISTING RIPARIA	N WID	тн:	[	<u>&lt;</u> 25	5 ft	25 - 50	) ft	50-75	ift □	75-100ft	□ >100t	ft	
SEVERITY(circle?)       of the stream obvious threat to property or infrastructure.       widening, bank's actively eroding at a mont of steam amount of steam infrastructure.       widening, bank's actively eroding at a mont of steam to property or infrastructure.       Gade all wide infrastructure.       failure?erosion: likely causes to baik failure.         ACCESS:       Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.       Fair access: Forested or developed area solute in form stream section. Specialized heavy equipment using existing roads or trails.       Difficult access. Must cross welland, steep slope or other sensitive areas to access stream. Minimal stockpile areas small or distant from stream.         NOTES/CROSS SECTION SKETCH:       5       4       3       2       1	EROSION	Active d	owncutting; tall ban	ks on bol	th sides		Pat downcut	ting evide	nt, active	stream	Crada an	d width atab	la, icolated a	roop of honk
Channelized=       1       Intrastructure.       Intrastructure.       scour, impaired riparian vegetation or adjacent use.         ACCESS:       Good access: Open area in public       5       4       3       2       1         Maccess:       Good access: open area in public       Fair access: Forested or developed area adjacent to stream. Access requires tree adjacent to stream. Access requires tree andjacent to stream. Access requires tree andjacent to landscaped areas. Stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment using existing roads or interval or impact to landscaped areas. Stockpile areas small or distant from stream.       Difficult access. Must cross welland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment using existing roads or interval or impact to landscaped areas.         Image:       5       4       3       2       1         Notes/CRoss Section Sketcett:       Stetchile areas small or distant from stream.       Heavy equipment using existing roads or interval or impact of the sensitive areas stream section. Specialized heavy equipment required.	<b>SEVERITY</b> (circle#)	contribu	ting significant amo	unt of se	diment t	to	widening, ba	nks activ	ely erodin	g at a perty or	failure/erc	sion; likely	caused by a p	pipe outfall, local
ACCESS: <sup>5</sup> <sup>4</sup> <sup>3</sup> <sup>2</sup> <sup>1</sup> <sup>1</sup> <sup>1</sup> <sup>5</sup> <sup>4</sup> <sup>3</sup> <sup>2</sup> <sup>1</sup>	Channelized = $\Box 1$	stream; infrastru	obvious threat to pricture.	operty or		i	infrastructure	e, no trice 9		ity Of	scour, imp	paired riparia	an vegetation	or adjacent use.
ACCESS:       Cood access: Upen area in public       Fair access: Forested or developed area adjacent to stream. Access services tree moval or impact to landscaped areas. Stockpile areas small or distant from stream.       Difficult access. Must cross welland, steep slope of adjacent to stream. Access. Must cross welland, steep slope of the sensitive areas to access stream. Minimal stockpile areas small or distant from stream.         materials, easy stream channel access for heavy equipment using existing roads or itals.       5       4       3       2       1         NOTES/CROSS SECTION SKETCH:       NOTES/CROSS SECTION SKETCH:       Fair access adjaced areas show and stockpile areas adjacent to stream.       The sensitive access the access stream. Minimal stockpile areas small or distant from stream.		0	5			4		3			2		1	
NOTES/CROSS SECTION SKETCH:	ACCESS:	Good a ownersh material heavy e trails.	ccess: Open area in hip, sufficient room t s, easy stream char quipment using exis	n public o stockpi nnel acce sting roac	le ess for Is or		Fair access adjacent to s removal or ir Stockpile are	Forestee tream. Ad npact to l eas small	d or develo ccess requ andscape or distant	oped area uires tree d areas. from stream	Difficult a other sens stockpile distance f equipmen	access. Mus sitive areas areas availa rom stream t required.	st cross wetla to access stro ble and/or loo section. Spe	nd, steep slope or eam. Minimal cated a great cialized heavy
NOTES/CROSS SECTION SKETCH:	No		5			4		3			2		1	
	NOTES/CROSS SEC	TION S	<b>ЖЕТСН:</b>								December			

							Impac	ted Bu	ffer	IB
WATERSHED/SUBSHED:					DATE	: <u>/</u>	/	Ass	ESSED B	Y:
SURVEY REACH:			TIME:	: AM/PI	1 Рнот	ro ID: (	(Camera-P	Pic #)	/#	ŧ
<b>SITE ID:</b> (Condition-#)	START LA	г °	' '' I	ONG °	,	"		,	GPS:	(Unit ID)
IB-		г <u> </u>	<u> </u>	.ONG °	,	••			-	
		·	*			·	<u></u>			
IMPACTED BANK:     LT   RT     Both	REASON INA	DEQUATE:	Lack of	vegetation	Too narrov Other:	w 🗆 W	idespread ir	nvasive p	olants	
LAND USE:	Private Ir	stitutional	Golf Cou	rse Park	Other Pub	olic				
(Facing downstream) LT Ban	k 🗌					]:				
RT Ban	k 🗌					]:				
DOMINANT	Paved	Bare ground	l Turf/lav	vn Tall gr	ss Shrub/	scrub	Trees	Other		
LAND COVER: LT Bar	nk 📙									
R'f Bar			<u>L</u>		L	<u> </u>		<u> </u>		
INVASIVE PLANTS:	None None	Rare	□ P	artial coverag	E 🗌 E	xtensive	e coverage	unk	nown	
STREAM SHADE PROVID	ED? DNone	Part	ial 🗌	Full W	etlands F	RESEN	г? 🗌 No	□ Y	es 🗌 U	nknown
				•						
POTENTIAL RESTORATION	ON CANDIDAT	TE Activ	ve reforestati	on Greenv	ay design	🗌 Natu	iral regenera	ation 🗌	Invasive	s removal
no		Othe	er:							
<b>Restorable Area</b>				Impacted area	n public land	Impac	ted area on eit	her	Impacted	area on private
LT BANK	K RT	REFOREST POTENTIAL	ATION 2:	where the ripar not appear to b specific purpos	an area does e used for any e; plenty of	public preser purpos	or private land ntly used for a se; available ar	l that is specific rea for	land where encroachr feature sig	e road; building nent or other pificantly limits
Width (ft):		(cucie iii)			n planung	piantin			available a	
POTENTIAL CONFLICTS	WITH REFORE	STATION impervious c	Wi over 🗌 Sev	5 despread inva vere animal in	ive plants pacts (deer,	4 Pot	tential conta	umination	ı 🗌 La	ck of sun
NOTES:		X								

# Stream Crossing

SURVEY REACH ID:       TIME:       AMPM       PHOTO ID: (Camera-Pic #)       /#         STE ID: (Candidon-#)       SC       LAT       '       ''       LONG       ''       LINK       GPS (Unit ID)         TYPE:       Road Crossing       Railroad Crossing       Manmade Dam       Beaver Dam       Geological Formation       Other:         Arch       Bottomless       Singht       Concrete       IConcrete       Discource       Discource       Barel diameter:       Height:       Height:       Height:       Height:       Height:       Width:       Height:       Width:       Guivert length:       Width:       Width:       Width:       Height:       Width:       Guivert length:       Width:       Width:       Height:       Width:       Height:       Width:       Height:       Width:       Height:       Not flow-aligned       Height:       Width:       Height:       Width:       Height:       Height:       Height:       Width:       Height:	WATERSHED	/SUBSHED:		-		DA	TE:	<u> </u>	ASSE	SSED BY:
STE ID: (Condition-#)       SC       LAT'       "I LONG'       "I LMKGPS (Unit D))         TYFE:       Road Crossing       Rairoad Crossing       Mainade Dam       Beaver Dam       Geological Formation       Other:         Box       BitAPE:       # BARRELS:       MATERIAL:       ALIGNMENT:       DIMENSIONS: (if variable, ske         Box       Elliptical       Doubles       Double:       Do not know       Barel diameter:       Height:       Height:<	SURVEY REA	сн <b>ID:</b>		TIME::	AM/PM	Рн	ото ID	: (Camera-Pio	c #)	/#
TYPE:       Road Crossing       Mailroad Crossing       Manmade Dam       Geological Formation       Other:         FOR ROAD/       Barret       Barret <td< td=""><td>SITE ID: (Con</td><td>dition-#) SC</td><td>LAT</td><td>o'</td><td>_" LONG</td><td><u> </u></td><td><u>'</u></td><td><u> </u></td><td>МК<u></u></td><td>GPS (Unit ID)</td></td<>	SITE ID: (Con	dition-#) SC	LAT	o'	_" LONG	<u> </u>	<u>'</u>	<u> </u>	МК <u></u>	GPS (Unit ID)
TYPE:       Road Crossing       Manmade Dam       Beaver Dam       Geological Formation       Other:         FOR ROAD/       Arch       Bottomless       Sile       Markels:       Arch       Diversity       Diversity       Bared diameter:       Height:       Height: </td <td>m []-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> <td></td> <td>~</td>	m []-							~		~
Sin Pr:       # Arch Bottomless       MATERIAL:       HAIGNMENT:       DIMENSIONS: (# variable, ske         Box       Elliptical       Double       Metal       Not flow-aligned         CROSSINGS       Onter:       Other:       Do not know       Culvert stops:         ONLY       Construction       Downstream scour hole       Slight (2" - 5")       Culvert stops:         Sediment deposition       Failing embankment       Distipt (2" - 5")       Obvious (>5")       Roadway elevation:         POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no       Doato lastream repair       Other:       Other:       Atola fish blockage on a tay where where yhead 0 a storage retrofit         stypes for fish barrier       Total       Partial       A structure such as a dam or road udvert on a d order or grade stream locking where with the migration or a tabcka fish blockage on a tay where had 0 a storage in fast blockage on a tay where had 0 a storage in tabckage in the migration or a tabcka fish blockage on a tabcka the migration or a tabcka	TYPE: 🗌 Roa	ad Crossing 🔲 Railroad	l Crossi	ng 🛄 Manmade	Dam 🗌 Beav	er D	am 🔄	Geological For	mation	Other:
RALIROAD       Other:       Other:       Other:       Other:       Other:       Other:       Other:       Cuvert length:         ONLY       Construction:       (Evidence of)       Cuvert length:       Width:       Width:         Construction:       Failing embankment       Flat       Slight (2 <sup>o</sup> - 5 <sup>o</sup> )       Roadway elevation:         Other:       Other (describe):       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no       Local stream repair       Other:       Structure such as a dam or nod tokanown       A total fish blockage on a tiparty barver such as a dam or nod tokage that may above it nature barver dam or ablockage on a tipartial tockage that may above it nature barver as waterfals.         If yes for       Fish barrier       CAUSE:       BLOCKAGE Sevenity: (circle #)         Promo too high       Water Drop:	For Road/	SHAPE:     Arch   Bottor     Box   Elliptic     Circular	nless ical	# BARRELS:	MATERIAL:		ALIGN	NMENT: w-aligned t flow-aligned not know	<b>DIMENS</b> Barrel dia	IONS: (if variable, sketch) ameter:(ft) Height:(ft)
CNONDITION: (Evidence of)       CULVERT SLOPE:       Culvett RSLOPE:         ONLY       Cracking/chipping/corrosion       Downstream scour hole       Flat       Slight (2 <sup>o</sup> - 5 <sup>o</sup> )         Other (describe):       Culvet repair/replacement       Upstream storage retrofit         no       Local stream repair       Other:         ISSC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)         Total       Partial       A structure such as a dam or road culver on a 3rd order or or addculver on a 3rd order or or partial blockage on a inbutary that would isolate a significant reach of stream, or a blocka, the very head of a stream storage device present.       A lemporary barier such as a dam or or ablocka the very head of a stream storage that may ustream movement of anadromous fish.         in Other:       5       4       3       2         NOTES/SKETCH:       5       4       3       2       1	<b>R</b> AILROAD	U Other:		Other:				not know	Culuent le	an other (ft)
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no       Local stream repair       Other:       Is SC ACTING AS GRADE CONTROL       No       Yes         Is SC ACTING AS GRADE CONTROL       No       Yes       Unknown       It is storage retrofit         If yes for fish barrier       CAUSE:       BLOCKAGE       BLOCKAGE SEVERITY: (circle #)         If yes for fish barrier       CAUSE:       adoronous fish: no fish anadromous fish: no fish assage device present.       A start barrier suction as a start and a streat as waterfalls.         NOTES/SKETCH:       5       4       3       2       1	CROSSINGS Only	CONDITION: (Evidence	e of) orrosion 1	n 🗌 Downstrear 🗌 Failing emb	n scour hole pankment		CULV	<b>ERT SLOPE:</b> t ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$	Roadway	width:(ft)
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no       Local stream repair       Other:         ISSC ACTING AS GRADE CONTROL       No       Yes       Unknown         Fish barrier       Total       Partial       A structure such as a dam or radic culvert on a 3d order or greater stream blocking the upstream start abariter is a waterfalls.       A structure such as a dam or radiomous fish: no fish and ornous fish.       Total stream the upstream order or upstream start abariter is a waterfalls.         If yes // Yes /										()
ISSC ACTING AS GRADE CONTROL       No       Yes       Unknown         EXTENT OF PHYSICAL BLOCKAGE:       Total       Partial         Total       Partial       A total fish blockage on a tribulary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish; no fish passage device present.       A total fish blockage on a tribulary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish; no fish passage device present.       A total fish blockage that may interfere with the migration of anadromous fish; no fish passage device present.         NOTES/SKETCH:       5       4       3       2       1	POTENTIAL I	RESTORATION CANDII	DATE	Fish barrier re	emoval 🗌 Cul <sup>4</sup> repair 🗌 Oth	vert r er:	epair/rep	placement 🔲 I	Upstream s	torage retrofit
EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)         I otal       Partial       Temporary       Unknown         If yes for       Temporary       Unknown       A structure such as a dam or noad cuivert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish       A total fish blockage on a ispan field blockage that may interfere with the migration of anadromous fish; no fish       A total fish blockage that may interfere with the migration of anadromous fish; no fish       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.         Other:       5       4       3       2       1         NOTES/SKETCH:       5       4       3       2       1	IS SC ACTING	G AS GRADE CONTROI		No Y	es 🗌 Unk	now	n			
Image: Total image: Total image: Temporary		EXTENT OF PHYSICA	L BLO	OCKAGE:	I		BLO	CKAGE SEVEF	RITY: (circ	le #)
NOTES/SKETCH:	If yes for fish barrier	☐ Total ☐ ☐ Temporary ☐ CAUSE: ☐ Drop too high V ☐ Flow too shallow V ☐ Other:	Partial Unknov Vater Di Vater D	wn rop: (in) epth: (in)	A structure such road culvert on a greater stream b upstream moven anadromous fish passage device	as a d 3rd or locking hent of ; no fis presen	lam or rder or g the f sh tt.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
	Notes/Sket	Сн.			5		4	4 3		2 1

Channel Modification

WATERSHED/SUBSHED:			DATE: /	/	ASSESSED BY:		
SURVEY REACH ID:		TIME:AM/PM	Рното ІІ	<b>D:</b> (Camera-Pic #)	/#		
SITE ID: (Condition-#)	START LAT	' Long	<u> </u>	LMK	GPS: (Unit ID)		
CM	END LAT °	LONG	o ı ıı	LMK	_		
<b>TYPE:</b> Channelization	ion 🗌 Bank armoring 🔲 concrete channel 🔲 Floodplain encroachment 🗌 Other:						
MATERIAL:	Does channel hav	e perennial flow?	🗌 Yes 🗌 No	<b>DIMENSIONS:</b>			
Concrete Gabion	Is there evidence	of sediment deposition?	🗌 Yes 🗌 No	Height	(ft)		
☐ Rip Rap ☐ Earthen	Is vegetation grov	ving in channel?	Yes No	Top Width:	(It)(ft)		
Other:	Is channel connec	ted to floodplain?	Yes No	Length:	(ft)		
		<u> </u>					
BASE FLOW CHANNEL			ADJACENT STR	ENT STREAM CORRIDOR			
Depth of flow	(in)		Available width LT (ft) RT (ft				
Defined low flow channe	1? 🗌 Yes 🗌 No		Utilities Present? Fill in floodplain?				
% of channel bottom	%		$\Box \text{ Yes } \Box \text{ No} \qquad \Box \text{ Yes } \Box \text{ N}$				
POTENTIAL RESTORATION	ON CANDIDATE	Structural repair 🛛 Bas	se flow channel cre	ation 🗌 Natural	channel design 🔲 Can't tell		
no no	Ľ	De-channelization Fis	h barrier removal	🗌 Bioengi	neering		
CHANNEL- A long section	n of concrete stream (>500	) A moderate length ( > 200'),	but channel stabilized a	An earthen ch	n channel less than 100 ft with good water		
IZATION deep) with no	o natural sediments present	in beginning to function as a na Vegetated bars may have for	atural stream channel. med in channel.	shape similar	to the unchannelized stream reaches		
( <i>Circle #</i> )	5				ow impacted area.		
Notes:	5	4 5		2	1		
NOTES.							

WATERSHED/SUBSHED:					<b>D</b> ATE:/	/	Assessed by:
SURVEY REACH I	D:		TIME:	AM/PM	Рното ID: (Ca	umera-Pic #)	/#
SITE ID: (Condition-#) TR LAT ''' LONG			G'	_'' LMK_	GPS: (Unit ID)		
Type: Industrial Commercial Residential	MATERIAL: Plastic Tires Appliances Automotive		aper onstruction ard Waste ther:	☐ Metal ☐ Medical	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION:	ea          LAND OWNERSHIP:         Public       Unknown         Private         AMOUNT (# Pickup truck loads):
POTENTIAL RESTORATION CANDIDATE       Stream cleanup       Stream adoption segment       Removal/prevention of dumping         no       Other:							
If yes for trash or	EQUIPMENT NEE	CDED:	Heavy	equipment 🔲 🛛	Frash bags 🗌 Unkno	own	DUMPSTER WITHIN 100 FT:
debris removal	WHO CAN DO IT:		Yes No Unknown				
CLEAN-UP POTENTIAL: (Circle #)	A small amount of t than two pickup truck inside a park with ea	trash (i.e., k loads) loc sy access	less ated a long few da	e amount of trash, a asy access. Trash period of time but ays, possibly with a	or bulk items, in a small a may have been dumped o it could be cleaned up i small backhoe.	rea ver n a or indications c	nt of trash or debris scattered over a large ccess is very difficult. Or presence of drums of hazardous materials
(enere #)	5			4	3	2	1
NOTES:						REPORTE	D TO AUTHORITIES TO VES TO NO.
						REPORTE	D TO AUTHORITIES   YES   NO

## Utility Impacts UT

WATERSHED/SUBS	HED:		DATE:	<u> </u>	А	SSESSED	BY:		
SURVEY REACH II	):	,	TIME::	AM/PM	Рноте	0 <b>ID:</b> ( <i>Ca</i>	amera-Pic	#)	/#
SITE ID: (Condition-+	#) UT	LAT	o 1	"LONG	٥	<u> </u>	" LMK:	·	GPS: (Unit ID)
Type: Leaking sewer Exposed pipe Exposed manhole Other:	MATERIAL: LOCAT		LOCATION: Floodplain Stream bank Above streat Stream botto Other:	m m CONDITION: Joint failure Protective covering broken			IER: t failure ken	: PIPE DIMENSIONS: Diameter: <u>in</u> Length exposed: <u>ft</u> lure Pipe corrosion/cracking Manhole cover absent	
					r:				
EVIDENCE OF       COLOR       None       Clear       Dark Brown       Lt Brown       Yellowish       Greenish       Other:         DISCHARGE:       ODOR       None       Sewage       Oily       Sulfide       Chlorine       Other:         DEPOSITS       None       Tampons/Toilet Paper       Lime       Surface oils       Stains       Other:					] Other: er:				
POTENTIAL RESTO	PRATION CANDII	DATE	] Structural repa	urs 🗌 Pipe test	ing 🔲 (	Citizen ho	otlines 🗌 D	Ory weath	er sampling
🗌 no			] Fish barrier re	moval 🗌 Othe	е — г:			5	1 0
If yes to fish barrier,	Water Drop:	(in)							
UTILITY IMPACT SEVERITY: ( <i>Circle #</i> ) Section of pipe undermined by erosion and could collapse in the near future; a pipe running across the bed or suspended above the stream; a long section along the edge of the stream where nearly the entire side of the pipe is exposed; or a manhole stack that is located in the center of the stream channel and there is evidence of stack failure			A moderately long section of pipe is partially exposed but there is no immediate threat that the pipe will be undermined and break in the immediate future. The primary concern is that the pipe may be punctured by large debris during a large storm event.			d pipe, stream bank near the s across the bottom of the portion of the top of the pipe losed but is reinforced with using a blockage to upstream ble stack that is at the edge of t extend very far out into the			
Leaking= $\_ 5$	5			4	3		2		1
NOTES: REPORTED TO LOCAL AUTHORITIES Yes No									

			Miscellar	neous	
WATERSHED/SUBSHED:		DATE:/	Assessed by:		
SURVEY REACH ID:		TIME:AM/PM	<b>Рното ID:</b> ( <i>Camera-Pic #</i> )	/#	
SITE ID: (Condition-#) MI]	Lat <u>°</u>	•' LONG•_	' LMK:	GPS: (Unit ID)	
POTENTIAL RESTORATION CANDIDA	TE 🗌 St	torm water retrofit 🛛 Stream r	restoration 🔲 Riparian Manageme	nt	
no	Discharge Prevention Other:				
DESCRIBE:					
			<b>REPORTED TO LOCAL AU</b>	THORITIES 🗌 Yes 🗌 No	

WATERSHED/SUBSHED:	DATE:/	Assessed by:			
SURVEY REACH ID:	<b>TIME:</b> AM/PM	<b>Рното ID:</b> ( <i>Camera-Pic #</i> )	/#		
SITE ID: (Condition-#) MI LAT°	' LONG	''' LMK:	GPS: (Unit ID)		
POTENTIAL RESTORATION CANDIDATE	orm water retrofit 🛛 Stream r	restoration 🔲 Riparian Manageme	nt		
Discharge Prevention Other:					
DESCRIBE:					
		<b>REPORTED TO LOCAL AU</b>	THORITIES 🗌 Yes 🗌 No		

WATERSHED/SUBSHED:	DATE://	Assessed by:		
SURVEY REACH ID:	<b>TIME:</b> AM/PM	<b>Рното ID:</b> ( <i>Camera-Pic #</i> ) /#		
SITE ID: (Condition-#) MI LAT°		' LMK: GPS: (Unit ID)		
POTENTIAL RESTORATION CANDIDATE	torm water retrofit 🛛 Stream r	restoration 🔲 Riparian Management		
Discharge Prevention Other:				
DESCRIBE:				
		<b>Reported to local authorities</b> Yes No		



SURVEY REACH I	D:	WTRS	HD/SUBSHD:			DATE:/	/	Assessed	BY:
START TIM	E:AI	M/PM	LMK:	END	TIME:	:AM/PM	LM	К:	GPS ID:
Lat'	Lo	NG	<u> </u>	LAT	<u> </u>	LONG		<u>'</u> ''	
<b>Description:</b>				DESCRIP	TION:				
RAIN IN LAST 24 HO	URS £ Heavy	rain	£ Steady rain	PRESENT C	ONDITIONS	£ Heavy rain	£ Stea	dyrain £ li	ntermittent
	E Interm	Ittent	E Trace	E Urban/P	acidantial	E Trace	E UVE	stad E I	Partity cloudy
SURROUNDING LAN	£ Gol	f course	e E Park	£ Crop	esidendai	£ Pasture	£ Othe	er:	Istitutional
Average	CONDITIONS	(check	applicable)		REACH	SKETCH AND SIT	те Імра	CT TRACK	ING
BASE FLOW AS % CHANNEL WIDTH	£ 0-25% £25-50 %		£ 50%-75% £ 75-100%	Simple p within	lanar sketch o the survey reo features o	of survey reach. Trac ach (OT, ER, IB,SC, deemed appropriate.	ck locatio UT, TR, M Indicate	ns and IDs for 11) as well as a direction of fl	r all site impacts any additional ow
<b>DOMINANT SUBSTR</b> £ Silt/clay (fine or £ Sand (gritty) £ Gravel (0.1-2.5	OOMINANT SUBSTRATE2 Silt/clay (fine or slick)£ Cobble (2.5 -10")2 Sand (gritty)£ Boulder (>10")2 Gravel (0.1-2.5")£ Bed rock								
WATER CLARITY £ Stained (clear, no £ Other (chemicals,	É Clear ÉT aturally colored) dyes)	urbid (s £ Oj	suspended matter) paque (milky)						
AQUATIC PLANTS IN STREAM	Attached: £ Floating: £	none :	£ some £ lots £ some £ lots						
WILDLIFE IN OR Around Stream	(Evidence of) E Fish E E Snails E	Beaver Other:	£ Deer						
STREAM SHADING (water surface)	£ Mostly sha £ Halfway ( £ Partially sl £ Unshaded	aded ( <u>&gt;</u> 50%) haded ( <u>&gt;</u> (< 25%	75% coverage) ≥25% ) )						
CHANNEL	Downcut	ting	Bed scour						
DYNAMICS		g	Bank failure						
Unknown	Aggradin	g sition	Slope failure						
Channel Dimensions	Height: LT b RT b	oank _ oank _	(ft)						
(FACING DOWNSTREAM)	Width: Bott	om	(ft)						
Do misricenni)	Тор		(ft)						
R	REACH ACCESS	BILITY		4					
Good: Open area in	Fair: Forested or developed area	r D W	Vitticult. Must cross Vetland, steep slope, or						
public ownership, sufficient room to	adjacent to strea	m. se	ensitive areas to get to						
stockpile materials,	removal or impac	t to st	tockpile available						
easy stream channel access for heavy	landscaped areas. and/or located a great								
equipment using									
	stream.	e	quipment required.	4					
NOTES: (biggest prob	+ 3 olem you see in si	2 urvey rec	1 ach)	1					
	-	-	-						
						Repor	TED TO A	AUTHORITIES	S 🗌 YES 🗌 NO

OVERALL STREAM CONDITION								
	Optimal	Suboptimal	Marginal	Poor				
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
	Right Bank 10 9	8 7 6	5 4 3	2 1 0				
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; fail banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
	Right Bank 10 9	8 7 6	5 4 3	2 1 0				
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.				
	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0							
	OVER	ALL BUFFER AND FLOODPLAI	IN CONDITION					
	Optimal	Suboptimal	Marginal	Poor				
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.				
	Left Bank 10 9	8 7 6	5 4 3	2 1 0				
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	8 / 0 Predominant floodplain vegetation type is young forest	5 4 5 Predominant floodplain vegetation type is shrub or old field	2         1         0           Predominant floodplain vegetation type is turf or crop land         Image: Complexity of the second seco				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water				
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0				
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function				
	20 19 18 17 16	15 14 13 12 11	10 9 8 / 6	5 4 3 2 1 0				
Sub Total In-stream:       /80       +       Buffer/Floodplain:       /80       =       Total Survey Reach       /160								

#### Photo Inventory (By Camera)

Project:	This field sheet is to be completed AS photos are taken in the field. The intent is to
Group:	force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a
Camera:	new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description

Date	Stream/ Reach	Location ID	Photo #	Description

**Comments:**
	Reach Level Assessment RCH
SURVEY REACH ID: TB-OI WTRSHD/SUBSHD:	UER BK DATE: 71 108 ASSESSED BY:
START TIME: 3:00 AM(PM) LMK: LAT <u>M</u> • <u>M</u> • <u>77</u> " LONG <u>77</u> • <u>20</u> • <u>16</u> " DESCRIPTION: Conf. W/ UTR	$END$ TIME: $U : 00$ AM/PM       LMK:       GPS ID:         LAT $U \circ U \circ 1 $ $U \circ 1 \circ 1 $ LONG $7 \circ 2 \circ 1 \circ 3$ "         DESCRIPTION: $5 \circ -04$ $5 \circ -04$ $6 \circ 1 \circ 1 \circ 3$ "
RAIN IN LAST 24 HOURS Heavy rain     Steady rain       None     Intermittent     Trace	PRESENT CONDITIONS  Heavy rain  Steady rain  Intermittent
SURROUNDING LAND USE:  Industrial Golf course Park	□ Urban/Residential □ Suburban/Res □ Crop □ Pasture □ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS %         □ 0-25%         □ 50%-75%           CHANNEL WIDTH         □ 25-50 %         □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE         Silt/clay (fine or slick)         Sand (gritty)         Gravel (0.1-2.5")    Cobble (2.5 -10")          Boulder (>10")         Bed rock	
WATER CLARITY Declear Turbid (suspended matter) Description (clear, naturally colored) Declear (milky) Other (chemicals, dyes)	Sc-04
AQUATIC PLANTS       Attached:       none       some       lots         IN STREAM       Floating:       none       some       lots	
WILDLIFE IN OR AROUND STREAM (Evidence of) Grish Beaver Deer Snails Other:	\$c-03
STREAM SHADING (water surface) $\square$ Mostly shaded ( $\geq$ 75% coverage) $\square$ Halfway ( $\geq$ 50%) $\square$ Partially shaded ( $\geq$ 25%) $\square$ Unshaded (<25%)	for-1
CHANNEL       Downcutting       Bed scour         DYNAMICS       Widening       Bank failure         Unknown       Aggrading       Slope failure         Channelized       Sed. deposition       Channelized	50°2
CHANNEL DIMENSIONSHeight: LT bank $\overline{2}$ (ft)DIMENSIONS (FACING DOWNSTREAM)RT bank $\overline{3}$ (ft)Width:Bottom $12$ (ft)Top $7$ (Q) (ft)	55.07 /
REACH ACCESSIBILITY	and I have been a second se
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using 	
NOTES: (biggest problem you see in survey reach)	- C
Failing industrial-ena	intestructure
	REPORTED TO AUTHORITIES YES NO

		OVERALL STREAM COND	ITION	
	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 4 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 (16,)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	OVER	ALL BUFFER AND FLOODPLA	IN CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
Freener	Night Dank IV 9	<u>()</u> / 6	Dredominant floodoloin	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
· · · · · · · · · · · · · · · · · · ·	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sub Total In-str	ream:/80 + Bi	uffer/Floodplain:/80	= Total Survey	Reach /160

	( where			S	evere Bank I	Erosion	ER
WATERSHED/SUBS	SHED: Fratt	Brk		DATE: 7/ /	108 ASS	SESSED BY:	KR
SURVEY REACH:	TBOI	TIME: S:	15 AM/PM)	<u></u> Рното ID (Сам	$\frac{1}{1} = \frac{1}{1} = \frac{1}$	/#	
SITE ID: (Condition-	#) STARTLAT	11.49.26	" LONG 77 ° ?	9.15	IMK	CPS· (I	Init ID)
ER- OI	END LAT	<u> </u>	"LONG $^{\circ}$	1 11			mit ID)
					<u></u>		
PROCESS:	Currently unknown	BANK OF CC	NCERN: 🗌 LT	🛛 RT 🔲 Both (l	ooking downstree	am)	
Downcutting	Bed scour	LOCATION:	🛛 Meander bend	Straight section	Steep slope/v	valley wall	Other:
Widening	·X Bank failure	DIMENSIONS	5:		-		a
Headcutting	Bank scour	Length (if no (	<i>GPS</i> ) LTft	and/or RT_5	<u>O</u> ft Bo	ottom width	<u> 5_ft</u>
Aggrading	Slope failure	Bank Ht	LTft	and/or RT	<u>O</u> ft To	p width	<u>20 ft</u>
Sed. deposition	Channelized	Bank Angle	LT	and/or RT 9	<u>2</u> ° w	etted Width _	<u> 0</u> ft
LAND OWNERSHIP	Private 🗌 Publi	c 🔀 Unknown	LAND COVER:	Forest F	ield/Ag 🗌 De	eveloped:	
POTENTIAL RESTO	ORATION CANDIDATI	E: Grade	control	Bank stabilizatior	1		
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🔀 No	Yes (Describ	e):			
EXISTING RIPARIA	AN WIDTH:	⊠ ≤25 ft	25 - 50 ft	] 50-75ft	-100ft 🗌 >1	00ft	
EROSION	Active downcutting; tall ban	ks on both sides	Pat downcutting evide	nt. active stream			
SEVERITY(circle#)	contributing significant amo	unt of sediment to	widening, banks active	ely eroding at a	Grade and width s	stable; isolated ar elv caused by a r	reas of bank
Channelined - 🗔 1	stream; obvious threat to pr	operty or	infrastructure	at to property or	scour, impaired rip	parian vegetation	or adjacent use.
	5		4 3	>	2	1	
ACCESS:	Good access: Open area i ownership, sufficient room t materials, easy stream chai heavy equipment using exist trails	n public to stockpile nnel access for sting roads or	Fair access: Forester adjacent to stream. Ac removal or impact to la Stockpile areas small	I or developed area ccess requires tree andscaped areas. or distant from stream.	Difficult access. other sensitive are stockpile areas av distance from stre	Must cross wetla eas to access stre ailable and/or loc am section. Spe	nd, steep slope o eam. Minimal cated a great cialized heavy
	5		3		equipment require	1	
NOTES/CROSS SEC	CTION SKETCH:		Sank being Stabilized trees, roo are have	"by its ngjing bjank			
)					REPORTED TO A	UTHORITIES	Yes N

e

					Stre	am Cros	ssing SC
WATERSHED	SUBSHED: TAnta	Tucker		DATE:	711/08	ASSE	SSED BY:
JURVEY REA	CHID: TB01	TIME: 4:60	AM/RM	Рното	ID: (Camera-Pi	c #)	/#
SITE ID: (Con	udition-#) SC- <u>[74]</u> LAT	41.49.18		<u>2°29</u>	<u>'/2"</u> L	MK	GPS (Unit ID)
TYPE: X Roa	ad Crossing 🔲 Railroad Cross	ing Manmade	Dam Beave	r Dam	Geological For	mation 🔲	Other:
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:     MATERIA       ess     Single     Concre       1     Triple     Metal       1     Other:     Other:			IGNMENT: Flow-aligned Not flow-aligned Do not know	DIMENSI Barrel dia	IONS: (if variable, sketch) ameter:(ft) Height:(ft)
ONLY	CONDITION: (Evidence of)	n 🖾 Downstrear	n scour hole pankment		<b>LVERT SLOPE:</b> Flat Slight (2° – 5 <sup>0</sup> ) Obvious (>5°)	Roadway	width:(ft) elevation:( $5$ (ft)
POTENTIAL ]	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culve repair 🗌 Other	ert repair. r:	/replacement	Upstream st	torage retrofit
IS SC ACTIN	G AS GRADE CONTROL	XN₀ □Y	es 🗌 Unkr	nown			
	EXTENT OF PHYSICAL BLO	DCKAGE:	[	В	LOCKAGE SEVE	RITY: (circ	le #)
If yes for fish barrier	Total      Partial     Temporary Unknow CAUSE:     Drop too high Water D     Flow too shallow Water D     K Other: 2000 ⊕ d ≤	wn Prop: (in) Pepth: (in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; i passage device pr	s a dam or Brd order or ocking the ent of no fish resent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SKET	сн:			/	<u> </u>	λ <b>Λ</b>	
NUTES/SKET		T T T		pooli suo	rocts dise vergy dise prevent passage	allatres 1	
 _)			Cenent		REPOR	<b>TED TO AU</b>	
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		D a			Strea	am Cros	ssing SC
WATERSHED	SUBSHED: Tanter	Tucker	. D <i>i</i>	ате: 7_	1108	ASSE	SSED BY: LB
URVEY REA	CHID: TBOI	TIME: 3 : 57		<u>ното Ď:</u>	(Camera-Pic	#)	/#
SITE ID: (Con	dition-#) SC- <u>Ø</u> LAT	410-44-1	<u>" LONG 72</u>	<u>14'</u>	<u>14_"</u> lr	ИК	GPS (Unit ID)
TYPE: X Ros	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade I	Dam 🗌 Beaver D	Dam 🗌 C	Geological Form	nation 🔲	Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIGN	MENT: v-aligned flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter:(ft) Height:(ft)
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n ŽLDownstrean □ Failing emb	CULVE	ERT SLOPE: ht (2° – 5 <sup>0</sup> ) ious (>5°)	Culvert le Roadway	ength: <u>20</u> (ft) Width:(ft)	
POTENTIAL ]	RESTORATION CANDIDATE	Fish barrier re	rmoval 🕅 Culvert repair 🔲 Other:	repair/repl	lacement 🔲 l	Jpstream st	torage retrofit
IS SC ACTIN	G AS GRADE CONTROL		es 🗌 Unknov	vn			
EXTENT OF PHYSICAL BLOCKAGE:       BLOCKAGE SEVERITY: (circle #)         Total       Partial         Temporary       Unknown         If yes for       A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such beaver dam or a blockage that may interfere with the migration of anadromous fish.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A temporary barrier such beaver dam or a blockage that may interfere with the migration of anadromous fish.       A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.       A total fish blockage that may interfere with the migration of anadromous fish.							
	U Other:		5	4	3		2 1
Rotes/sket Bi	ignificant scound	itment. 15 occ. ng near	nl deck ming don and und	type what	Crossin ean	ñg on ab	outments
		7 60 51	orting				
					REPOR	TED TO AU	THORITIES YES N

				I	Storm	Water Outfall	s OT
' WATERSHED/SUBS	SHED: - tucher	F/L		DATE: 7/	108	ASSESSED BY:	DB
SURVEY REACH II	D: TB-01 TI	ME: 3 : 15 AM/	PM)	Рното ID: (Car	mera-Pic #)	/#	
SITE ID (Condition-#	): <b>OT-<u>O</u>[</b> LA	<u>141º49.2</u>	<u>5</u> "Lo	DNG-12°-29'	14 "	LMK	GPS: (Unit ID)
BANK: LT ART Heat FLOW: None Tric	Ad TYPE: M Closed pipe	MATERIAL:	]Metal ]Brick .P	SHAPE: S Circular S Elliptical C Other:	ingle <b>I</b> Double Triple I	DIMENSIONS: Diameter: <u>\Z(i</u> i	SUBMERGED:
Substantial	Dpen channel	Concrete II I	Earthen	<ul> <li>Trapezoid</li> <li>Parabolic</li> <li>Other:</li> </ul>	Depth Width " (Bo	:(in) (Top):(in) ottom):(in)	NOT APPEICABLE
CONDITION:	ODOR: XNO Gas Sewage Rancid/Sour Sulfide	<b>DEPOSITS/STAIN</b> None Oily Flow Line Paint	vs:	VEGGIE DENSIT	TY: PI	PE BENTHIC GE Brown Dorat Other:	ROWTH: A None nge Green
Other:	Other:	Other:		Other:		Good Odors Suds Algae Other:	Colors Oils Floatables
FLOWING     TUR       ONLY     FLO       OTHER     FLO       CONCERNS:     T	BIDITY: None ATABLES: None Excess Trash (paper/pla Needs Regular Mainten	Brown [] ( Slight Cloudir Sewage (toilet stic bags) [] I ance [] B	arey [ ness [ paper, e Dumping Bank Eros	Yellow Gree Cloudy Opz tc.) Petr (bulk) Exc sion Oth	een []] Ora aque oleum (oil s cessive Sedi er:	nge Red () ( heen) () mentation	Other: Other:
POTENTIAL RESTO	RATION CANDIDATE	Discharge inve Storm water ret	estigatior rofit of existi	Stream dayligh	nting 🗆 L m(?, Ţ	ocal stream repair. Do CSN + SeCM Slope:	outfall stabilization
If yes for stormwate Is stormwater current	r: y controlled?	Land	Use desc	ription:		F	
OUTFALL SEVERITY: (circle #)	Not investigated Heavy discharge with a distii strong smell. The amount of compared to the amount of r stream; discharge appears to significant impact downstrea	Area and color and/or a discharge is significant at a normal flow in receiving to be having a m.	available Small dis discharg discharg flow and	: charge; flow mostly cle: e has a color and/or odo e is very small compared any impact appears to b	ar and odorless r, the amount c I to the stream re minor / locali	s. If the of s base zed. Outfall doe discharge; of causing	s not have dry weather staining; or appearance any erosion problems.
SKETCH/NOTES:	5		4	3		2	
SKETCH/NUTES:		~ ~ ~ ~ ~	F-01				and the second of the second o
)					REPOR	TED TO AUTHORI	TIES: 🗌 YES 🗌 NO

WATERSHED/SUE	BSHED: TUCKER		DATE: 7/1/0	8 ASSESSED BY: KB
SURVEY REACH ]	D: T3-01 TI	ME: 2:45AM/RM	Рното ID: (Camera-P	ic #) /#
SITE ID (Condition-	#): OT- <u>07</u>	<u>ат 41° 49 · 22 " I</u>	ONG 720 29 13	" LMK GPS: (Unit ID)
BANK: LT RT H	ead TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: Single	DIMENSIONS: SUBMERGED: Diameter: (in) Partially Fully
Substantial Other:	Open channel	☐ Concrete ⊠ Earthen ☐ Other:	Trapezoid   D     Parabolic   W     Other:   0	Depth: $3C(in)$ Width (Top): $5H(in)$ (Bottom): (in)
CONDITION: None Chip/Cracked	ODOR: NO Gas Sewage	<b>DEPOSITS/STAINS:</b> None Oily Flow Line	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: D None         Brown       Orange         Other:
Corrosion	Sulfide	☐ Paint ☐ Other:	Inhibited Excessive Other:	POOL QUALITY:       Image: Colors       Oils         Good       Odors       Colors       Oils         Suds       Algae       Floatables         Other:       Image: Colors       Other
FLOWING TU ONLY FL OTHER CONCERNS:	DLOR: Clean IRBIDITY: None OATABLES: None Excess Trash (paper/plan Needs Regular Mainten	t Brown Grey	Yellow  Green    Cloudy  Opaque    etc.)  Petroleum    g (bulk)  Excessive	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation
FLOWING TU ONLY FL OTHER CONCERNS: POTENTIAL REST	DLOR: Clean CONTABLES: None OATABLES: None Excess Trash (paper/plant) Needs Regular Mainten CORATION CANDIDATE	t Brown Grey Brown Grey Slight Cloudiness Scwage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation
FLOWING     TL       ONLY     FL       OTHER     E       CONCERNS:     E       POTENTIAL REST     E       Ino     If was for devilable	DLOR: Clean IRBIDITY: None OATABLES: None Excess Trash (paper/plant) Needs Regular Mainten CORATION CANDIDATE	t Brown Grey Brown Grey Slight Cloudiness Scwage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation Storm water retrofit	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       Other:	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation
FLOWING     TL       ONLY     FL       OTHER     Image: Concerns:       OTHER     Image: Concerns:       POTENTIAL REST       M no       If yes for daylighti       Length of vegetative	DLOR: Clear ORATABLES: None OATABLES: None Excess Trash (paper/pla Needs Regular Mainten CORATION CANDIDATE ing: cover from outfall:	t Brown Grey Brown Grey Slight Cloudiness Scwage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation Storm water retrofit ft Type of existing ft Type of e	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       Stream daylighting	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation         Local stream repair/outfall stabilization         Slope:      °
FLOWING     FL       ONLY     FL       ONLY     FL       OTHER     Inc       CONCERNS:     Inc       POTENTIAL REST     Inc       Image: Specific stress     Inc	DLOR: Clear CRBIDITY: None OATABLES: None Excess Trash (paper/pla Needs Regular Mainten CORATION CANDIDATE ing: cover from outfall: ter: atly controlled?	t Brown Grey Brown Grey Slight Cloudiness Sewage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation Storm water retrofit ft Type of exist Land Use de	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       String vegetation:	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation         Local stream repair/outfall stabilization         Slope:      °
FLOWING       TU         FLOWING       TU         ONLY       FL         OTHER       Image: Concerns:         OTHER       Image: Concerns:         POTENTIAL REST       Image: Concerns:         Image: Concerns:       Image: Concerns:         POTENTIAL REST       Image: Concerns:         Image: Concerns:       Image:	DLOR:        Cleat         /RBIDITY:        None         /OATABLES:        None         /Excess Trash (paper/plate       None         /REDITY:        None         /ORATABLES:        None         /RECESS Trash (paper/plate       Needs Regular Mainten         /RORATION CANDIDATE	t Brown Grey Brown Grey Slight Cloudiness Cloud Schwage (toilet paper, Scwage (toilet paper, Dumpin ance Bank Er Bank Er Discharge investigation Storm water retrofit Land Use de Area availab inct color and/or a discharge is significant normal flow in receiving o be having a am.	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       Stream daylighting         isting vegetation:       Stream daylighting         escription:       Stream daylighting         isting vegetation:       Stream daylighting         discharge; flow mostly clear and our       Stream daylighting out         discharge; flow mostly clear and our       Stream daylighting out         ing has a color and/or odor, the am       Stream daylighting out         ing has a color and/or odor, the am       Stream daylighting out         ing has a color and/or odor, the am       Stream daylighting out         ing has a color and/or odor, the am       Stream daylighting out         ing has a color and/or odor, the am       Stream daylighting out         ing has a color and/or odor, the stream daylighting is very small compared to the stream daylightis very small compared to the stream daylightis	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation
FLOWING     TL       FLOWING     TL       ONLY     FL       OTHER     Concerns:       OTHER     Difference       POTENTIAL REST       Diff yes for daylighti       Length of vegetative       If yes for stormwate       is stormwater curren       Diff yes for stormwate       Stormwater curren       DUTFALL       Severity:       Circle #)	DLOR:       Clea         (RBIDITY:       None         OATABLES:       None         Excess Trash (paper/pla         Needs Regular Mainten         'ORATION CANDIDATE         'or or from outfall:         'ing:         e cover from outfall:         ter:         'tly controlled?         Not investigated         Heavy discharge with a dististrong smell. The amount of compared to the amount of stream; discharge appears t significant impact downstreat         5	t Brown Grey Brown Grey Slight Cloudiness Sewage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation Storm water retrofit C Discharge investigation to ft Type of exist Land Use de Area availab inct color and/or a idischarge is significant normal flow in receiving o be having a am. 4	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       Stream daylighting         sting vegetation:       Stream daylighting         escription:       Stream daylighting         of the stream daylighting       Stream daylighting	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation
FLOWING       FL         ONLY       FL         ONLY       FL         OTHER       FL         ONLY       FL         ONCERNS:       FL         POTENTIAL REST       FL         Ø no       Hermitian	DLOR:       Clean         IRBIDITY:       None         OATABLES:       None         Excess Trash (paper/pla         Needs Regular Mainten         PORATION CANDIDATE         ing:         cover from outfall:         ter:         ttly controlled?         Not investigated         Heavy discharge with a dististrong smell. The amount of stream; discharge appears t significant impact downstreat         5	t Brown Grey Brown Grey Slight Cloudiness Sewage (toilet paper, stic bags) Dumpin ance Bank Er Discharge investigation Storm water retrofit ft Type of exis Land Use de Area availab inct color and/or a idischarge is significant normal flow in receiving o be having a m. 4	Yellow       Green         Cloudy       Opaque         etc.)       Petroleum         g (bulk)       Excessive         osion       Other:         on       Stream daylighting         Other:       Stream daylighting         sting vegetation:	Orange       Red       Other:         (oil sheen)       Other:         Sedimentation         Local stream repair/outfall stabilization         Slope:

8	Stream	n Cros	ssing

						Stre	am Cros	ssing	SC
WATERSHED	)/SUBSHED: tucher B	K	~	DATE	E: 7/	1 106	ASSE	SSED BY:	DE
URVEY REA	асн ID: +13-01	TIME: 3 : 70	AMPM	Рнот	ro ID:	(Camera-Pi	c #)	/#	39
SITE ID: (Cor	ndition-#) SC- <u>()</u> LAT	11º 40.7,	5_" LONG 7	202	19.1	互" L	MK	GPS	<b>S</b> (Unit ID)
	www.www.	·····						···· I	
	ad Crossing 🔲 Railroad Crossin	ng 🗌 Manmade I	Dam 🗌 Beave	r Dam	1 🗌 G	eological For	mation 🗌	Other:	
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other: Abot with Atch	# BARRELS: Single Double Triple Other:	MATERIAL:	ALIGNMENT: Flow-aligned Not flow-aligned Do not know		DIMENSIONS: (if variable, sketch) Barrel diameter: <u>5</u> (ft) Height: <u>MA</u> (ft)		rariable, sketch) <u>5</u> (ft) <u>NA</u> (ft) <u>7</u> (1)	
CROSSINGS ONLY	CROSSINGS ONLY Cracking/chipping/corrosion Condition Cracking/chipping/corrosion Failing emban Other (describe):				CULVEI Flat Sligh Obvi	<b>RT SLOPE:</b> t $(2^{\circ} - 5^{0})$ ous $(>5^{\circ})$	Roadway	ength: Width: elevation:	(ft) (ft)
							I		
POTENTIAL	RESTORATION CANDIDATE	Fish barrier re	moval 🗌 Culve repair 🗌 Other	ert repa r:	air/repla	acement 🔲 1	Upstream st	torage retr	ofit
IS SC ACTIN	G AS GRADE CONTROL		es 🗌 Unkr	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:	[		BLOC	KAGE SEVEI	RITY: (circ	le #)	
If yes for fish barrier	CAUSE: Drop too high Water Drop too shallow Water Drop	vn op: (in) epth: (in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	s a dam Brd orde ocking th ent of no fish resent.	a dam or order or ing the of or partial blockage on a significant reach of stream, of or partial blockage that may interfere with the migration of anadromous fish. A tempor beaver di the very l very little above it; as waterf		A tempora beaver dar the very he very little v above it; n as waterfa	ry barrier such as a n or a blockage at ead of a stream with iable fish habitat atural barriers such lls.	
	V Other: TVODDVAIN	ENCROAL HY	MENT 5		4	3		2	1
NOTES/SKET	rch:		N SC-OZ I ATE	Maga, La estador - so -	DEC	Ch. CA C-01	NE		

undi,

					Stre	am Cros	ssing SC
WATERSHED	SUBSHED: LAWTER	Tucken-		DATE 7	11/08	Asse	SSED BV. V.R
URVEY REA	CHID: TBOI	TIME: 3:20	AM/PM	Рното ID	: (Camera-Pie	; #)	/#
SITE ID: (Con	dition-#) SC-	41.49.2	4" LONG FT	- 29.	14 " L	MK	GPS (Unit ID)
TYPE: Ros	nd Crossing KRailroad Cross	sing 🔲 Manmade	Dam 🗌 Beaver	Dam 🗌	Geological For	nation 🗌	Other:
FOR ROAD/	SHAPE: Arch Bottomless Box Elliptical Circular	# BARRELS:	MATERIAL: Concrete Metal	ALIGN	NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	IONS: (if variable, sketch) ameter: (ft) Height: (ft)
CROSSINGS			store			Culvert le	ength (ft)
ONLY	CONDITION: (Evidence of)         VLY         Cracking/chipping/corrosion         Sediment deposition			CULVERT SLOPE: $\Box$ Flat Slight (2° – 5°)		Poodway	Width:(ft)
	Uther ( <i>describe</i> ):				110 us (* 5 )	Koadway	
POTENTIAL I	RESTORATION CANDIDATE	🔀 Fish barrier re	emoval 🗌 Culver	rt repair/rer	lacement 🔲 l	Upstream s	torage retrofit
no		Local stream	repair 🔲 Other:	: 1		•	~
IS SC ACTING	G AS GRADE CONTROL		es 🗌 Unkno	own			
	EXTENT OF PHYSICAL BL	OCKAGE:		BLO	CKAGE SEVER	RITY: (circ	le #)
If yes for fish barrier	CAUSE: Drop too high Water I Flow too shallow Water I	Drop: <u>4</u> (in) Depth: (in)	A structure such as road culvert on a 3r greater stream bloc upstream movemer anadromous fish; nu passage device pre	a dam or d order or king the nt of o fish sent.	A total fish blocka tributary that wou significant reach o or partial blockag interfere with the anadromous fish.	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
)	U Other:		5	(4	3		2 1
	P. Ilsi	ALWAY					
	- T	yours					
	f glove ave			-	÷	11	
)					Repor	TED TO AU	THORITIES TYES NO

					Impacted Bu	uffer	IB
	Ucker Bar			D			1.0
IDVEV REACH: TDOL	nker pirt	TIME: 7	· 011	DATE: (	$\underline{/}$ \underline	SESSED I	BY: KIS
SITE D: (Condition=#)	THE YIOUG	$\frac{11\text{ME}}{127111}$	<u> </u>		(Camera-Pic #)		( <u>Init ID</u> )
$\mathbf{B}_{\mathbf{R}}$	$\frac{RT}{LAT} = \frac{1}{2}$		$\frac{10 \text{NG}}{2} \frac{12}{2} \frac{21}{2}$	<u>- 16 "</u>		- 015.	(Onit ID)
		1	LONG				
IMPACTED BANK: REAL	SON INADEQUATE:	Lack of Recently	vegetation 🗶 To planted 🛛 Oth	o narrow 🗖 er: Bridge	Widespread invasive	plants	namall
LAND USE: Priv	vate Institutional	Golf Cou	rse Park Of	ther Public		10.1	
(Facing downstream) LT Bank							
DOMINANT I	Paved Bare groups	L Turf/lay		Shrub/sorub	Troop Other		
LAND COVER: LT Bank							
RT Bank						ROAN	SWAY
INVASIVE PLANTS:	] None 🛛 🗌 Rare	□ P	artial coverage	🔲 Extensi	ive coverage 🛛 🕅 unl	known	***
STREAM SHADE PROVIDED?	None Part	ial 🗌	Full WETL	ands Prese	ит? Дио □ У	les □l	Jnknown
POTENTIAL RESTORATION CA	ANDIDATE Activ	ve reforestati er:	on Greenway d	lesign 🕅 Na	atural regeneration	] Invasive	es removal
<b>RESTORABLE AREA</b>			Impacted area on pu	blic land Imc	acted area on either	Impacted	area on private
LT BANK RT Length (ft): $\underline{40}$ $\underline{30}$	T     REFOREST       ic     POTENTIAL       ic     (Circle #)	ATION L:	where the riparian arr not appear to be used specific purpose; plea area available for pla	a does pub d for any pre- nty of pur nting plar	vilic or private land that is sently used for a specific pose; available area for nting adequate	land whe encroach feature si available	re road; building ment or other gnificantly limits area for planting
			5	4	3	2	$\overline{1}$
POTENTIAL CONFLICTS WITH	REFORESTATION	over 🗌 Wi	despread invasive /ere animal impact	plants 🔲 H s (deer, beave	Potential contaminatio er)  Other:	n 🗌 La	ack of sun
Notes: left bank c yo right bank	ft upstream to has brid	stred tas ge ab	concrete a atment,	ty g. butuli ho po	vass/scrub t_ approx ssible rest	15-Ft orati	- long
On the second	Surg The work	arass Survo					

Reach Level Assessment RCH

SURVEY REACH	ID: <u>B-02</u> WTRSHI	/SUBSHD:	THERE BK	Date: 7/	Asses	SSED BY:
START TIM	IE::AM/PM	LMK:	END TIME:	:AM/PM	LMK:	GPS ID:
LATMI º MQ ·	<u>15</u> " Long <u>72</u> °_	<u> 19.    "</u>	Lat''	" LONG	°ł	''
<b>DESCRIPTION:</b>			DESCRIPTION:			
RAIN IN LAST 24 HO		Steady rain	DECENT CONDITIONS			
		Trace		Trace	☐ Steady rain ☐ Overcast	Intermittent     Partly cloudy
SURROUNDING LAN	DUSE:  Industrial Golf course	□ Commercial □ Park	□ Urban/Residential □ Crop	□ Suburban/Res □ □ Pasture □	Forested Other:	
Averagi	E CONDITIONS (check app	olicable)	REACH	SKETCH AND SITE	IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	© 0-25% □ □25-50 %	] 50%-75% □ 75-100%	Simple planar sketch o within the survey red features	of survey reach. Track ach (OT, ER, IB,SC, UT deemed appropriate. In	locations and L T, TR, MI) as we	Ds for all site impacts ell as any additional
<b>DOMINANT SUBSTR</b> Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5)	ATE slick)	(2.5 –10") r (>10") ck			uicuie un ecnoi	n 0j jiow
WATER CLARITY	☐ Clear □Turbid (susp aturally colored) □ Opac dyes)	pended matter) que (milky)				
AQUATIC PLANTS IN STREAM	Attached: 🖾 none 🗆 Floating: 🖾 none 🗆 :	some □ lots some □ lots				
Wildlife in or Around Stream	(Evidence of) □ Fish □ Beaver □ Snails □ Other:	Deer		11		
STREAM SHADING (water surface)	Mostly shaded (≥75% Halfway (≥50%) □ Partially shaded (≥25 □ Unshaded (< 25%)	% coverage) % )				
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading	Bed scour Bank failure Bank scour Slope failure				
CHANNEL DIMENSIONS (FACING DOWNSTREAM)	Height: LT bank RT bank Width: Bottom	$\frac{2}{2}  (ft)$ $\frac{2}{5}  (ft)$ $\frac{15}{2}  (ft)$		re verti innerna de que i i mais innerna de anos		
		<u>(</u> tt)	DEC HADRED WAY	Sc. Survey and Handley		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream.     Diffic wetla       Access requires tree removal or impact to landscaped areas.     strean       Stockpile areas     and/o       Stockpile areas.     speci equip       4     3	rult. Must cross nd, steep slope, or tive areas to get to m. Few areas to pile available r located a great noce from stream. alized heavy ment required.			-	
NOTES: (biggest prob	lem you see in survey reach)	A		12 AT		
DI	NOT W	AK I	FACH.	-174FC		ITED
	-125-			Reportei	D TO AUTHORI	TIES YES NO
1	1 222					

Greater than 70% of substrate	40-70% mix of stable babitat: well	Iviarginai	Poor		
Greater than 70% of substrate	40-70% mix of stable babitat: woll				
fish cover; mix of snags, submediation and logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
Left Bank 10 9	8 7 6	5 4 3	2 1 0		
Right Bank 10 9	8 7 6	5 4 3	2 1 0		
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
Left Bank 10 9	8 7 6	5 4 3	2 1 0		
Right Bank 10 9	8 7 6	5 4 3	2 1 0		
High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
OVER	ALL BUFFER AND FLOODPLAI	N CONDITION			
Optimal	Suboptimal	Marginal	Poor		
Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
Left Bank 10 9	8 7 6	5 4 3	2 1 0		
Right Bank 10 9	8 7 6	5 4 3	2 1 0		
Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
20 19 18 17 16	( 15 )14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	N. Consul				
	colonization potential (i.e., logs/snags that are not new fall and not transient). 20 19 18 17 16 More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. Left Bank 10 9 Right Bank 10 9 High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched. 20 19 18 17 16 <b>Overmal</b> Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone. Left Bank 10 9 Right Bank 10	colonization potential (i.e., logs/snags that are not new fall and not transient).not yet prepared for colonization (may rate at high end of scale).20191817161514131211More than 90% of the streambank surfaces and immediate priarian zore covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; allmost all plants allowed to grow naturally.70-90% of the streambank surfaces covered by native vegetation, including trepsented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.Left Bank109876Banks stable; evidence of erosion or bank faiture absent or minimal; little potential for future problems. <5% of bank affected.	colonization potential (i.e., logistrags) that are <u>not</u> new fail and <u>pot</u> transient).       not yet prepared for colonization, may rate at high end of scale).       cisturbed or removed.         20       19       18       17       16       15       14       13       12       11       10       9       8       7       6         More than 90% of the streambank surfaces and immediate iparian zone covered by native vegetation, location through prazing or mowing minimator not evident junctial plants allowed to grow naturally.       70-90% of the streambank surfaces covered by native vegetation, location to any great extent; more than one-half of the polensial plant stubble height remaining.       50-70% of the streambank surfaces covered by vegetation of suntial and sold plants allowed to grow naturally.       50-70% of the streambank surfaces covered by vegetation 		

	Reach Level Assessment RCH
SURVEY REACH ID: 78-63 WTRSHD/SUBSHD:	DATE: 71108 ASSESSED BY:
START         TIME: 94:00 AM/PM         LMK:           LAT         10.44:51"         LONG 72.029 '14"	$END$ TIME: $1/2$ : $rm$ AM/PM       LMK:       GPS ID: $LAT_1 \circ 46' \cdot 44'''$ $Long - 70^\circ 72' \cdot 76'''$ $etrex$
DESCRIPTION: JUD OF REG. LU	DESCRIPTION: PLACNY RD
RAIN IN LAST 24 HOURS       Heavy rain       Steady rain         None       Intermittent       Trace	PRESENT CONDITIONS       Image: Heavy rain       Steady rain       Image: Image: Image: Heavy rain         Image:
SURROUNDING LAND USE:  Industrial Golf course Park	□ Urban/Residential Suburban/Res □ Forested □ Institutional □ Crop □ Pasture □ Other:
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
Base Flow as %         □ 0-25%         □ 50%-75%           Channel Width         □ 25-50 %         □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTRATE         Silt/clay (fine or slick)         Sand (gritty)         Gravel (0.1-2.5")         Bed rock	200 For Forts PIRELINE
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)	15 Wearea/ Mallandia)
AQUATIC PLANTS       Attached: In Stream       Attached: In Stream       Inone       Inon	
WILDLIFE IN OR       (Evidence of)         AROUND STREAM       Image: Construction of the state of	Lenseller V
STREAM SHADING       Image: Mostly shaded (≥75% coverage)         (water surface)       Image: Halfway (≥50%)         Image: Water surface       Image: Water surface         Im	13-C
CHANNEL     Owncutting     Bed scour       DYNAMICS     Widening     Bank failure       Headcutting     Bank scour       Slope failure	C contractor States
Unknown Sed. deposition Channelized	TE 10 1 X X
CHANNEL Height: LT bank (ft)	
(FACING Width: Bottom (ft)	
$\frac{\text{Top}}{\text{Pr}}$	and a state of the
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel         Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas.         Difficult. Must cross wetland, steep slope, or sensitive areas to get to stockpile available and/or located a great	Theored)
equipment using existing roads or trails.     Stockpile areas small or distant from stream.     distance from stream.       5     4     3     2	138.472 Ax Line ha
Notes: (biggest problem you see in survey reach)	
SMARTED HE EJENE	
	<b>REPORTED TO AUTHORITIES</b> YES NO

	OVERALL STREAM CONDITION									
\	Optimal	Suboptimal	Marginal	Poor						
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.						
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0						
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.						
	Left Bank 10 9	8 7 6	3 4 3	2 1 0						
	Right Bank 10 9	8 7 6	5 4 3	2 1 0						
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.						
	Left Bank 10 9	8 7 6	5 4 3	2 1 0						
	Right Bank 10 9	8 7 6	5 4 3	2 1 0						
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.						
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0						
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION							
	Optimal	Suboptimal	Marginal	Poor						
Vegetated Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.						
	Left Bank 10 9	8 7 6	<u>5</u> 4 3	2 1 0						
~	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0						
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land						
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0						
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water						
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0						
Floodplain Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function						
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0						
Sub Total In-str	Sub Total In-stream:      /80       +       Buffer/Floodplain:      /80       =       Total Survey Reach      /160									

Storm Water Outfalls									
WATERSHED/SUBSHE	»: Tucker		DATE: 7/1/0	DATE: 7/1/08 ASSESSED BY: KMB					
SURVEY REACH ID: -	TB'03 :	FIME: 0: 00 ADA/PM	<b>Рното ID:</b> (Camera-P	Pic #) /#	(=				
SITE ID (Condition-#): O	T- <u>01</u> ]	LAT 41. 48. 44	"LONG 72º 29' 7	" LMK	GPS: (Unit ID)				
	1								
BANK: LT X RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete XM PVC/Plastic Br Other:	SHAPE: X Single etal Circular Double ick Elliptical Triple Other:	DIMENSIONS: Diameter: <u>15 (in</u> )	SUBMERGED:				
Substantial Other:	Open channel	Concrete Eart	hen Trapezoid I Parabolic V Other:	Depth:(in) Width (Top):(in) " (Bottom):(in)	NOT APOSICABLE				
CONDITION:     ODOR: No       None     Gas       Chip/Cracked     Sewage       Peeling Paint     Rancid/Sour		DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	DWTH: 🛃 None ge 🗌 Green				
Corrosion	Sulfide	Paint Other:	Excessive     Other:	POOL QUALITY:       Image: No pool         Good       Odors       Colors       Oils         Suds       Algae       Floatables         Other:       Other:       Image: No pool					
For     Color:       FLOWING     TURBID       ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need	ITY: ANC BLES: MO SSS Trash (paper/j ls Regular Maint	ear Brown Grey ne Slight Cloudiness ne Sewage (foilet pap plastic bags) Dum enance Bank	Yellow     Green       Cloudy     Opaque       per, etc.)     Petroleum       uping (bulk)     Excessive       k Erosion     Other:	Orange     Red     O       (oil sheen)     C       Sedimentation	ther:				
POTENTIAL RESTORA	FION CANDIDA	TE Discharge investig	gation  Stream daylighting it  Other:	Local stream repair/	outfall stabilization				
If yes for daylighting: Length of vegetative cove	r from outfall: _	ft Type of	existing vegetation:	Slope:	o				
If yes for stormwater: Is stormwater currently co	ontrolled? investigated	Land Us Area ava	e description:						
OUTFALL     Hea       SEVERITY:     strong       (circle #)     streng	DUTFALL       Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Sr		mall discharge; flow mostly clear and c scharge has a color and/or odor, the ar scharge is very small compared to the w and any impact appears to be minor	nall discharge; flow mostly clear and odorless. If the charge has a color and/or odor, the amount of scharge is very small compared to the stream's base w and any impact appears to be minor / localized. Outfall does not have dry weath discharge; staining; or appearation of causing any erosion problem					
SKETCH/NOTES	5	4	3	2					
SKETCH/NOTES:									
)			J	REPORTED TO AUTHORI	fies: 🗌 yes 🗌 no				

				In	pacted B	uffer IB
WATERSHED/SUBSHED: TUCKOr			DATE:	7/1	108 AS	SESSED BY. KMR
IRVEY REACH: TZ 03	TIME: G	: 45 AM/PM	Рното	<b>DID</b> : (Cam	era-Pic #)	/#
SITE ID: (Condition-#) START LAT 4 04	5.46"	ONC 77 079	110 11	I M	<u> </u>	GPS: (Unit ID)
$\mathbb{B}_{-}(\mathcal{O})^{3} = \mathbb{E}_{\mathrm{ND}} = \mathbb{E}_{\mathrm{AT}} - \mathbb{E}_{\mathrm{AT}} - \mathbb{E}_{\mathrm{AT}}$	<u> </u>	ONG 77 0 79	1-7 11			
	<u> </u>	LONG <u>[C</u> <u>V</u>	(	LIVI	<u> </u>	
IMPACTED BANK:     REASON INADEQUATE:       LT     RT     Both	Lack of	vegetation 🛛 Too planted 🗌 Oth	o narrow er:	☐ Widesp	read invasive	plants
LAND USE: Private Institutional	Golf Cou	rse Park Ot	her Publi	ic		
(Facing downstream) LT Bank	Ľ			: Unk	nonh	
RT Bank 🔀 🗌		]		:		
DOMINANT Paved Bare grour	nd Turf/lav	vn Tall grass	Shrub/so	crub Tree	s Other	r
			r R			ATV trail
	¥					•
INVASIVE PLANTS:	P	artial coverage		tensive cove	rage 🗌 un	lknown
STREAM SHADE PROVIDED? None 🕅 Par	rtial	Full WETL	ands Pr	esent? 🛛	No 🗌	Yes 🔲 Unknown
		<b>1</b>				
no	ive reforestati ner:	on []Greenway d	lesign []	€Natural re	generation L	Invasives removal
RESTORABLE AREA		Impacted area on put	blic land	Impacted are	a on either	Impacted area on private
LT BANK RT REFORES	TATION	where the riparian are	ea does	public or prive	ate land that is	land where road; building
Length (ft): POTENTIA	AL:	specific purpose; pler	nty of	purpose; ava	lable area for	feature significantly limits
Vidth (ft):		area available for pla	nting	planting adec	uate	available area for planting
		5	4		3	2 1
<b>POTENTIAL CONFLICTS WITH REFORESTATION</b>	⊂ Wi cover □ Sev	despread invasive	plants s (deer b	Potential	contaminatio	on 🔲 Lack of sun
NOTES:			3 (ucci, 0			
NOTES.						
)						
• <u>-</u>						

							Impact	ed Bu	uffer	IB
WATERSHED/SUBSHED: TUCK	er				DATE:	7/	1 / 08	Ass	SESSED I	BY: KMB
JRVEY REACH: TB03	Ти	ме: <u> </u>	: 29 A)/PI	M	Рнотс	<b>DID:</b> (C	Camera-Pi	ic #)		#0,7
SITE ID: (Condition-#) START	LAT 41 048.4	19 " I	LONG 72°	29	13"	Ι	LMK		GPS:	(Unit ID)
<b>IB-02.</b> END	LAT	" I	LONG°	1	111	1				
Impacted Bank:         Reason I           It         RT         Both	NADEQUATE: 🕅	Lack of Recently	vegetation 🔀	Too Othe	narrow r:	🗌 Wic	lespread in	vasive	plants	
LAND USE: Private	Institutional G	olf Cou	rse Park	Oth	er Publi	с	1			
(Facing downstream) LT Bank				]		: Atv	trail			
DOMINANT Paved	Bare ground	L Turf/lay	J ∟ vn Tallør	1	Shrub/sc	: Trub T	rees	Other		··· ··································
LAND COVER: LT Bank RT Bank		Z Z Z		] ]		/100 1			leaf	
INVASIVE PLANTS:	e 🗌 Rare	□ P	artial coverage	;e	🗌 Ext	ensive c	overage	🗹 unl	known	
STREAM SHADE PROVIDED?	one Partial		Full W	/ETLA	NDS PR	ESENT?	No 🖸 No	Y	/es 🔲 l	Jnknown
POTENTIAL RESTORATION CANDIN	ATE Active ret	forestati	ion 💭 Greenv	way de	sign [	] Natura	il regenerat	ion 🗌	] Invasiv	es removal
<b>RESTORABLE AREA</b>			Impacted area	on publ	ic land	Impacte	d area on eith	er	Impacted	area on private
LT BANK RT Length (ft):	<b>REFORESTATIO</b> <b>POTENTIAL:</b> ( <i>Circle</i> #)	ON	where the ripari not appear to b specific purpose area available f	rian area be used se; plent for plant	a does for any y of ting	public or presently purpose	private land t used for a sp available are	that is pecific a for	land whe encroach feature si available	re road; building ment or other gnificantly limits area for planting
Vidth (ft):			5		4				2 valiable	1
POTENTIAL CONFLICTS WITH REFO	PRESTATION ng impervious cover	☐ Wi □ Sev	despread inva vere animal im	isive p npacts	lants (deer, b	Poter eaver)	ntial contar	ninatio	n 🗌 L	ack of sun
Notes: 2 sections	Stream Stream PATH Inhurdered and	F. F.	< 150 f erns	Ft.						
	Lect bav	ik								

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WATERSHED/SUBSHED: TUCKe	x		DATE: 7 / ( / 0)	S ASSESSED BY: KMR
JRVEY REACH: TROZ	TIME: 4	7:22 ATTYPM	PHOTO ID: (Camera-P	Pic #) /# <
SITE ID: (Condition-#) START LA	T 41 048,50"	$Long 17 \circ 29$		GPS: (Unit ID)
IB-01	T <sup>°</sup> ' ''	LONG °	' '' LMK	
IMPACTED BANK:     REASON INA       LT     Image: Comparison of the second sec	ADEQUATE: Lack c	f vegetation 🔀 To ly planted 🗌 Oth	o narrow 🔊 Widespread in ner:	nvasive plants
LAND USE: Private I	nstitutional Golf Co	urse Park O	ther Public	
(Facing downstream) LT Bank			AP: TOVEST	
DOMINANT Paved	Bare ground Turf/1		Shruh/comh Trocc	Other
LAND COVER: LT Bank				Other □·
RT Bank				
INVASIVE PLANTS:		Partial coverage	Extensive coverage	<b>X</b> )unknown
STREAM SHADE PROVIDED?	e 🔀 Partial [	Full WETL	ands Present? 🕅 No	Yes Unknown
POTENTIAL RESTORATION CANDIDA	TE 🗖 Active reforests	tion Creenway	danian 🗔 Natural reasonar	
	Other:			
RESTORABLE AREA		Imposted eres on pu	blip land have also a set of	
LT BANK RT	REFORESTATION	where the riparian ar	rea does public or private land	that is land where road; building
Length (ft): <b>50</b>	<b>POTENTIAL:</b>	not appear to be use specific purpose: ple	ed for any presently used for a s	specific encroachment or other rea for feature significantly limits
$\gamma = \frac{1}{2}$	(Circle #)	area available for pla	anting planting adequate	available area for planting
		5	4 3	2 1
POTENTIAL CONFLICTS WITH REFOR	ESTATION	videspread invasive	plants 🔲 Potential conta ts (deer, beaver) 🕅 Other	mination 🗌 Lack of sun
NOTES:				
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1 2 2	· /			
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and the second				

				S	evere Ba	ank Ero	sion	ER
WATERSHED/SUBS	SHED: Tucker			DATE: <u>7</u> / 1	108	ASSESS	ED BY:	KMR
SURVEY REACH:	TBOZ	TIME: 9 : 0	25 AMYPM	Рното ID (Cam	IERA-PIC #	t):	/#	
SITE ID: (Condition-	$= \frac{1}{START LAT}$	11048.51.	' LONG 12º 2	9.13"	LMK		GPS: (1	Unit ID)
ER- <u>0</u>	END LAT	1 . 48.50.	' Long <u>72° 3</u>	7.12"	LMK			
PROCESS:	Currently unknown	BANK OF CO LOCATION: DIMENSIONS	NCERN: LLT	RT Both ( <i>l</i> Straight section	ooking dow	<i>enstream)</i> lope/valle	y wall [	] Other:
Headcutting	Bank scour	Length (if no C	(PS) LTf	and/or $RT_{12}$	<u>5_ft</u>	Botton	n width	<u>5</u> ft
Aggrading	Slope failure	Bank Angle		and/or RI	ft	Top wi	idth	
Sed. deposition		Bank Angle		and/or R1		Wettec	l Width	<u></u> ft
LAND OWNERSHIP	Private Public	C Unknown	LAND COVER	Forest F	ield/Ag [	Develo	oped:	
POTENTIAL RESTO	DRATION CANDIDATE	E: Grade	control	Bank stabilizatior	1			
THREAT TO PROP	ERTY/INFRASTRUCT	URE: 🗌 No	Yes (Descrit	e): Shed				
EXISTING RIPARIA	N WIDTH:	□ ≤25 ft	⊠ 25 - 50 ft [	] 50-75ft  [] 75∙	-100ft [	>100ft		
EROSION SEVERITY(circle#) Channelized= 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure Active downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to infrastructure Active downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure Active downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure							
)	5	C	3		2		1	
ACCESS:	ownership, sufficient room t materials, easy stream char heavy equipment using exis trails.	n public o stockpile nnel access for ting roads or	Fair access: Foreste adjacent to stream. A removal or impact to Stockpile areas small	ir access: Forested or developed area jacent to stream. Access requires tree noval or impact to landscaped areas. ockpile areas small or distant from stream.				and, steep slope or eam. Minimal cated a great ecialized heavy
NOTES/CROSS SEC	TION SKETCH.	4		)	2		1	
I 25 €	tion Sketch:	ections	Crussien Constitut	Stream rung	REPORTEI	D TO AUTH	IORITIES	T YES T No.

Stream Crossing

		Parts			<b>n</b> +		L		
WATERSHED	WATERSHED/SUBSHED: THOUGH IN K. DATE: 1/ 08 ASSESSED BY: KMS								
URVEY REA	<u>сн ID: 7505</u>	TIME: :	_AM/PM	PHOTO I	D: (Camera-Pic	: #)	<u>/# 4</u>	0	
SITE ID: (Con	dition-#) SC- <u>O(</u> LAT	<u>41°48'4'</u>	_ LONG	2º_19	<u>'8</u> " Li	MK	GPS (Unit	( <i>ID</i> )	
TYPE: 🗌 Roa	d Crossing 🔲 Railroad Crossi	ng 🕅 Manmade I	Dam 🔲 Beav	er Dam	Geological For	nation	Other:		
For Road/ Railroad Crossings	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:		GNMENT: Flow-aligned Jot flow-aligned Do not know	DIMENSI Barrel diar	ONS: (if variable meter: Height:	e, sketch) (ft) (ft)	
ONLY	Cracking/chipping/corrosion Sediment deposition	n 🗌 Downstrean	n scour hole ankment		Sight $(2^\circ - 5^\circ)$ Divious $(>5^\circ)$	Roadway	Width:	(ft)	
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv repair 🔲 Othe	/ert repair/r er:	replacement 🗌 l	Jpstream sto	orage retrofit		
IS SC ACTING	G AS GRADE CONTROL	🗌 No 🕅 Ye	es 🗌 Unk	nown					
	EXTENT OF PHYSICAL BLO	CKAGE:		BL	OCKAGE SEVER	RITY: (circl	'e #)		
If yes for fish barrier	CAUSE: Drop too high Water D Flow too shallow Water D Other:	vn rop: $\frac{12}{\leq 1}$ (in) epth: $\leq 1$ (in)	A structure such road culvert on a greater stream bl upstream mover anadromous fish, passage device p	as a dam or 3rd order or ocking the lent of no fish present.	A total fish blocka tributary that wou significant reach of or partial blockag interfere with the anadromous fish.	ge on a d isolate a of stream, e that may migration of	A temporary barrie beaver dam or a b the very head of a very little viable fis above it; natural b as waterfalls.	er such as a blockage at stream with sh habitat arriers such	
<u> </u>			5		4 3		2 (1	(י	
NOTES/SKE1	CH:	000 010 - 894	Cascad De De	Q VIder Æ C	rs Sinder blocks				
<b>)</b>									
Ĺ					REPOR	TED TO AUT	HORITIES 🗌 Y	es 🗌 No	

Stream	Crossing

						Stre	am Cros	sing	SC
WATERSHED	SUBSHED: tucker B	rk		DA	TE: <u>7</u>	1 1 08	> Asse	SSED BY:	KMB
URVEY REA	CHID: TBO3	TIME: 9:54	M/PM	Рн	ото ID	: (Camera-Pi	c #)	/# [	1
SITE ID: (Con	dition-#) SC- <u>02</u> LAT	<u>41. 48. 41</u>	1" LONG	<u> 72°</u>	<u> 29 '</u>	<u>7 "</u> L	мк	GPS (	Unit ID)
TYPE: X Roa	ad Crossing 🔲 Railroad Crossin	ng 🗌 Manmade I	Dam 🗌 Be	aver D	am 🗌	Geological For	mation 🗌	Other:	
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIA Concret Metal Other:	L: e	ALIGI X Flo No Do	NMENT: w-aligned t flow-aligned not know	DIMENS	IONS: (if vari imeter: Height:	able, sketch)
CROSSINGS Only	CONDITION: (Evidence of)	n 🗌 Downstrean 🗋 Failing emb	n scour hole ankment		CULV Fla Slig	ERT SLOPE: t ght (2° – 5 <sup>0</sup> ) vious (>5°)	Culvert le	ength: <u>2</u> Width: elevation:	(ft)
							L		
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	repair 🗌 C	ulvert 1 ther:	epair/rep	blacement	Upstream st	torage retrofi	t
IS SC ACTING	G AS GRADE CONTROL	🗶 No 🗌 Ye	es 🗌 U	nknow	'n				
	EXTENT OF PHYSICAL BLO	CKAGE:	·····		BLO	CKAGE SEVEI	RITY: (circ	le #)	
If yes for fish barrier	CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	vn rop: (in) epth: (in)	A structure su road culvert o greater stream upstream mov anadromous f passage device	ch as a c n a 3rd c n blockin rement o ish; no fi ce prese	dam or Irder or g the f sh nt.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish	age on a Ild isolate a of stream, e that may migration of	A temporary b beaver dam o the very head very little viabl above it; natur as waterfalls.	parrier such as a r a blockage at of a stream with le fish habitat ral barriers such
/				5		1 3		2	1
NOTES/SKET	CH:		triam		ρ	HOENIXIS	- T_		
) [						Repor	TED TO AU	THORITIES [	Yes 🗌 No

SURVEY REACH II START TIME LAT 0 06, 0 DESCRIPTION: 7 RAIN IN LAST 24 HOU I NONE SURROUNDING LAND	D: 16:00A WTI :: 10:30 AM/PM 44" LONG 4 how V Ed	RSHD/SUBSHD: LMK: L°_204 '_07_''	END TIME:	DATE: <u>7/</u>	10 Asse	SSED BY:
START     TIME       LAT $\mathcal{M} \circ \mathcal{M} \circ$ T       DESCRIPTION: $\mathcal{M}$ RAIN IN LAST 24 HOU $\Box$ None       SURROUNDING LAND	<u>:: 11:30</u> AM/PM <u>44</u> " LONG <u>4</u> MUAN Ed	LMK: L° 201 ' 07"	END TIME:			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
RAIN IN LAST 24 HOU			LAT <u>U</u> <sup>o</sup> <u>U</u> <sup>g</sup> , DESCRIPTION:	6:36 AM/PM 93" LONG 7 PAND OUN	LMK: 120_791.04 z.c./Rzem	GI
SURROUNDING LAND	URS  Heavy rain Intermittent	□ Steady rain □ Trace	PRESENT CONDITIONS	□ Heavy rain □ Trace	☐ Steady rain □ Overcast	☐ Intermitte
	USE:  Industrial Golf cour	□ Commercial se □ Park	Urban/Residential	Suburban/Res	□ Forested □ Other:	□ Institution
AVERAGE	CONDITIONS (chec	k applicable)	REACH	SKETCH AND SI	FE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% 🕅 75-100%	Simple planar sketch within the survey re features	of survey reach. Tra each (OT, ER, IB,SC, deemed appropriate.	ck locations and 1 UT, TR, MI) as w Indicate directio	Ds for all site in ell as any additi on of flow
DOMINANT SUBSTRA Silt/clay (fine or s Sand (gritty) Gravel (0.1-2.5'	ATE dick) □ Co □ Bo ') □ Bea	bble (2.5 –10") ulder (>10") 1 rock				
WATER CLARITY	KClear □Turbid turally colored) □ ( lyes)	(suspended matter) Dpaque (milky)				
AQUATIC PLANTS IN STREAM	Attached: 🗆 none Floating: 🔀 none	□ some ⊠ lots □ some □ lots		Pond.		
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish ⊠ Beave □ Snails □ Other:	r 🗆 Deer				
STREAM SHADING (water surface)	Mostly shaded (≥ Halfway (≥50%) Partially shaded Unshaded (< 25%	≥75% coverage) (≥25% ) %)	\ \	Beaver d	laun	
CHANNEL DYNAMICS	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour				
Unknown	Sed. deposition	Channelized			Spercie	£ S <sub>e</sub>
CHANNEL DIMENSIONS	Height: LT bank RT bank	$\frac{2}{2}$ (ft)			inwo m 4	aching
DOWNSTREAM)	Width: Bottom	(ft)				
Rı	TOP	(TT)		and the second s		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas.	<ul> <li>Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great</li> </ul>	a manufacture		-56 F/	Man Calendary and Alexandra Contractor -
equipment using existing roads or trails.	stream.	uistance from stream. Specialized heavy equipment required.	KNOWK K	and a stand of the	1 to service and the service of the	gan 1 - a Faran 16 - a ann 16 19 1 - 11 - 11
Notes: (biggest proble	em you see in survey re	each)	1	·····		

Upullia		A	The second secon
	Suboptiniai	Marginal	Poor
Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank 10 9	8 7 6	5 4 3	2 1 0
Right Bank 10 9	8 7 6	5 4 3	2 1 0
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
Left Bank 10 9	8 7 6	5 4 3	2 1 0
Right Bank 10 9	8 7 6	5 4 3	2 1 0
High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Over	ALL BUFFER AND FLOODPLA	IN CONDITION	
Optimal	Suboptimal	Marginal	Poor
Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
Left Bank 10 9	8 7 6	5 4 3	2 1 0
Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
	Greater than 10 / 9 or substrate         favorable for epifaunal colonization and         fish cover, mix of snags, submerged         logs, undercut banks, cobble or other         stable habitat and at stage to allow full         colonization potential (i.e., logs/snags         that are not new fall and not transient).         20       19         18       17         16         More than 90% of the streambank         surfaces and immediate riparian zone         covered by native vegetation, including         trees, understory shrubs, or nonwoody         macrophytes; vegetative disruption         through grazing or mowing minimal or         not evident; almost all plants allowed to         grow naturally.         Left Bank       10         9         Right Bank       10         9       Right Bank         10       9         Right Bank       10	Citeden liner 10 worsubstrates       Participation         Teavorable for optimular consultation       Subted for full colonization and fish cover; mix of snages, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).       Subted for full colonization and substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).         20       19       18       17       16       15       14       13       12       11         More than 90% of the streambank surfaces and immediale riparian zone covered by native vegetation, including trees, understoy shrubs, or nonwody macrophytes; vegetative disruption through grazing or mowing minimal or not evident jamost all plants allowed to grow naturally.       70-90% of the streambank surfaces and immediale riparian zone half of the potential plant stubble height remaining.         Left Bank       10       9       8       7       6         Right Bank <td< td=""><td>0 deal half / 0 are substated       0 deal half / 0 are substated         0 deal half / 0 are substated       0 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal h</td></td<>	0 deal half / 0 are substated       0 deal half / 0 are substated         0 deal half / 0 are substated       0 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         1 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal half / 0 are substated         2 deal half / 0 are substated       1 deal h

	1		F	Reach Level A	ssessment	R	CH
SURVEY REACH	D: TBOYB	WTRSHD/SUBSHD: TV	icker Brk	DATE: 1/	/08 Asse	SSED BY:	DRB -
START TIN LAT <u>μ</u> [• <u>Υ</u> g · DESCRIPTION: βίλ	1E: <u>[0:520)</u> <u>43</u> " LONG trance to B	'PM LMK: 572°29'5' eaver Dam	$END TIME: LAT 4 \circ 43,DESCRIPTION: ((f)$	11:28 (9)/PM 73" LONG ]	LMK:	2"	GPS ID:
RAIN IN LAST 24 HO	DURS 🗆 Heavy ra	in 🗆 Steady rain	PRESENT CONDITION		-yins		· · · · · · · · · · · · · · · · · · ·
None	□ Intermitt	ent 🗆 Trace		$\Box$ Trace	□ Steady rain □ Overcast	D Intern	uttent cloudv
SURROUNDING LAN	ID USE: Golf c	rial	□ Urban/Residential □ Crop	Suburban/Res	□ Forested □ Other:	🗆 Institu	tional
AVERAGI	E CONDITIONS (c	heck applicable)	REACH	SKETCH AND SI	TE IMPACT TR	ACKING	
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% ⊠25-50 %	□ 50%-75% □ 75-100%	Simple planar sketch within the survey re	of survey reach. Tra each (OT, ER, IB,SC,	ck locations and II UT, TR, MI) as we	Ds for all si Il as any ad	te impacts Iditional
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick)	Cobble (2.5 –10") Boulder (>10") Bed rock	Jeatures	deemed appropriate.	Indicate direction	1 of flow	
Stained (clear, no. 1) Other (chemicals,	<b>t&amp;l√lea</b> r ∐Turl aturally colored) [ dyes)	oid (suspended matter) ∃ Opaque (milky)					
Aquatic Plants in Stream	Attached: no Floating: no	ne □ some ⊠ lots ne ⊠ some □ lots					
Wildlife in or Around Stream	(Evidence of) □ Fish X Bea □ Snails □ Oth	aver 🗆 Deer er:					
STREAM SHADING (water surface)	☐ Mostly shaded A Halfway (≥50 ☐ Partially shad ☐ Unshaded (<2	d (≥75% coverage) %) ed (≥25% ) 25%)		1 THANKE			
Channel Dynamics	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour	LAND +	Hors			
Unknown	Aggrading Sed. deposition	on Slope failure		Server S			
CHANNEL DIMENSIONS (FACING	Height: LT bank RT bank	(ft)	Mater	Involu	Hand		
DOWNSTREAM)	Width: Bottom	$-\frac{9}{17}$	1	TOLK	similer		
RI	EACH ACCESSIBIL	<u> </u>	L Ala	DI C	wa		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great	Long The Fre	Roaver 1			
equipment using existing roads or trails.	small or distant from stream.	ustance from stream. Specialized heavy equipment required. 2 1		pond			
NOTES: (biggest proble	em you see in survey	reach)			······································		
1422118	c species	covering st	RAM				
		1		Reporte	ED TO AUTHORITI		

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	Ontimal	Subontimal	Manginal	
	Optimiai	Suboptimai	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 G	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	76	5 4 3	2 1 0
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 (3) 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
FLOODPLAIN	Predominant floodplain vegetation type is mature forest	dominant floodplain vegetation type Predominant floodplain vegetation type is young forest		Predominant floodplain vegetation type is turf or crop land
VEGETATION		~	iiciu	
VEGETATION	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	20 19 18 17 16 Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	15 14 13 (12) 11 Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	10       9       8       7       6         Either all wetland or all non- wetland habitat, evidence of standing/ponded water	5 4 3 2 1 0 Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
FLOODPLAIN HABITAT	2019181716Even mix of wetland and non-wetland habitats, evidence of standing/ponded water201918172019181716	15     14     13     12     11       Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water       15     14     13     12     11	10       9       8       7       6         Either all wetland or all non-wetland habitat, evidence of standing/ponded water       10       9       8       7       6	5     4     3     2     1     0       Either all wetland or all non-wetland habitat, no evidence of standing/ponded water     5     4     3     2     1     0
FLOODPLAIN HABITAT FLOODPLAIN FLOODPLAIN ENCROACH- MENT	2019181716Even mix of wetland and non-wetland habitats, evidence of standing/ponded water201918172019181716No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	15     14     13     12     11       Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water     15     14     13     12     11       Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function     16     17	109876Either all wetland or all non- wetland habitat, evidence of standing/ponded water109876Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function101010	5     4     3     2     1     0       Either all wetland or all non-wetland habitat, no evidence of standing/ponded water     5     3     2     1     0       Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function     1     0

WATERSHED/SUBSHED	: Triker	(	DATE: 1 / / / C	ASSESSED BY:	LMB DRB
SURVEY REACH ID: 7	BOYR TI	ME: 11 : 06 AM/PM	Рното ID: (Camera-P	Pic #) /# ~	
SITE ID (Condition-#): O	Т- <u>0 </u> LA	1-410-48.44 "La	DNG72029.2	" LMK	GPS: (Unit ID)
	Г	· · · · · · · · · · · · · · · · · · ·			
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete Metal PVC/Plastic Brick Other:	SHAPE: X Single Circular Double Elliptical Triple Other:	DIMENSIONS: Diameter: <u>8 (in</u>	SUBMERGED: No Partially Fully
X Moderate Substantial Other:	Open channel	Concrete Earthen Other:	Trapezoid E Parabolic y Other:	Depth:         (in)           Width (Top):         (in)           " (Bottom):         (in)	NOT APPESCABLE
CONDITION:	<b>ODOR:</b> NO Gas Sewage	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	OWTH: X None ge Green
Peeling Paint Corrosion Other:	☐Rancid/Sour ☐ Sulfide ☐ Other:	Paint Other:	☐ Inhibited ☐ Excessive ☐ Other:	POOL QUALITY:	<mark>≯No pool</mark> □Colors □Oils □ Floatables
FORCOLOR:FLOWINGTURBIDIONLYFLOATAOTHERExcestCONCERNS:Need	TY: Z Non BLES: Z Non ss Trash (paper/pla s Regular Mainten	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping hance Anne Bank Ero	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         clouk)       Excessive         sion       Other:	Orange     Red     C       (oil sheen)     C       Sedimentation	)ther:
FOR     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       OTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT	IV: One IV: None BLES: V None ss Trash (paper/pla s Regular Mainten TON CANDIDATI	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, c astic bags) Dumping nance A Bank Ero	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         (bulk)       Excessive         sion       Other:         n       Stream daylighting	Orange Red C C (oil sheen) C Sedimentation	outfall stabilization
FOR     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       OTHER     Exceed       CONCERNS:     Need       POTENTIAL RESTORAT       no       f ves for daylighting:	TY: Z Non BLES: Non ss Trash (paper/pla s Regular Mainten	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping nance A Bank Ero G Discharge investigation Storm water retrofit	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         (bulk)       Excessive         sion       Other:         n       Stream daylighting         Other:       Other:	Orange Red C C (oil sheen) C Sedimentation	Other:
FOR     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       DTHER     Excession       CONCERNS:     X Need       POTENTIAL RESTORAT     no       f yes for daylighting:	TY: Z None BLES: Z None ss Trash (paper/pla s Regular Mainten TON CANDIDATH	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping nance Annu Bank Ero Discharge investigation Storm water retrofit	Yellow Green Control Control Control Green Control Con	Orange       Red       C         (oil sheen)       C         Sedimentation       C         X Local stream repair/         Slope:	Other:
FOR     COLOR:       FLOWING     FURBIDI       ONLY     FLOATA       OTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT     no       f yes for daylighting:     Length of vegetative cover       f yes for stormwater:     s stormwater currently co	TY: Z Non BLES: Z Non ss Trash (paper/pla s Regular Mainten TON CANDIDATI	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping nance A Bank Ero Discharge investigation Storm water retrofit ft Type of exist	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         (bulk)       Excessive         sion       Other:         n       Stream daylighting         Other:       Ing vegetation:	Orange       Red       C         (oil sheen)       C         Sedimentation       C         X       Local stream repair/         Slope:       S	Other:
FOR     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       OTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT     no       Ino     fyes for daylighting:       Length of vegetative cover     fyes for stormwater:       s stormwater currently co     Yes No       Yes     No	TY: Z None BLES: Z None ss Trash (paper/pla s Regular Mainten TON CANDIDATI r from outfall: ntrolled?	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping nance A Bank Ero Discharge investigation Storm water retrofit ft Type of exist Land Use des Area available	Yellow       Green         Cloudy       Opaque         Cloudy       Opaque         Stream       Petroleum         n       Excessive         n       Stream daylighting         Other:       Image: Stream daylighting         ing vegetation:       Image: Stream daylighting         cription:       Image: Stream daylighting	Orange       Red       C         (oil sheen)       C         Sedimentation         The call stream repair/         Slope:	outfall stabilization
For     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       OTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT     no       Ino     fyes for daylighting:       _ength of vegetative cover     yes for stormwater:       s stormwater currently co     No in Not in       OUTFALL     Heavestorm       SEVERITY:     comp       circle #)     streating	TY: Z Non BLES: Z Non ss Trash (paper/pla s Regular Mainten TON CANDIDATI TON CANDIDATI TON CANDIDATI TON CANDIDATI TON CANDIDATI TON CANDIDATI (nvestigated y discharge with a dist g smell. The amount of m; discharge appears ficant impact downstreat	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping hance A Bank Ero Discharge investigation Storm water retrofit ft Type of exist Land Use des Area available inct color and/or a f discharge is significant normal flow in receiving to be having a am.	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         ictory       Petroleum         ictory       Petroleum         ictory       Other:         in       Stream daylighting         Other:       Other:         ing vegetation:	Orange       Red       C         (oil sheen)       C         Sedimentation       C         Sedimentation       C         Image: Construction       C	outfall stabilization outfall stabilization outfall stabilization outfall stabilization o o o o o o o o o o o o o o o o o o
FOR     COLOR:       FLOWING     TURBIDI       ONLY     FLOATA       OTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT     Ino       Ino     fyes for daylighting:       Length of vegetative cover     Stormwater:       s stormwater currently co     Yes       Q Yes     No       DUTFALL     Heavestorm       SEVERITY:     comparison       circle #)     storn	TY: Solution of the amount of m; discharge appears in the amount of m; discharge appears in the amount of m; discharge appears in the amount of the amount o	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, e astic bags) Dumping nance A Bank Ero Discharge investigation Storm water retrofit ft Type of exist Land Use des Area available inct color and/or a f discharge is significant normal flow in receiving to be having a am. 4	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         ic(bulk)       Excessive         sion       Other:         in       Stream daylighting         Other:       Other:         ing vegetation:	Orange       Red       C         (oil sheen)       C         Sedimentation       C         Image: Constraint of stream's base / localized.       Slope:	outfall stabilization outfall stabilization o not have dry weather staining; or appearance any erosion problems. 1
FOR       COLOR:         FLOWING       TURBIDI         ONLY       FLOATA         OTHER       Excession         CONCERNS:       Need         POTENTIAL RESTORAT       Image: Concent of the concent o	TY: Non BLES: Non ss Trash (paper/pla s Regular Mainten TION CANDIDATH r from outfall: ntrolled? nvestigated ry discharge with a dist g smell. The amount of m; discharge appears ficant impact downstrea 5	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, of astic bags) Dumping tance M Bank Ero Discharge investigation Storm water retrofit ft Type of exist Land Use des Area available inct color and/or a f discharge is significant normal flow in receiving to be having a am. 4	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         (bulk)       Excessive         sion       Other:         n       Stream daylighting         other:       Other:         ing vegetation:	Orange       Red       C         (oil sheen)       C         Sedimentation       C         Sedimentation       C         Q Local stream repair/       Slope:         Slope:       Slope:         dorless. If the nount of stream's base / localized.       Outfall does discharge; s of causing a	outfall stabilization outfall stabilization o not have dry weather staining; or appearance any erosion problems. 1
FOR     COLOR:       FLOWING     FURBIDI       ONLY     FLOATA       DTHER     Excession       CONCERNS:     Need       POTENTIAL RESTORAT     Need       Ino     fyes for daylighting:       Length of vegetative cover     Stormwater:       s stormwater currently co     No       Q Yes     No       DUTFALL     Heavestorm       Severity:     Storm       circle #)     Streating       Streating     Stor       Shorv     Shorv	TY: Non BLES: Non ss Trash (paper/pla s Regular Mainten TION CANDIDATI r from outfall: nvestigated ry discharge with a dist g smell. The amount of m; discharge appears ficant impact downstrea 5	r Brown Grey e Slight Cloudiness e Sewage (toilet paper, of astic bags) Dumping hance M Bank Ero C Discharge investigation ft Type of exist Land Use des Area available inct color and/or a f discharge is significant normal flow in receiving to be having a am. 4 ft Storm Small di discharge to be having a am. 4	Yellow       Green         Cloudy       Opaque         ctc.)       Petroleum         steam       Petroleum         f(bulk)       Excessive         sion       Other:         n       Stream daylighting         ing vegetation:	Orange       Red       C         (oil sheen)       C         Sedimentation       C         Sedimentation       C         Q Local stream repair/       Slope:         Slope:       Slope:         dorless. If the nount of stream's base / localized.       Outfall does discharge; s of causing a         (2)       C	outfall stabilization outfall stabilization outfall stabilization o o o o o o o o o o o o o o o o o o

Trash and Debris

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WATERSHED/SUB	sshed: Tucker		DATE: <u>7</u> /	1/08	ASSESSED BY: KMB DRB
URVEY REACH I	D: TBOYB TI	ме: <u>  :02</u> АД/рм	Рното ID: (Ca	mera-Pic #)	1# 20
SITE ID: (Condition	-#) <u>TR-<u>θ</u>   <sub>LAT</sub><u>Ψ</u> •.</u>	<u>98.44</u> "LON	072029.3	_" LMK	GPS: (Unit ID)
TYPE: Industrial Commercial Residential	MATERIAL:         Plastic       Paper         Tires       Constr         Appliances       Yard V         Automotive       Other:	uction Medical	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION:	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 0,5
POTENTIAL REST	ORATION CANDIDATE	tream cleanup 🔲 Stre Dther:	am adoption segment	Removal/pr	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED :	Heavy equipment 🕅 T	rash bags □ Unkno Gov □ Hazmat Te	own am 🗌 Other	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, of with easy access. Trash in a long period of time but few days, possibly with a s	or bulk items, in a small ar may have been dumped or it could be cleaned up in small backhoe.	A large amoun area, where ac or indications o	it of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials
	(5)	4	3	2	1
NOTES: grag	os and brush dip	pings			
				REPORTEI	TO AUTHORITIES VES VINO

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	Reach Level Assessment RCH
SURVEY REACH ID: 13-04C WTRSHD/SUBSHD: TO START TIME: 11: 30 AM/PM LMK:	END TIME: : AM/PM LMK; GPS ID:
LAT 410 48.43" LONG 72029 100"	LAT' LONG' '''
DESCRIPTION: Bodayor D	DESCRIPTION:
RAIN IN LAST 24 HOURS   Heavy rain   Steady rain     None   Intermittent   Trace	PRESENT CONDITIONS       □       Heavy rain       □       Steady rain       □       Intermittent         Clear       □       Trace       □       Overcast       ☑       Partly cloudy
SURROUNDING LAND USE:  Golf course  Park	Urban/Residential Suburban/Res Forested Institutional
AVERAGE CONDITIONS (check applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS %         □ 0-25%         □ 50%-75%           CHANNEL WIDTH         □ 25-50 %         □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional fortunes downed appropriate. Indiract dimension of the
DOMINANT SUBSTRATE         Silt/clay (fine or slick)       Cobble (2.5 -10")         Sand (gritty)       Boulder (>10")         Gravel (0.1-2.5")       Bed rock	SC-D2
WATER CLARITY Clear Turbid (suspended matter) Stained (clear, naturally colored) Opaque (milky) Other (chemicals, dyes)	SMTUC
AQUATIC PLANTS Attached: none some lots	77213-7
WILDLIFE IN OR       (Evidence of)         AROUND STREAM       IFish       Beaver       Deer         AROUND STREAM       Snails       Other:	OF-R. A
STREAM SHADING (water surface) $\Box$ Mostly shaded ( $\geq$ 75% coverage) $\Box$ Halfway ( $\geq$ 50%) $\Box$ Partially shaded ( $\geq$ 25%) $\Box$ Unshaded (<25%)	
CHANNEL     Downcutting     Bed scour       DYNAMICS     Widening     Bank failure	A LI (SF-
Unknown Aggrading Slope failure Sed. deposition Channelized	(scol 18.01 / 18.01
CHANNEL Height: LT bank (ft) DIMENSIONS RT bank (ft)	
(FACING Width: Bottom(ft)	
(ft)	Fry / / / tra
REACH ACCESSIBILITY         Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.       Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.       Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.         5       4       3       2	VOUDTA STATE
NOTES: (biggest problem you see in survey reach)	Α.
)	
	<b>Reported to authorities</b> Yes No

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				1
	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> translent).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfuil) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	Over	ALL BUFFER AND FLOODPLAI	N CONDITION	
	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
-	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
~	No evidence of floodplain encroachment in the form of fill	Minor floodplain encroachment in the form of fill material, land development, or manmade structures,	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures) Significant effect on
FLOODPLAIN ENCROACH- MENT	material, land development, or manmade structures	but not effecting floodplain function	effect on floodplain function	floodplain function

r				Storn	ו Water Out	tfalls	ΟΤ
WATERSHED/SUBSH	ED: Tucke	R	DATE: 7	11108	ASSESSED	ву: <i>(</i>	MR
SURVEY REACH ID:	TBOYC T	IME: <u>[2: 08 am/</u> PM	) Рното II	: (Camera-Pic #	#)	/#	
SITE ID (Condition-#):	от- <u>04</u> Ц	<u>ат ЦС. 48. 43</u>	UNG 720 2	28.51"	LMK	GF	<b>PS:</b> (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete N CPVC/Plastic F Other:	SHAPE: Metal XCircular Brick Ellipticz	☐ Single • ☑ Double ıl ☐ Triple	DIMENSIONS 2@ Diameter:	5: / (in)	SUBMERGED: No Partially Fully
Moderate Substantial	Open channel	Concrete Ea Other:	rthen Trapezo	id Dep c Wid " (	th: th (Top): (Bottom):	<u>(in)</u> (in) (in)	NOT APPEICABLE
CONDITION: Done Chip/Cracked Peeling Paint	ODOR: MNO Gas Sewage Rancid/Sour	DEPOSITS/STAINS	: VEGGIE D	ENSITY:	PIPE BENTHIC Brown Other:	C GROW	TH: None
Corrosion	Sulfide	Paint Other:	Excessive     Other:	/e	Good Od Suds Al	lors $\square$ C lgae $\square$ F	Colors Oils
FOR COLO FLOWING TURB ONLY FLOAT	R: Cler DITY: Mon FABLES: Non	ar Brown Gr a Slight Cloudine; a Sewage (toilet p	ey 🗌 Yellow ss 🛄 Cloudy paper, etc.) [	☐ Green ⊠C ☐ Opaque ] Petroleum (oi	Drange 🗌 Red	Other	
OTHER Ex CONCERNS: Ne POTENTIAL RESTOR	cess Trash (paper/pl eds Regular Mainter ATION CANDIDAT	astic bags) 🗌 Du nance 🗌 Bar E A Discharge invest	mping (bulk) nk Erosion	Excessive Se     Other:     daylighting	edimentation	epair/outf	àll stabilization
If yes for daylighting. Length of vegetative co	ver from outfall:	ft Type o	fit Other:	n:	SI	ope:	o
Is stormwater currently	controlled? t investigated	Land U Area av	Use description: vailable:				
OUTFALL     H       SEVERITY:     st       (circle #)     st	eavy discharge with a dis rong smell. The amount of ompared to the amount of ream; discharge appears gnificant impact downstre	tinct color and/or a of discharge is significant f normal flow in receiving to be having a eam.	Small discharge; flow m discharge has a color an discharge is very small c flow and any impact app	ostly clear and odor d/or odor, the amou ompared to the stre: ears to be minor / lo	less. If the nt of am's base calized.	all does not narge; stainin nusing any e	have dry weather ng; or appearance rosion problems.
SKETCH/NOTES:	s PPt	4	``	3	2		1
)				Ref	PORTED TO AUT	HORITIES	: 🗌 yes 🗌 no

				Stor	m Water Ou	Itfalls OT
WATEDSHED/SUDSHED	. Jucker			DATE: 71 1 1 28	×	
SUDVEN DEL CU De	D ANIA	- 		DATE: _/ _/ _/ _/ _/ _/ _/ _/ _/ _/ _/ _/ _/	ASSESSEI	DBY: KMB
SURVEY REACH ID:	BOYC	IME: <u>IL: YG</u> AMPM		PHOTO ID: (Camera-Pi	<i>c</i> #)	/#
SITE ID (Condition-#): O'I	- <u>05</u>  1	LAT <u>47 ° 48 ' 44</u>	<u>4</u> " Lon 7	NG <u>16 08 '40 '</u>	LMK	<b>GPS:</b> (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: TClosed pipe	MATERIAL:	Aetal Brick	SHAPE: X Single Circular Double Elliptical Triple Other:	DIMENSION	IS: SUBMERGED: No (in) Partially Fully
Moderate Substantial	Open channel	Concrete Ear	rthen	Trapezoid   De     Parabolic   W     Other:   "	epth: 'idth (Top): (Bottom):	(in) NOT APPEICABLE (in)
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR! NC Gas Sewage Rancid/Sou Sulfide Other:	<ul> <li>DEPOSITS/STAINS:</li> <li>None</li> <li>Oily</li> <li>Flow Line</li> <li>Paint</li> <li>Other:</li> </ul>		VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHI Brown C Other: POOL QUALI Good O Suds A Other:	IC GROWTH: Orange Green TY: Colors Orange TY: Orange TY: TY: Orange Orange TY:
FOR FLOWING ONLY     COLOR: TURBIDIT FLOATAB       OTHER     Excess       CONCERNS:     Needs	Cles: Clear	ear Brown Gra one Slight Cloudines one Sewage (toilet p plastic bags) Dur enance Ban	ey [	Yellow     Green       Cloudy     Opaque       Cloudy     Petroleum (       bulk)     Excessive S       on     Other:	Orange Rec oil sheen) Sedimentation	1 Other:
no	ION CANDIDA	Storm water retro	fit	Other	_ Local stream	repair/outfall stabilization
If yes for daylighting: Length of vegetative cover If yes for stormwater: Is stormwater currently con	from outfall:	ft Type of Land U	f existin	g vegetation:	S	Slope:°
OUTFALL     Heavy       SEVERITY:     compa       (circle #)     strean	y discharge with a d smell. The amoun ared to the amount n; discharge appea cant impact downst	Area av listinct color and/or a t of discharge is significant of normal flow in receiving rs to be having a ream.	Small disc discharge discharge flow and a	charge; flow mostly clear and od has a color and/or odor, the am is very small compared to the st my impact appears to be minor /	lorless. If the ount of tream's base localized.	tfall does not have dry weather charge; staining; or appearance ausing any erosion problems.
	5	4		3	2	(V
SKETCH/NOTES:				R	EPORTED TO AU	THORITIES: 🗌 YES 🗌 NO

WATERSHED/SUBSHED: Tuckey Brook			DATE: 7/ 1/08	ASSESSED BY: DZ
SURVEY REACH ID: 775-046 TIME: 11:45 AMPM			PHOTO ID: (Camera-Pic #	(#) /#
SITE ID (Condition-#): O	T- <u>02</u> La	т <u>ЧІ°Чв'ЧЧ</u> "	LONG 110 28.55 "	LMK GPS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle	TYPE: Closed pipe	MATERIAL: Concrete Meta PVC/Plastic Brick Other:	SHAPE: Single al Circular Double k Elliptical Triple Other:	DIMENSIONS: SUBMERGED: Diameter: 4 (in) Partially Fully
Moderate Substantial Other:	☐ Open channel	Concrete Earthe	n Trapezoid Dep n Parabolic Wid Other: " (	th: <u>(in)</u> th (Top): <u>(in)</u> Bottom): (in)
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY:	PIPE BENTHIC GROWTH: None Brown Orange Green Other: POOL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other:
ELOATA	BLES: None	e 🗌 Sewage (toilet pape	r, etc.) Petroleum (oi	1 sheen) Other
OTHER     Exce       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       no	BLES: Daper/pla	<ul> <li>Sewage (toilet pape astic bags)          Dumpi ance         Bank E         Discharge investigat         Storm water retrofit     </li> </ul>	r; etc.)	I sheen) Other: dimentation Local stream repair/outfall stabilization
OTHER     Exce       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       Ino       If yes for daylighting:       Length of vegetative cove	BLES: Display None Iss Trash (paper/pla Is Regular Mainten FION CANDIDATE r from outfall:	Sewage (toilet pape stic bags)      Dumpi ance      Bank E      Discharge investigat     Storm water retrofit     ft Type of ex	r, etc.)	1 sheen)       Other:         odimentation         Local stream repair/outfall stabilization <i>fleaders w/ vangavden</i>
OTHER     Exce       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       no       If yes for daylighting:       Length of vegetative cove       If yes for stormwater:       Is stormwater currently co       Yes X No     Not	BLES: Discrete Strash (paper/pla ss Trash (paper/pla ls Regular Mainten TION CANDIDATE r from outfall: ontrolled?	<ul> <li>Sewage (toilet pape</li> <li>stic bags)          <ul> <li>Dumpi</li> <li>ance</li> <li>Bank E</li> <li>Discharge investigat</li> <li>Storm water retrofit</li> </ul> </li> <li>ft Type of ex Land Use of Area availa</li> </ul>	r; etc.)	1 sheen)       Other:         odimentation         Local stream repair/outfall stabilization <i>f beaders y vaingavden</i> Slope:      °
OTHER     FLOATA       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT     Ino       If yes for daylighting:     Length of vegetative cove       If yes for stormwater:     Is stormwater currently co       Yes X No     Not if       OUTFALL     Hea       SEVERITY:     com       (circle #)     stor	BLES: Discrete Strack (paper/pla ss Trash (paper/pla ls Regular Mainten FION CANDIDATE r from outfall: ontrolled? in vestigated vy discharge with a disting smell. The amount of pared to the amount of pared to the amount of	<ul> <li>Sewage (toilet pape astic bags) Dumpi ance Bank E</li> <li>Discharge investigat</li> <li>Discharge investigat</li> <li>Storm water retrofit</li> <li>ft Type of ex</li> <li>Land Use of Area availa</li> <li>inct color and/or a f discharge is significant normal flow in receiving to be having a am.</li> </ul>	r; etc.)       Petroleum (oi         ng (bulk)       Excessive Se         Brosion       Other:         ition       Stream daylighting         Other:       Petroleum (oi         isting       Other:         description:       Petroleum (oi         able:       Il discharge; flow mostly clear and odor         harge has a color and/or odor, the amounarge is very small compared to the stream of and any impact appears to be minor / loop	1 sheen)       Other:         adimentation
OTHER     Exce       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       no       If yes for daylighting:       Length of vegetative cove       If yes for stormwater:       Is stormwater currently co       Yes No     Not i       OUTFALL     Hea       SEVERITY:     ccom       'circle #)     Stread	BLES: None ss Trash (paper/pla ls Regular Mainten FION CANDIDATE r from outfall: ontrolled? investigated vy discharge with a disting smell. The amount of pared to the amount of fam, discharge appears to ificant impact downstrea 5	<ul> <li>Sewage (toilet pape astic bags) ance Dumpi Bank E</li> <li>Discharge investigat</li> <li>Discharge investigat</li> <li>Storm water retrofit</li> <li>ft Type of ex</li> <li>Land Use of Area availa</li> <li>inct color and/or a f discharge is significant normal flow in receiving to be having a am.</li> </ul>	r; etc.)	1 sheen)       Other:         adimentation         Local stream repair/outfall stabilization <i>f baders w/ vangavdem</i>
OTHER       Exce         OTHER       Exce         CONCERNS:       Need         POTENTIAL RESTORAT       Image: Concerns in the second sec	BLES: None ss Trash (paper/pla ls Regular Mainten FION CANDIDATE r from outfall: ontrolled? investigated vy discharge with a disti rg smell. The amount of pared to the amount of	Sewage (toilet pape ustic bags) ance Bank E Bank E Bank E Discharge investigat Storm water retrofit ft Type of ex Land Use of Area availa inct color and/or a f discharge is significant normal flow in receiving am. 4	r, etc.)       Petroleum (oi         ng (bulk)       Excessive Se         Brosion       Other:         ition       Stream daylighting         Other:       Petroleum (oi         isting       Other:         Isting vegetation:       Petroleum (oi         isting vegetation:       Petroleu	1 sheen)       Other:         adimentation

Storm Water Outfalls

WATERSHED/SUBS	HED: Inchr		DATE: 7/ 108 ASSESSED BY: CMB			
SURVEY REACH ID: BOYC TIME: 11:55 AD/PM			Рното ID: (Camera-Pic #) /# 27			
SITE ID (Condition-#)	0T- <u>65</u> LA	т <u> 41° 48 ' 43</u> " L	ONG 72028 .52 "		GPS: (Unit ID)	
				······································		
BANK:	TYPE:	MATERIAL:	SHAPE: Single	DIMENSIONS:	SUBMERGED:	
	Closed	$\mathbf{X}$ PVC/Plastic $\Box$ Brick	Circular Double	Diameter: $\Psi$ (in)		
$\mathbb{K}$ None $\square$ Trick	le pipe	Other:	Other:		$\square$ Partially	
Moderate						
Substantial	Dpen	Concrete Earthen	Parabolic W	$\frac{(1n)}{(1n)}$		
U Other:	channel	Uther:	Other:	(Bottom): (in)	NOT AT LECABLE	
CONDITION:	ODOR: NO	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	WTH · Mone	
None	Gas	None	None	Brown Orange	e $\Box$ Green	
Chip/Cracked	Sewage	□ Oily	Normal	Other:		
	Sulfide	Paint Paint		POOL QUALITY: 1	No pool	
Other:	Other:	Other:	Other:	Good Odors	Colors Oils	
				Other:	T Toatables	
For			· · · · · · · · · · · · · · · · · · ·			
FLOWING TUP	BIDITY: None	Brown Grey	Vellow Green	Orange Red Oth	ier:	
ONLY FLO	ATABLES: None	Sewage (toilet paper,	etc.) Petroleum (	oil sheen) 🗌 Ott	ler.	
OTHER E	xcess Trash (paper/pla	stic bags) 🗌 Dumpin	g (bulk) 🗌 Excessive S	Sedimentation		
CONCERNS:	leeds Regular Maintena	ance 🗌 Bank Er	osion 🗌 Other:			
				· · · · · · · · · · · · · · · · · · ·		
POTENTIAL RESTO	RATION CANDIDATE	Discharge investigation	on 🗌 Stream daylighting 🛛	] Local stream repair/ou	atfall stabilization	
X no		Storm water retrofit	Other:	AND 110		
I yes for advirghting	over from outfall:	A Trans of ania	4	<b>a</b> 1		
Length of vegetative e		n Type of exis	ting vegetation:	Slope:		
If yes for stormwate	r:					
Is stormwater currently controlled? Land Use description:						
	lot investigated	Area availab	le:			
OUTFALL SEVEDITY:	Heavy discharge with a disting strong smell. The amount of	nct color and/or a Small	discharge; flow mostly clear and od	orless. If the Outfall does n	of have draweather	
<i>Circle #</i> )	compared to the amount of normal flow in receiving discharge appears to be baying a		rge has a color and/or odor, the amo rge is very small compared to the st	ount of discharge; sta	discharge; staining; or appearance	
	significant impact downstrea	m. flow ar	nd any impact appears to be minor /	localized. of causing an	y erosion problems.	
	5	4	3	2	$\overline{(1)}$	
SKETCH/NOTES:						
)			R	EPORTED TO AUTHORITI		
/		·····		,		

## IB

WATERSHED/SUBSHED: 7 MCKCK DATE: 71 (108 ASSESSED BY: KN	S
URVEY REACH: 1804 C TIME: 2: 40 AM/RG PHOTO ID: (Camera-Pic #) /#	
SITE ID: (Condition=#) START LAT <u>41 ° 48 '43 " LONG 72 ° 29 '00 " LMK</u> GPS: (Unit ID)	)
IB-UI END LAT <u>41° 48' 44'' LONG 77.º 28' 55''</u> LMK	
IMPACTED BANK:       REASON INADEQUATE:       Lack of vegetation       Too narrow       Widespread invasive plants         LT       RT       Both       Recently planted       Other:	
LAND USE: Private Institutional Golf Course Park Other Public	
(Facing downstream) LT Bank	
K1 Dank     L     L     L       DOMINANT     Paved     Bare ground     Turf/lawn     Tall group     Charle from the state	
LAND COVER: LT Bank	
$RT Bank \square \square \square \square \square \square \square \square \square \square$	
INVASIVE PLANTS: None Rare Partial coverage Extensive coverage unknown	
STREAM SHADE PROVIDED? None Partial Full WETLANDS PRESENT? MNO DURING	
WEILANDSTRESENT! WINO Yes Unknown	
POTENTIAL RESTORATION CANDIDATE	
RESTORABLE AREA	-
LT BANK RT <b>REFORESTATION</b> where the riparian area does public or private land that is land where road; build	ate ing
Length (ft): POTENTIAL: not appear to be used for any presently used for a specific encroachment or other specific purpose; plenty of purpose; available area for feature significantly line	n
( <i>Circle #</i> ) area available for planting planting adequate available area for planting	ting
<u>5 4 3 2 1</u>	
POTENTIAL CONFLICTS WITH REFORESTATION UNdespread invasive plants Potential contamination Lack of sun Severe animal impacts (deer, beaver)	ile
NOTES:	<u></u>

				Impacted	d Buffer	IB
WATERSHED/SUBSHED: 73			DATE: _	21 1 108	ASSESSED	BY: DER
JIRVEY REACH: TR-040	TIME:	2:15AM/PM	Рното І	<b>D:</b> (Camera-Pic i	#) /	/#
SITE ID: (Condition-#) START LA	T 4/048.41 "	LONG 72°28	130"	LMK	GPS:	(Unit ID)
IB-09	TU1048141"	LONG 12 074	· 40/11			
						,
IMPACTED/BANK:     REASON INA       LT     RT       Both	ADEQUATE: Lack of	vegetation 🗌 Too y planted 🔲 Othe	narrow [	] Widespread invas	sive plants	
LAND USE: Private I	nstitutional Golf Cou	rse Park Oth	ner Public			
(Facing downstream) LT Bank						
RT Bank				1		
LAND COVER IT Bank	Dare ground 1 urt/la	wn ⊥all grass	Shrub/scru	ib Trees O	ther	
RT Bank			ЦА. M			
INVASIVE PLANTS: None	$\square$ Rare $\square$ F	artial coverage	□ Exten	sive coverage	 ] unknown	· · · · · · · · · · · · · · · · · · ·
STREAM SHADE PROVIDED? MNon						
STREAM SHADE I ROVIDED:		I FUIL WEILA	ANDS PRES	ENI! ENNO	∐ Yes ∐ (	Jnknown
POTENTIAL RESTORATION CANDIDA	TE Active reforestat	ion 🔲 Greenway de	esign 🖄	Natural regeneration	n 🗌 Invasivo	es removal
RESTORABLE AREA		Impacted area on pub	lic land In	macted area on oithor	Impacted	aroa an privata
LT βάνκ RT	REFORESTATION	where the riparian are	a does pi	ublic or private land that	t is land whe	re road; building
Length (ft):	POTENTIAL:	not appear to be used specific purpose; plent	forany pi tyof pi	resently used for a spec urpose; available area fo	cific encroach or feature si	ment or other anificantly limits
Width (ft): $2\Omega + 400$	(Circle #)	area available for plan	iting pl	lanting adequate	available	area for planting
)		5	-4-	> 3	2	1
POTENTIAL CONFLICTS WITH REFOR	ESTATION Window Wi Window Window Wind	despread invasive p vere animal impacts	olants 🔲 (deer, beav	Potential contamir ver)  D Other:	nation 🔲 La	ack of sun
NOTES:						

Storm Water Outfalls						
WATERSHED/SUBSHE	»: there	RBrK	DATE: 1 / 0	8 ASSESSED BY: KM	B DRR	
SURVEY REACH ID: 1	BOYC TH	ME: 11: 38AG/PM	PHOTO ID: (Camera-Pi	ic #) /#		
SITE ID (Condition-#): OT- $O[$ LAT $46.48.42$ "LONG $72.28.57$ " LMK GPS: (Unit ID)						
BANK: LT RT Head FLOW: Mone Trickle Moderate Substantial	TYPE: Closed pipe	MATERIAL: Concrete Metal PVC/Plastic Brick Other: Concrete Earthen	SHAPE:     Single       Active     Double       Elliptical     Triple       Other:     Duble	DIMENSIONS: S Diameter: <u>(in)</u>	UBMERGED: No Partially Fully	
Other:	channel Other:		Other:	/idth (Top):     (in)       " (Bottom):     (in)	OT APPEICABLE	
CONDITION: None Chip/Cracked Peeling Paint	ODOR: 🕅 NO Gas Sewage Rancid/Sour	<b>DEPOSITS/STAINS:</b> None Oily Flow Line	VEGGIE DENSITY: X'None Normal	PIPE BENTHIC GROWT	H: 🗌 None I Green	
Corrosion	Sulfide	☐ Paint ☐Other:	Excessive     Other:	POOL QUALITY:       Model         Good       Odors       Co         Suds       Algae       Fl         Other:       Other:	o pool lors □Oils oatables	
FOR       COLOR:       Clear       Brown       Grey       Yellow       Green       Orange       Red       Other:         FLOWING ONLY       TURBIDITY:       None       Slight Cloudiness       Cloudy       Opaque         FLOATABLES:       None       Sewage (toilet paper, etc.)       Petroleum (oil sheen)       Other:         OTHER       Excess Trash (paper/plastic bags)       Dumping (bulk)       Excessive Sedimentation         ONCERNS:       Needs Regular Maintenance       Bank Erosion       Other:						
POTENTIAL RESTORA	FION CANDIDATE	Discharge investigati	on 🗌 Stream daylighting	Local stream repair/outfa	ll stabilization	
If yes for daylighting: Length of vegetative cover from outfall:ft Type of existing vegetation:Slope:°						
If yes for stormwater: Is stormwater currently co ☐ Yes ☐ No ☐ Not	ontrolled? investigated	Land Use de Area availab	escription:			
OUTFALL       Heavy discharge with a distinct color and/or a       Sma         SEVERITY:       strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.       Sma		Il discharge; flow mostly clear and odorless. If the harge has a color and/or odor, the amount of harge is very small compared to the stream's base and any impact appears to be minor / localized.				
	5	4	3	2		
SKETCH/NOTES:						
)			R	REPORTED TO AUTHORITIES:	YES NO	

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Stream Crossing SC

WATERSHED	/subshed: Tucker			DATE: 7	1/ 108	ASSE	SSED BY: 🌾	MB. DRB
URVEY REA	сн ID: + В 04С	<u>ТІМЕ: [[: Ч</u>	SAN/PM	Рното ID	: (Camera-Pie	c #)	/#	/
SITE ID: (Con	dition-#) SC- <u>Ol</u> LAT	41.48.41	<u>4</u> " Long	12:28.	<u>55</u> " L	МК	GPS (U	Jnit ID)
TYPE: 🗌 Roa	ad Crossing 🔲 Railroad Crossi	ng 🕅 Manmade	Dam 🔲 Beave	er Dam 🔲	Geological For	nation 🗵	Other: Bri	dgeate
FOR ROAD/ RAILROAD CROSSINGS ONLY	SHAPE: Arcfi Bottomless Box Elliptical Circular Other: CONDITION: (Evidence of)	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIG	NMENT: ow-aligned t flow-aligned not know CERT SLOPE:	<b>DIMENSI</b> Barrel dia Culvert le	IONS: ( <i>if varis</i> umeter: Height: ength: Width:	able, sketch) (ft) (ft) (ft) (ft) (ft)
	Cracking/chipping/corrosion	Failing emb	ankment		ght (2° – 5 <sup>0</sup> ) vious (>5°)	Roadway	elevation:	(ft)
POTENTIAL ]	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv repair 🔲 Othe	vert repair/rej er:	placement	Upstream st	torage retrofi	t
IS SC ACTING	G AS GRADE CONTROL	No Y	es 🗌 Unk	nown				
	EXTENT OF PHYSICAL BLC	CKAGE:	,	BLO	CKAGE SEVE	RITY: (circ	le #)	
If yes for fish barrier	Cause:     Drop too high Water D     Flow too shallow Water D	wn rop: <u>57</u> (in) epth:(in)	A structure such a road culvert on a greater stream bl upstream movem anadromous fish; passage device p	as a dam or 3rd order or ocking the ent of no fish oresent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish	age on a Ild isolate a of stream, le that may migration of	A temporary b beaver dam o the very head very little viabl above it; natur as waterfalls.	arrier such as a r a blockage at of a stream with e fish habitat ral barriers such
<u></u>	U Other:		5		4 3		2	1
NOTES/SKET	cm:	westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly westerly wes	('enew hrat	terfal	.¥ 11 /dam			
					Repor	RTED TO AU	THORITIES [	] Yes 🗍 No

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Stream Crossing

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WATERSHED	/SUBSHED: TUCCUP			DATE:	11108	Assi	ESSED BY: KMB
URVEY REA	CHID: TUOYC		_AM/PM	Рното I	D: (Camera-Pi	c #)	/#
SITE ID: (Con	dition#) SC- <u>07</u> LAT	<u>41. 48.4</u>	Z" LONG	12-24	<u>'50 "</u> L	MK	_ GPS (Unit ID)
TYPE: 🗌 Roa	d Crossing 🔲 Railroad Crossi	ng 🕅 Manmade	Dam 🗌 Beave	er Dam	Geological For	mation <b>Г</b>	Other:
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:		<b>GNMENT:</b> low-aligned ot flow-aligned o not know	DIMENS Barrel di	SIONS: (if variable, sketch ameter:( Height:(
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	n 🔲 Downstrean	n scour hole vankment		VERT SLOPE: lat light (2° – 5 <sup>0</sup> ) bvious (>5°)	Culvert le Roadway	ength:( Width:( / elevation:
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culve repair 🔲 Othe	ert repair/r	eplacement 🔲 🛛	Upstream s	storage retrofit
IS SC ACTING	G AS GRADE CONTROL		es 🔲 Unkr	nown			
	EXTENT OF PHYSICAL BLO	CKAGE:		BL	OCKAGE SEVER	RITY: (circ	cle #)
If yes for fish barrier	CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other	wn rop: <u>36</u> (in) epth: (in)	A structure such a road culvert on a 3 greater stream blo upstream moveme anadromous fish; passage device pr	is a dam or Brd order or ocking the ent of no fish resent.	A total fish blocka tributary that wou significant reach or partial blockag interfere with the anadromous fish.	ige on a Id isolate a of stream, e that may migration of	A temporary barrier such a beaver dam or a blockage the very head of a stream v very little viable fish habitat above it; natural barriers su as waterfalls.
)			5		4 (3)		2 1
	Stonel	Jool da vool de	m/ aterfall re tived	House	Æ		
		`			Repor	TED TO AU	THORITIES 🗌 YES 🙀

Stream	Cros	sind
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Stream Crossing	SC
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WATERSHED	/SUBSHED: Jucker	DA	TE: 7/ 1 / 08	ASSESS	SED BY: K-MB
URVEY REA	<u>CHID: 16090 TIME: 12:5</u>	OAM/M PH	юто ID: (Camera-Pid	c #)	/#
SITE ID: (Con	dition=#) SC- <u>03</u>   LAT <u>41° 44' 3</u>	7_" LONG 72°	<u>28,45"</u> LI	МК	GPS (Unit ID)
Tunn, ST					N1
TYPE: Z Roa	ad Crossing Kaliroad Crossing Manmade	Dam Beaver D	am Geological For		Other:
For Road/ Railroad	Shape:       # DARCELS:         Arch       Bottomless         Box       Elliptical         Circular       Triple         Other:       M. Other: 6	Concrete Metal Other:	ALIGNMENT: Difference of the second	Barrel diam	heter: $13$ (ft) leight: $5$ (ft)
CROSSINGS ONLY	CONDITION: (Evidence of)         Cracking/chipping/corrosion         Sediment deposition         Failing emb	n scour hole pankment	CULVERT SLOPE: Flat Slight $(2^{\circ} - 5^{\circ})$	Culvert len	gth: $\underline{13} \underline{70}(ft)$ Vidth: $\underline{(ft)}$
	Other ( <i>describe</i> ):			Roadway e	levation: (ft)
POTENTIAL I	<b>RESTORATION CANDIDATE</b> Fish barrier ro	emoval 🗌 Culvert i repair 🔲 Other:	repair/replacement 🔲 🛛	Upstream sto	rage retrofit
IS SC ACTING	G AS GRADE CONTROL 🛛 🖾 No 🗌 Y	es 🗌 Unknow	'n		
	EXTENT OF PHYSICAL BLOCKAGE:		BLOCKAGE SEVER	RITY: (circle	#)
If yes for fish barrier	□ Total       □ Partial         □ Temporary       □ Unknown         CAUSE:         □ Drop too high       Water Drop: (in)         □ Flow too shallow       Water Depth: (in)         □ Other:       □	A structure such as a c road culvert on a 3rd o greater stream blockin upstream movement o anadromous fish; no fi passage device preser	dam or A total fish blocka order or tributary that wou g the significant reach of or partial blockag sh interfere with the nt. anadromous fish.	age on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
		5	4 3	2	2 1
Ľ			Repor	TED TO AUTI	HORITIES YES NO

Trash and Debris

WATERSHED/SUB	shed: Tucker		DATE: <u>7</u> /	(_/08	ASSESSED BY: KMB
JURVEY REACH I	D: TB 04C T	IME: 12: 27 AM/M	Рното ID: (Ca	amera-Pic #)	/#
SITE ID: (Condition	-#) TR- <u>02</u> Lat <u>Ψ</u> •	48.40 " LON	072028.49	/_'' LMK	GPS: (Unit ID)
TYPE: Industrial Commercial Residential	MATERIAL:         Plastic       Paper         Tires       Constr         Appliances       Yard         Automotive       Other:	☐ Metal uction ☐ Medical Waste	SOURCE: Unknown Flooding Ullegal dump Local outfall	LOCATION:	ea LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 2
POTENTIAL REST	ORATION CANDIDATE	Stream cleanup 🔲 Stre	am adoption segment	t 🏹 Removal/pr	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED : X	Heavy equipment 🔲 T	`rash bags □ Unkno Gov □ Hazmat Te	own am 🗌 Other	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	CLEAN-UP       A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access       A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backbee       A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials				
NOTES:	5	4	(3)	2	1
Tree	in pieces blu	2-10 ft	long die	mater n	~ (ft
)				Reportei	D TO AUTHORITIES 🗌 YES 🔽 NO

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Trash and Debris

r	- 1				A
WATERSHED/SUB	SHED: Inder		DATE: <u>7</u> /	08	ASSESSED BY: FMB
JURVEY REACH I	D: TBOYC TI	ме: <u>12:00</u> ам/б	PHOTO ID: (Ca	mera-Pic #)	1# 28
SITE ID: (Condition	₽#) <b>TR-<u>0</u>L</b>   Lat <u>Ψ</u> .	46 . 44 " LON	072.28.51	<u>-</u> " LMK	GPS: (Unit ID)
TYPE: Industrial Commercial Residential	MATERIAL: Plastic Paper Tires Constr Appliances Yard V Automotive Other:	☐ Metal uction ☐ Medical Vaste	SOURCE: Unknown Flooding Illegal dump Local outfall	LOCATION:	ea LAND OWNERSHIP:
POTENTIAL REST	CORATION CANDIDATE $\boxtimes$ S	tream cleanup 🔲 Stre Other:	am adoption segment	🔀 Removal/pro	evention of dumping
If yes for trash or debris removal	EQUIPMENT NEEDED :	Heavy equipment 🕅 T	rash bags 🔲 Unkno	wn	DUMPSTER WITHIN 100 FT:
CLEAN-UP POTENTIAL: (Circle #)	Instruction       WHO CAN DO IT:       Volunteers       Local Gov       Hazmat Team       Other       Yes       No       Vulnknown         CAN-UP       A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access       A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.       A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drum or indications of hazardous materials				
Notes: pill	e of leaves and	yard clipp	ings	Z	Δ
)				REPORTED	TO AUTHORITIES TYPES TO NO

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SURVEY REACH I START TIM	D: <u>WZOI</u> W1 E: <u>10 : 76 A</u> MPN	TRSHD/SUBSHD: Woll	END TIME:	DATE: <u>6</u> / 0:35 AM/PM	LMK:	SSED BY: <u>     back 35, 707</u> GPS ID:
Lat <u>4</u> ° <u>5</u> ' Description: W	SILO" LONG ? MUNS Res. W.	<u>2026 11.3 "</u> ust	Lat <u>41 ° 50 '</u> Description: Cul	AT " LONG ] WAT PA I-	12 ° 26 ' 14 - 44	<u>,0</u> "
RAIN IN LAST 24 HO	URS 🗆 Heavy rain	Steady rain	PRESENT CONDITIONS	□ Heavy rain □ Trace	Steady rain	☐ Intermittent ☐ Partly cloudy
SURROUNDING LAN	DUSE:	l 🗆 Commercial rse 🗆 Park	□ Urban/Residential □ Crop	□ Suburban/Res □ Pasture	Forested	□ Institutional
AVERAGE	CONDITIONS (che	ck applicable)	REACH S	SKETCH AND SI	TE IMPACT TR	ACKING
BASE FLOW AS % CHANNEL WIDTH	○ □25-50 %	□ 50%-75% □ 75-100%	Simple planar sketch c within the survey rec features c	of survey reach. Tra ach (OT, ER, IB,SC, deemed appropriate	eck locations and I UT, TR, MI) as w Indicate directio	Ds for all site impacts ell as any additional on of flow
DOMINANT SUBSTR. □ Silt/clay (fine or : ⊠ Sand (gritty) □ Gravel (0.1-2.5	ATE slick)	obble (2.5-10") oulder (>10") ed rock	Prairie OF	010 400	······	I-84
WATER CLARITY Stained (clear, no	Clear Turbic aturally colored) dyes) NO WATER	d (suspended matter) Opaque (milky) 2 IN MOLT D Repch	OUTFALL CHANNELS NOCUMENT SOR TLOW	prototic cu	10001174V	IATER
AQUATIC PLANTS IN STREAM	Attached: 🖾 non Floating: 🖾 non	e □ some □ lots e □ some □ lots	A	<u> </u>	5 (	
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beav □ Snails □ Othe	er 🛛 Deer r:	x L		1015	Solar Wallow Brow
STREAM SHADING (water surface)	Mostly shaded □ Halfway (≥50% □ Partially shaded □ Unshaded (< 25	(≥75% coverage) 6) d (≥25% ) 5%)			nue	Heree .
CHANNEL Dynamics	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour				First
Unknown	Aggrading Sed. deposition	Slope failure		N		New
CHANNEL Brain DIMENSIONS FIGU	Height: LT bank	<u>ho Book</u> (ft) <u>no Book</u> (ft)		ling for	it is the	
(FACING NO IT DOWNSTREAM)CHOMO OF HIE	Width: Bottom	$\frac{35}{6.5}$ (ft)	Li X	While W		
R	EACH ACCESSIBILI	ГУ	Dl.v.	M. TOL M.		
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockoile areas	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream.	C-	it left &	- TOOK Channel Nong Thus	Stream wisth is From L Thopsings
existing roads or trails.	small or distant from stream.	Specialized heavy equipment required.	NY I D	PLT L		9-15
NOTES: (biggest prob.	lem you see in survey	reach)	1 / Walkers Less	WOIR WYSY		

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Y	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamb surfaces covered by vegetatic disruption of streambank vegetation is very high; vegeta has been removed to 5 centimeters or less in avera- stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks both sides of the stream erodi a fast rate; erosion contributin significant amount of sedimen stream; obvious threat to prop or infrastructure.
MBOUR	Left Bank 10 9	8 7 6	5 4 3	2 1 0
- 1	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than banki not able to enter floodplain. Stream deeply entrenched.
	<u>20 19 18 17 10</u>	ALL BUFFEFP AND FLOODDLAD		
	Ontimal	Subartinal		
		Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: or no riparian vegetation due t human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegeta type is turf or crop land
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence o standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	No evidence of floodplain encroachment in the form of fill	Minor floodplain encroachment in the form of fill material, land development, or manmade structures	Moderate floodplain encroachment in the form of filling, land development, or	Significant floodplain encroachment (i.e. fill material, land development, or man-mac
Floodplain Encroach- ment	material, rand development, or manmade structures	but not effecting floodplain function	effect on floodplain function	floodplain function

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WATERSHED/SUBSHI	ED: Wolling	ZUSENTAV	DATE: 61410	ASSESSED BY	X: W LATST
JURVEY REACH ID:	WROL TI	ME: <u>/0</u> : <u>35</u> AM/PM	Рното ID: (Camera-F	Pic#) //6 /#	SC, GH, JS, C
SITE ID (Condition-#);	0 <u>7-0 </u> LA	NT <u>41° 50 · 577</u>	"LONG 72 ° 76 '14.0	LMK	GPS: (Unit ID
BANK: LT RT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete Ma PVC/Plastic Br Other:	SHAPE: Single etal Circular Double rick Elliptical Triple Other: Sec	DIMENSIONS: Diameter: SKAA	SUBMERGEI
Moderate Substantial	Open channel	Concrete Eart	hen Trapezoid I Parabolic V Other:	Depth:(ir Width (Top):(ir " (Bottom):(it	n) NOT APPEICABL
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BENTHIC C Brown O O Other: POOL QUALITY Good Odor Suds Alga Other:	GROWTH: None range Green : No pool s Colors O e Floatables
For     Color       Flowing     Turbing       ONLY     Float       Other     Example       Concerns:     New	R: Clea DITY: ONO ABLES: Non cess Trash (paper/pla eds Regular Mainter	r Brown Gree e Slight Cloudiness e Sewage (toilet pa astic bags) Dum nance Bank	y Yellow Green s Cloudy Opaque per, etc.) Petroleum nping (bulk) Excessive k Erosion Other:	Orange     Red       Orange     Red       (oil sheen)     Image: Comparison of the section       Sedimentation     Image: Comparison of the section       Image: Comparison of the section     Image: Comparison of the section	] Other: ] Other: SEIS
For     Color       Flowing     Turbi       ONLY     Float       OTHER     Exa       ONCERNS:     Nea       POTENTIAL RESTORATION     No	R:     Image: Clean of the clea	r Brown Gree e Slight Cloudiness e Sewage (toilet par astic bags) Durr aance Bank c Discharge investig Storm water retrofi	y Yellow Green s s Cloudy Opaque per, etc.) Petroleum nping (bulk) Excessive k Erosion Other: L gation Stream daylighting it Other: Cland	Orange       Red         Orange       Red         (oil sheen)       Image: Constraint on the second stream repairs of the second stream re	] Other: ] Other: 855 air/outfall stabilization 65 / Anges H
For     Color       Flowing     Turbing       ONLY     Float       OTHER     Exact       ONCERNS:     New       POTENTIAL RESTORA       Ino     If yes for daylighting:       Length of vegetative cov	R:     Clea       DITY:     Non.       ABLES:     Non.       cess Trash (paper/placeds Regular Mainternernernernernernernernernernernernerne	r Brown Grey e Slight Cloudiness e Sewage (toilet paj astic bags) Dum nance Bank E Discharge investig Storm water retroff	y Yellow Green s s Cloudy Opaque per, etc.) Petroleum nping (bulk) Excessive k Erosion Other: L gation Stream daylighting it Other: Clance	Orange       Red         (oil sheen)       [         Sedimentation       [         QCESSIVE       P         Local stream repairs       [         Local stream repairs       [         Local stream repairs       [         Slop       [	] Other: ] Other: & 5
FOR     COLOR       FLOWING     TURBI       ONLY     FLOAT       OTHER     Exa       ONCERNS:     Net       POTENTIAL RESTORA       Ano       If yes for daylighting:       Length of vegetative cov       If yes for stormwater:       Is stormwater currently of       Yes     No	R:     Clea       DITY:     Non.       ABLES:     Non.       cess Trash (paper/pla       eds Regular Mainter       additional control contro	r Brown Grey e Slight Cloudiness e Sewage (toilet paj astic bags) Dum ance Bank E Discharge investig Storm water retroff ft Type of Land Use Area ava	y Yellow Green s s Cloudy Opaque per, etc.) Petroleum nping (bulk) Excessive k Erosion Other: L gation Stream daylighting it Other: Clant ( existing vegetation: e description: milable:	Orange       Red         Orange       Red         (oil sheen)       []         Sedimentation       []         QCESSIVE       Person         Local stream repair       []         Local stream repair       []         Slop       []	] Other: ] Other: SEIS air/outfall stabilization (<   air/outfall stabilization (<
FOR       COLOR         FLOWING       TURBI         ONLY       FLOAT         OTHER       Exa         ONCERNS:       Net         POTENTIAL RESTORA       Net         If yes for daylighting:       Length of vegetative cov         If yes for stormwater:       Is stormwater currently of         Yes       No       No         OUTFALL       He         SEVERITY:       co         (circle #)       str	R:       Clea         DITY:       Non.         ABLES:       Non.         cess Trash (paper/placed)       Non.         ceds Regular Mainten       Non.         ver from outfall:       Non.         ver from outfall:       Non.         controlled?       Non.         t investigated       Non.         avy discharge with a distorn g smell. The amount of mared to the amount of eam; discharge appears inificant impact downstream.	Image:	y       Yellow       Green         y       Cloudy       Opaque         per, etc.)       Petroleum         nping (bulk)       Excessive         k Erosion       Other:         gation       Stream daylighting         it       Other:         ce description:	Orange       Red         Orange       Red         (oil sheen)       []         Sedimentation       []         Description       []	Other:         Other:         Sission         air/outfall stabilization         ission         ission         does not have dry weather         ge; staining; or appearance         ng any erosion problems.
FOR       COLOR         FLOWING       TURBI         ONLY       FLOAT         OTHER       Exc         ONCERNS:       Net         POTENTIAL RESTORA       Net         Ino       If yes for daylighting:         Length of vegetative cov       If yes for stormwater:         Is stormwater currently of       No       No         OUTFALL       He       Str         SEVERITY:       of       str         (circle #)       str       str         SKETCH/NOTES:       Str       Str	R:       Clea         DITY:       Non-         ABLES:       Non-         ABLES:       Non-         cess Trash (paper/plassing transmission)       Non-         ATION CANDIDATION       Non-         ver from outfall:	r Brown Gree e Slight Cloudiness e Sewage (toilet par astic bags) Durr aance Bank c Discharge investig Storm water retroff ft Type of Land Use Area ava inct color and/or a f discharge is significant normal flow in receiving to be having a am. 4	y       Yellow       Green         s       Cloudy       Opaque         per, etc.)       Petroleum         nping (bulk)       Excessive         k Erosion       Other:         gation       Stream daylighting         it       Other:         Cloudy       Other:         gation       Stream daylighting         it       Other:         cexisting vegetation:	Orange       Red         Orange       Red         (oil sheen)       []         Sedimentation       []         Description       []	Other:         Other:         SIS         air/outfall stabilization         SIS         air/outfall stabilization         SIS         does not have dry weather         ye; staining; or appearance         ng any erosion problems.         1
FOR       COLOR         FLOWING       TURBI         ONLY       FLOAT         OTHER       Exc         ONCERNS:       Net         POTENTIAL RESTORA       Net         Ino       If yes for daylighting:         Length of vegetative cov       If yes for stormwater:         Is stormwater currently of       No       No         OUTFALL       Her       Str         SEVERITY:       co       str         (circle #)       str       str         SKETCH/NOTES:       Str       str	R:       Clea         DITY:       Non         ABLES:       Non         ABLES:       Non         cess Trash (paper/pla         eds Regular Mainter         cess Trash (paper/pla         eds Regular Mainter         ver from outfall:         ver from outfall:         controlled?         t investigated         avy discharge with a dist         ong smell. The amount of         eard; discharge appears         inificant impact downstreat         5         BRA DED         ACUTYC         LOIS OF	r       Brown       Grey         e       Slight Cloudiness         e       Sewage (toilet pay         astic bags)       Durr         aance       Bank         2       Discharge investig         2       Discharge investig         3       Storm water retroff        ft       Type of         Land Use       Area ava         inct color and/or a       St         f discharge is significant       St         normal flow in receiving       di         am.       4         DEBRES       CHAN         A       DEBRES         A       DEBRES	y Yellow   gation Stream daylighting   it Other:   Qation Stream daylighting   it Other:   Cloudy Other:   gation Stream daylighting   it Other:   Cloudy Other:   gation Stream daylighting   it Other:   Cloudy Other:   gation Stream daylighting   it Other:   Cloudy Other:   ilable: Image is very small compared to the ow and any impact appears to be minor   3   MAL   4 Sup Acos H	Orange       Red         Orange       Red         (oil sheen)       []         Sedimentation       []         Description       []	Other:     Other:     Bit     air/outfall stabilization     bit     c:     o     does not have dry weather     ye; staining; or appearance     ng any erosion problems.     1     lvto

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Stream	Crossin

ng SC

	, <b>b</b> c = 2 ,									
WATERSHED	SUBSHED: Wolku's	Rescubir		DATE: <u>6</u>	14108	ASSE	SSED BY: JK, 6A, 15, El			
URVEY REA	CHID: WKO	TIME: :	_AM/PM	Рното П	D: (Camera-Pic	#)	1# 13 +14			
SITE ID: (Con	dition-#) SC <u>VI</u> LAT	<u>71° 60'54</u>	<u>_1" Long</u>	10 26 '	<u> 4.0 '' LN</u>	/IK	GPS (Unit ID)			
TYPE: X Ros	TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other									
FOR ROAD/	SHAPE: Arch Bottomless Box Elliptical Circular	# BARRELS: Single Double Triple	MATERIAL: Concrete Metal		NMENT: ow-aligned of flow-aligned o not know	DIMENS Barrel dia	IONS: ( <i>if variable, sketch</i> ) umeter: <u>2.0</u> (ft) Height:(ft)			
CROSSINGS ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Downstream	n scour hole ankment	CULV Fla Sli Culv	/ERT SLOPE: at ght $(2^{\circ} - 5^{\circ})$ avious (>5°)	Culvert le Roadway	ength: <u>65D</u> (ft) Width:(ft) elevation: <u>20</u> (ft)			
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv repair 🕅 Oth	vert repair/rep er: Lema	placement [] U ave Debizij	Ipstream st	torage retrofit			
15 SU ACTINO	A GRADE CONTROL		es 📋 Unk	nown		*****	1 11			
If yes for fish barrier	EXTENT OF PHYSICAL BLC         Total       Partial         Temporary       Unknow         CAUSE:       Drop too high         Water Di       Flow too shallow         Water D       Other	wn rop: (in) epth: (in)	A structure such road culvert on a greater stream bi upstream moven anadromous fish passage device p	BLO as a dam or 3rd order or ocking the lent of no fish oresent.	A total fish blockag tributary that would significant reach o or partial blockage interfere with the r anadromous fish.	ge on a d isolate a f stream, that may nigration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.			
) N			5		4 3		2 1			
INUTES/SKET										
)					REPORT	ED TO AU	THORITIES 🗌 YES 🗌 NO			

SURVEY REACH ID: <u>W202</u> WTRSHD/SUBS	ID: Workers Reservir	Date: <u>6/</u> 4/	OB ASSESSED BY	RI
START TIME: 11 : 35 AM/PM LMK	: <i>END</i> <b>TIME</b> :	1:40 AM/PM	LMK:	GPS ID:
LAT <u>41° 50 ' 54.3</u> " LONG <u>26</u>	264" LAT 41 0 51) 1	<u>52.0</u> " LONG <u>72°</u>	26 . 23. 9"	
DESCRIPTION: I-84 CULVART	DESCRIPTION:	84 Colvert	Sedge Ferd Pore	>
RAIN IN LAST 24 HOURS 🗆 Heavy rain 🛛 🕅 Steady	rain <b>PRESENT CONDITIONS</b>	🗆 Heavy rain 🛛 🕱	Steady rain 🗆 Inter	rmittent
□ None □ Intermittent □ Trace	Clear	Trace 🗌	Overcast  Part	tly cloudy
SURROUNDING LAND USE:  Industrial Cot Golf course Park	nmercial 📋 Urban/Residential	⊠Suburban/Res □ □ Pasture □	Forested □ Insti Other: Hickwaa	tutional
AVERAGE CONDITIONS (check applicable,	REACH	SKETCH AND SITE I	MPACT TRACKING	3
Base Flow as %         □ 0-25%         ⊠ 50%-           Channel Width         □ 25-50 %         □ 75-	75% Simple planar sketch of 100% within the survey rea features	of survey reach. Track lo ach (OT, ER, IB,SC, UT, 1 deemed appropriate Ind	cations and IDs for all TR, MI) as well as any licate direction of flow	site impacts additional
DOMINANT SUBSTRATEIp (pp)Silt/clay (fine or slick)A Cobble (2.5 -1)Sand (gritty)Boulder (>10"Gravel (0.1-2.5")Bed rock	0") )	accinca appropriate. Tha		
WATER CLARITY Clear Turbid (suspended) Stained (clear, naturally colored) Opaque (m. Other (chemicals, dyes)	natter) Iky)		X 5M	ells wit/s
AQUATIC PLANTSAttached: ⊠ none □ someN STREAMFloating: ☑ none □ some	□ lots □ lots		culyice 5	She he
WILDLIFE IN OR (Evidence of) AROUND STREAM STREAM STREAM	r	1-94	A Just 2121	
XMostly shaded ( $\geq$ 75% coverSTREAM SHADING $\Box$ Halfway ( $\geq$ 50%)water surface) $\Box$ Partially shaded ( $\geq$ 25%)	rage)	Sack	INTO CITCO DIANN	Jar
□ Unshaded (< 25%)		A- ~ >	entron -	IS SE
CHANNEL Downcutting Bed	scour	1875	and the first and the contract of the second s	n της ματική της της παραγολημητής της της της της της της της της της τη
DYNAMICS Widening Banl	failure	JUAN	5601	
hannel only 25+ Headcutting Banl	scour	WYD IN	7.51	
Unknown	e failure melized	1		
HANNEL Height: LT bank (1, 0	(ft)		CHOIN LIN	JK -
DIMENSIONS RT bank 1.0	(ft)	$\gamma$ $h$ .	Fence	Nº.
FACING Width: Bottom	(ft)	1 1 ron	NR 5	
Top d d	(ft)	y's	10/2	-
REACH ACCESSIBILITY			202	
Cond: Open area in Fair: Forested or Difficult. Mus	t cross	1.01+	) dr	
ublic ownership, developed area wetland, steel	slope, or			
adjacent to stream.   Sensitive area	areas to		- s.t	
asy stream channel removal or impact to stockpile avai	able		- nett	
ccess for heavy landscaped areas and/or located distance from	a great		aw.	
upment using small or distant from Specialized h	Bayy			
equipment rec	uired.		(DIN AN N	
<u>5 4 (3) 2</u>		<u>56254</u>	ICH PUR'S	
(orgest problem you see in survey reach)				

		OVERALL STREAM COND	ITION			
\	Optimal	Suboptimal	Marginal	Poor		
N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0		
	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0		
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.		
	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
<b>r</b>	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land		
	20 19 18 17 16	15 14 13 12 (1)	10 9 8 7 6	5 4 3 2 1 0		
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Encroach- ment	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0		
Sub Total In-st	ream: <u>47</u> /80 + Bu	uffer/Floodplain: <u>33</u> /80	= Total Survey	Reach/160		

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Stream	Cros	sing

Stream Crossing	SC

WATERSHED	SUBSHED: WONCA'S R	Scudir		DATE: 6	14104	ASSE	SSED BY: 14, 64, JS, 72
URVEY REA	CHID: WRO2	<u>ТІМЕ: // : 48</u>	DAM/PM	Рното ID	: (Camera-Pic	c #)	/#
SITE ID: (Con	dition-#) SC- <u>D</u> LLAT	<u>410 50 57</u>	2 <u>0</u> " LONG <u>7</u>	<u>2° 26 '</u>	<u>23.9</u> " Li	мк	GPS (Unit ID)
TYPE: X Roa	ad Crossing 🔲 Railroad Crossi	ng 🗌 Manmade	Dam 🗌 Beave	r Dam 🔲	Geological For	nation	Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:	ALIGI Flo	NMENT: w-aligned t flow-aligned not know	DIMENSI Barrel dia	ONS: (if variable, sketch) meter: <u>4 ft</u> (ft) Height:(ft)
ONLY	CONDITION: (Evidence of)	n 🔲 Downstrear	n scour hole bankment	CULV Fla	ERT SLOPE: t ght $(2^\circ - 5^\circ)$ vious (>5°)	Roadway	Width:(ft) elevation: <u>کے(ft</u> )
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culve repair 🔲 Other	ert repair/rep 	olacement 🔲 (	Jpstream st	orage retrofit
IS SC ACTING	G AS GRADE CONTROL	No Y	es 🗌 Unkn	own			
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVEF	RITY: (circi	le #)
If yes for fish barrier	Total Partial     Temporary Unknow CAUSE:     Drop too high Water Da     Flow too shallow Water Da     Other:	vn rop: (in) epth: (in)	A structure such as road culvert on a 3 greater stream bloc upstream moveme anadromous fish; r passage device pre	s a dam or rd order or cking the nt of no fish esent.	A total fish blocka tributary that wou significant reach o or partial blockage interfere with the anadromous fish.	ige on a Id isolate a of stream, e that may migration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
) Notes/Supt			5	4	3		2 1
)					Repor	TED TO AUT	
							4

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SURVEY REACH	D:WRO3 WI	RSHD/SUBSHD: Ma	Lec's Reserving DATE: 61	3 108 ASSESSED BY: Row
START TIM LAT <u>41 ° 51 '</u> DESCRIPTION: 1 <sup>97</sup>	1E: <u>3:10</u> AM/PM 07:1." Long <u>7</u> (lach upstraam	1) LMK: 2 • 25 · 44.4 " Prom Roservery	END         TIME: 3 : 35 AM/PI           LAT 410         51 ' 07% " LONG           DESCRIPTION: End Breach	A) LMK: GPS ; 72 ° 25 ' 42 (" st Culvent
RAIN IN LAST 24 HC	OURS 🗆 Heavy rain	□ Steady rain □ Trace	PRESENT CONDITIONS  Heavy ra	in 🗆 Steady rain 🗆 Intermittent
SURROUNDING LAN	DUSE: 🗆 Industria 🗆 Golf cou	Commercial rse Park	□ Urban/Residential □ Suburban/R □ Crop □ Pasture	es ⊠ Forested □ Institutional ☑ Other: &d Filer⊃
AVERAGE	CONDITIONS (che	ck applicable)	REACH SKETCH AND	SITE IMPACT TRACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	□ 50%-75% <b>⊠</b> 75-100%	Simple planar sketch of survey reach. within the survey reach (OT, ER, IB, features deemed appropri	Track locations and IDs for all site impo SC, UT, TR, MI) as well as any addition ate. Indicate direction of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) □ Co □ Bo 5") □ Be	bbble (2.5 –10") bulder (>10") ed rock	N dul	
WATER CLARITY Stained (clear, n Other (chemicals,	Clear □Turbic aturally colored) □ dyes)	l (suspended matter) Opaque (milky)	2 3 CLOUD Simprop	Very muck y per
AQUATIC PLANTS IN STREAM	Attached: 🗌 non Floating: 🖾 none	e $\square$ some $\square$ lots e $\square$ some $\square$ lots	5 15 4 AUOS	h kepsen
WILDLIFE IN OR AROUND STREAM	(Evidence of) □/Fish ☑ Beave □/Snails □.Other	er ⊡ Deer : Bycs S		29
STREAM SHADING (water surface)	⊠ Mostly shaded ( □ Halfway (≥50% □ Partially shaded □ Unshaded (< 25	(≥75% coverage) )) (≥25%) %)	L 2051 Della	•
CHANNEL DYNAMICS	Downcutting Widening Headcutting Aggrading Sed. deposition	Bed scour Bank failure Bank scour Slope failure Channelized	Superior Superior	
CHANNEL DIMENSIONS	Height: LT bank RT bank	<u>2.0</u> (ft) <u>2.35</u> (ft)	E H25 th - Will some	
DOWNSTREAM)	Width: Bottom Top	<u> </u>	and Brugs	
<b>Good:</b> Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	REACH ACCESSIBILIT Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.	policie de la companya de la company	S.
5 (2 NOTES: (biggest prob	3 2 olem you see in survey	reach)	100 17 22	
			Brp	OPTED TO AUTHODITIES 🗖 VES K

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	Optimal	Suboptimal	Marginal	Poor	
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habita of habitat is obvious; substra unstable or lacking.	
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1	
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream surfaces covered by vegetat disruption of streambank vegetation is very high; vege has been removed to 5 centimeters or less in aver stubble height.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall bank both sides of the stream eroc a fast rate; erosion contributi significant amount of sedime stream; obvious threat to pro or infrastructure.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) n <b>ot</b> able to enter floodplain. Stream deeply entrenched.	High flows (greater than bank not able to enter floodplain. Stream deeply entrenched.	
	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1	
	Over	ALL BUFFER AND FLOODPLA	IN CONDITION		
	Optimal	Suboptimal	Marginal	Poor	
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet or no riparian vegetation due human activities.	
	Left Bank 10 9	8 7 6	5 4 3	2 1 0	
	Right Bank 10 9	8 7 6	5 4 3	2 1 0	
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain veget type is turf or crop land	
	20 19 18 17 16	15 14 13 12 (1)	10 9 8 7 6	5 4 3 2 1 0	
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence standing/ponded water	
	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 (	
FLOODPLAIN	No evidence of floodplain encroachment in the form of fill material, land development, or	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill materia land development, or man-ma structures). Significant effect	
Encroach- ment	manmade structures		effect on floodplain function	floodplain function	

JURVEY REACH II	HED: Wolkiz	RESEVOIT	DATE: <u>6</u> <u>7</u>	_/_O_{{ Assesse	D BY: 35. 64	4,707
and the second	»: WR03	TIME: 3 : 35 AM/RN	4 Рното ID: (Сате	era-Pic #) -# 4	/#	
SITE ID (Condition-#	): OTOI	Lat <u>4  ° 5  ' 7.8</u>	1" LONG 72 ° 25 ' 4	12.5/" LMK	GPS:	(Unit ID)
BANK: LT ART Heat FLOW: None Tric	the TYPE:	MATERIAL: Concrete X PVC/Plastic Other:	SHAPE: Sir Metal Circular D Brick SElliptical Tr Other:	ngle <b>DIMENSIO</b> ouble iple Diameter: <u>4</u>	NS: SUI	BMERGED: No Partially Fully
Moderate Substantial Other:	Dpen channel	Concrete Ea	arthen Trapezoid Parabolic Other:	Depth: Width (Top): " (Bottom):	(in) (in) NOT (in)	APPESCABLE
CONDITION:	ODOR: MN	0 <b>DEPOSITS/STAINS</b> One Oily Description	S: VEGGIE DENSITY	PIPE BENTH           Brown           Other:	IIC GROWTH:	None Green
Peeling Paint     Corrosion     Other:	Sulfide	Ir Paint Other:	Inhibited Excessive Other:	POOL QUAL Good G Suds G Other: Cor	ITY: ☐ No p Ddors ☐Color Algae ☐ Floar	pool rs □Oils tables
ONLY     Top       OTHER     I       CONCERNS:     I	ATABLES: 2015 Excess Trash (paper, Needs Regular Main	one Sewage (foilet ) /plastic bags) Du	ess Cloudy Opac paper, etc.) Petro umping (bulk) Exce ank Erosion Othe	que leum (oil sheen) essive Sedimentation r:	Other;	
ONLY FLC OTHER DI CONCERNS: DI POTENTIAL RESTO	PATABLES: DATABLES: DATABL	one       Single Column         one       Sewage (toilet j         /plastic bags)       Du         itenance       Ba         ATE       Discharge invest	ass       Cloudy       Opac         paper, etc.)       Petro         umping (bulk)       Exce         ank Erosion       Othe         stigation       Stream daylight	que leum (oil sheen) ssive Sedimentation r: ing 🔲 Local stream	Other;	stabilization
ONLY FLC OTHER DI CONCERNS: DI POTENTIAL RESTOR	PATABLES:	one       Singit Coolumn         one       Sewage (toilet j         /plastic bags)       Du         itenance       Ba         ATE       Discharge inves         Storm water retr	ess Cloudy Opac paper, etc.) Petro umping (bulk) Exce ank Erosion Othe stigation Stream daylight ofit Other:	que leum (oil sheen) essive Sedimentation r: ing  Local stream	Other:	stabilization
ONLY     TU       ONLY     FLC       OTHER     I       CONCERNS:     I       POTENTIAL RESTO       Ino       If yes for daylightim       Length of vegetative of	DATABLES: DATABLES: Excess Trash (paper Needs Regular Main PRATION CANDIDA g: cover from outfall:	one       Signe Coolumn         one       Sewage (toilet j         /plastic bags)       Du         itenance       Ba         ATE       Discharge inves         Storm water retr        ft       Type of	ess Cloudy Opac paper, etc.) Petro umping (bulk) Exce ank Erosion Othe stigation Stream daylight ofit Other:	que leum (oil sheen) essive Sedimentation r: ing Docal stream	Other:	stabilization
ONLY     TU       ONLY     FLC       OTHER     I       CONCERNS:     I       POTENTIAL RESTO     I       Ino     If yes for daylightim       Length of vegetative of     I       If yes for stormwate     I       Is stormwater current     I	PATABLES: Excess Trash (paper Needs Regular Main PRATION CANDID g: cover from outfall: ??: ly controlled? Not investigated	one       Single Column         one       Sewage (toilet j         /plastic bags)       Du         itenance       Ba         ATE       Discharge inves         Storm water retr       ft         ft       Type of         Land U         Area a	sssCloudyOpac paper, etc.)Petro umping (bulk)Exce ank ErosionOthe stigationStream daylight ofitOther: of existing vegetation: Use description:	que leum (oil sheen) essive Sedimentation r: ing Local stream	Other:	stabilization
ONLY     TU       ONLY     FLC       OTHER     I       CONCERNS:     I       POTENTIAL RESTONE     I       Ino     If yes for daylighting       Length of vegetative of     Is stormwater       If yes for stormwater     I       Ves I No     I       OUTFALL     SEVERITY:       (circle #)     I	DATABLES: Excess Trash (paper Needs Regular Mair. Needs Regular Mair. DRATION CANDIDA ag: cover from outfall: 27: ly controlled? Not investigated Heavy discharge with a strong smell. The amoun compared to the amoun stream; discharge appe significant impact downs	one       Signit Coolumn         one       Sewage (toilet j         /plastic bags)       Du         itenance       Ba         ATE       Discharge invest         Storm water retr       ft         ft       Type of         Land U       Area a         distinct color and/or a       nt of discharge is significant         to f normal flow in receiving ars to be having a stream.       stream.	ass       Cloudy       Opac         paper, etc.)       Petro         umping (bulk)       Exce         ank Erosion       Othe         stigation       Stream daylight         ofit       Other:         of existing vegetation:	que       leum (oil sheen)         leum (oil sheen)       essive Sedimentation         r:       ing □ Local stream         ing □ Local stream       of         r and odorless. If the the amount of to the stream's base eninor / localized.       O	Other:     Other:     Slope:      utfall does not have     scharge; staining; c     causing any erosic	e dry weather properance on problems.

SURVEY REACH	<b>D: <u>W</u>2O4</b>   Wtf e: <u>8:52</u> ам/рм	RSHD/SUBSHD: With LMK:	IKER RESCUDIR         DATE:         6/4/08         ASSESSED BY:           END         TIME:         9:         4/08         35,6A 767,308           END         TIME:         9:         4/08         LMK:         GPS ID:
LAT 41 ° 51 '	7.56" LONG 7	20 25 14256"	LAT 41 ° 5] ' 13.3 " LONG 72 ° 25 ' 45.3"
DESCRIPTION: 50	ret of Rench 1	of CULVURT	DESCRIPTION: Culvert pt BL767 7242 I-84
RAIN IN LAST 24 HC	DURS 🗆 Heavy rain	Steady rain	PRESENT CONDITIONS       Heavy rain       Steady rain       Intermittent         Clear       Trace       Overcast       Partly cloudy
SURROUNDING LAN	DUSE: Industrial	□ Commercial se □ Park	□ Urban/Residential □ Suburban/Res □ Forested □ Institutional □ Crop □ Pasture ♀ Other: □ 07 Tean+Commute
Average	CONDITIONS (chec.	k applicable)	REACH SKETCH AND SITE IMPACT TRACKING
BASE FLOW AS % CHANNEL WIDTH	□ 0-25% □25-50 %	⊠ 50%-75% □ 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow
DOMINANT SUBSTR Silt/clay (fine or Sand (gritty) Gravel (0.1-2.5	ATE slick) □ Col 5") □ Be	oble (2.5 –10") ulder (>10") ł rock	
WATER CLARITY	$\Box \text{ Clear }  \text{Turbid}$ aturally colored) $\Box ($ dyes)	(suspended matter) Dpaque (milky)	
AQUATIC PLANTS IN STREAM	Attached: $\Box$ none Floating: $\Box$ none	$\boxtimes$ some $\square$ lots $\boxtimes$ some $\square$ lots	
WILDLIFE IN OR AROUND STREAM	(Evidence of) □ Fish □ Beave □ Snails 🔯 Other:	r 🗆 Deer Chropp 6ecser V	and some and the second s
STREAM SHADING (water surface)	□ Mostly shaded (2 □ Halfway (≥50%) ऄ Partially shaded □ Unshaded (< 25%	≥75% coverage) (≥25% ) %)	2×1+ 67
CHANNEL Dynamics	Downcutting Widening Headcutting	Bed scour Bank failure Bank scour	- RIPURAPUSTO V SUPERX
Unknown	Aggrading	Slope failure	Laiota Laiota L
	Height: LT bank BT bank	$\frac{NOBOON}{(ft)}$	Contain which we we
(FACING	Width: Bottom	구 (ft)	
DUWNSI REAIVI)	Тор	(ft)	10P The art V
R	EACH ACCESSIBILIT	¥	(in winny channels fill of
Good: Open area in public ownership, sufficient room to	Fair: Forested or developed area adjacent to stream. Access requires tree	Difficult. Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to	First culouit surrounsid
stockpile materials, easy stream channel access for heavy	removal or impact to landscaped areas.	stockpile available and/or located a great	By 1575 of AMANIN Drive
equipment using existing roads or trails.	small or distant from stream.	Specialized heavy equipment required.	Roserver DI
	<u>4 3 2</u>	1	June Mill FO
INOTES: (biggest prob	piem you see in survey re	each)	

\$

	Optimal	Suboptimal	Marginal	Poor		
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.		
	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0		
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streamban surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatic has been removed to 5 centimeters or less in average stubble height.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to propert or infrastructure.		
	Left Bank 10 9	8 7 6	5 4 3	2 1 0		
	Right Bank 10 9	8 7 6	5 4 3	2 1 0		
Floodplain Connection	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull not able to enter floodplain. Stream deeply entrenched.		
	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	Over	ALL BUFFER AND FLOODPLAI	IN CONDITION			
	Optimal	Suboptimal	Marginal	Poor		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: litt or no riparian vegetation due to human activities.		
	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0		
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0		
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field Wettows Plants	Predominant floodplain vegetatic type is turf or crop land		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
FLOODPLAIN Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water		Either all wetland or all non- wetland habitat, no evidence of standing/ponded water		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
	No evidence of floodplain	Minor floodplain encroachment in the	Moderate floodplain encroachment in the form of	Significant floodplain encroachment (i.e. fill material,		
7LOODPLAIN Encroach- 4ent	encroachment in the form of fill material, land development, or manmade structures	development, or manmade structures, but not effecting floodplain function	filling, land development, or manmade structures, some effect on floodpla <u>in</u> function	land development, or man-made structures). Significant effect on floodplain function		

				Stor	m Water	Outfalls	ΟΤ
WATERSHED/SUBSHE	D: Wallars	Reservoir	1	DATE: 1014 105	Asses	SED BY:	FrinnAc
SURVEY REACH ID:	NR OY T	'IME: 9:18 AM/PM	I	Рното ID: (Camera-Pi	c #)	/# 7	, 8
SITE ID (Condition-#): (	DT- <u>02</u> L	AT 41 . 51 . 12. 8	UN	G 72 0 25 1 45.4"	LMK_		GPS: (Unit ID)
BANK: LT MRT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete M PVC/Plastic B: Other:	[etal [ rick [	SHAPE: Single Circular Double Elliptical Triple	<b>DIMENS</b> Diameter	IONS:	SUBMERGED:
Moderate Substantial Other:	Open channel	Concrete Eart	then [	] Trapezoid Do Darabolic W ∑Other: גוף צמף יי	epth: idth (Top): (Bottom):	<u>(in)</u> (in) (in)	NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: M NO Gas Sewage Rancid/Sour Sulfide Other:	DEPOSITS/STAINS: None Oily Flow Line Paint Other:		VEGGIE DENSITY: None Normal Biffusion <sup>1</sup> Inhibited Excessive Other:	PIPE BEN Brown Other: POOL QU Good Suds Other: Other:	THIC GRO Orang ALITY: [ Odors [ Algae [	WTH: [] None         ge [] Green         Image: Image of the state of the stat
For     Color       FLOWING     TURBIN       ONLY     FLOAT       OTHER     Exc       ONCERNS:     Nec	Cle DITY: Cle No ABLES: No ABLES: No ABLES: No Clear Mainte	ar Brown Gre ne Slight Cloudiness ne Sewage (toilet pa lastic bags) Dur enance Ban	y s nper, etc. nping (b k Erosio	Yellow  Green    Cloudy  Opaque    .)  Petroleum (    .)  Excessive S    .)  Other:	Orange 🔲 oil sheen) Sedimentatic	Red 🗌 Ot	iher:
POTENTIAL RESTORA	TION CANDIDAT	TE   Discharge investi     Storm water retrol	igation [ fit [	Stream daylighting [ Other:	Local stre	am repair/c	outfall stabilization
<i>If yes for daylighting:</i> Length of vegetative cov	er from outfall:	ft Type of	existing	g vegetation:		Slope:	o
If yes for stormwater: Is stormwater currently c ☐ Yes ☐ No ☐ Not	ontrolled? investigated	Land Us Area ava	se descri ailable:	iption:	<del>7/10/1</del>		
OUTFALL He SEVERITY: con (circle #) stra sig	avy discharge with a di ong smell. The amount npared to the amount or aam; discharge appear nificant impact downstr	stinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam.	Small disch lischarge h lischarge i low and ar	harge; flow mostly clear and od has a color and/or odor, the am is very small compared to the st ny impact appears to be minor /	orless. If the ount of ream's base localized.	Outfall does discharge; si of causing a	not have dry weather taining; or appearance ny erosion problems.
SKETCH/NOTES	5	4		3	2	2	1
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WANFDOUED/OUDOUED	·///all/a à	Pacarenia	DATE lo 14 1		
SHDVEV REACH ID.	10 oct	MAR. Q. DECANATRA	DATE: <u>U</u> / <u>7</u> /	ASSESSED BY:	rilnd
SITE ID (Condition #): O	$T_{-}0!$	AT 2 0 SAMPPM	"LONG 70 ° 15 1 15	$\frac{1-P(C\#)}{1}$	$\frac{1}{GPS}$
Битень (солилон-т). С					
BANK:         Image: Head           LT         RT         Head           FLOW:         Image: Trickle         Trickle	TYPE:	MATERIAL: ☐ Concrete ☐M ☐ PVC/Plastic ☐Bi ☐ Other:	SHAPE: Single etal Circular Doul rick Elliptical Tripl	e <b>DIMENSIONS:</b> ble Diameter: $3^{(h)}$ (in)	SUBME
Moderate Substantial	Dpen channel	Concrete Eart	hen Trapezoid Parabolic Other:	Depth: <u>(in)</u> Width (Top): <u>(in)</u> " (Bottom): <u>(in)</u>	NOT APP
CONDITION:	ODOR: No	DEPOSITS/STAINS:	VEGGIE DENSITY:	PIPE BENTHIC GRO	WTH: 🗹 ge 🗌 Gree
Corrosion	Sulfide	Paint Other:	C Inhibited	POOL QUALITY:	] No pool ]Colors ] Floatable
ONLY FLOATA OTHER Exce CONCERNS: Need	BLES:	ne Sewage (toilet pa plastic bags) Dun enance Ban	per, etc.)	um (oil sheen) Ot	her:
ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       no	BLES:    Noi SS Trash (paper/p Is Regular Mainte FION CANDIDAT	ne Sewage (toilet pa lastic bags) Dun enance Ban FE Discharge investi	per, etc.)	um (oil sheen)  Ot ive Sedimentation g  Local stream repair/o	her: utfall stabi
ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT     Ino       If yes for daylighting:     Length of vegetative cove       If yes for tormwater:     If yes for tormwater:	BLES:   _ Noi ss Trash (paper/p ls Regular Mainte FION CANDIDAT or from outfall: _	ne Sewage (toilet pa lastic bags) Dun enance Banl TE Discharge investi Storm water retrof	per, etc.)	in (oil sheen) Ot ive Sedimentation g DLocal stream repair/o Slope:	her: utfall stabi
ONLY     FLOATA       OTHER     Exce       CONCERNS:     Need       POTENTIAL RESTORAT       no       If yes for daylighting:       Length of vegetative cove       If yes for tormwater:       Is stormwaer currently co       Yes     No	BLES: Noi SS Trash (paper/p Is Regular Mainte FION CANDIDAT FION CANDIDAT FION CANDIDAT FION CANDIDAT FION CANDIDAT	ne Sewage (toilet pa plastic bags) Dun enance Banl TE Discharge investi Storm water retrof ft Type of Land Us	per, etc.)  Petroleu nping (bulk)  Excessi k Erosion  Other: gation  Stream daylighting it  Other: existing vegetation: e description:	um (oil sheen)         Ot ive Sedimentation g	her:
UNLY       FLOATA         OTHER       Exce         CONCERNS:       Need         POTENTIAL RESTORAT       Ino         If yes for daylighting:       Length of vegetative cove         If yes for itormwater:       Is stormwaer currently co         Yes No       Not         OUTFALL       Heat         SEVERITY       com         (circle #)       strong	BLES:   Noi SS Trash (paper/p Is Regular Mainte FION CANDIDAT FION CANDIDAT Pr from outfall: ontrolled? investigated vy discharge with a di ng smell. The amount pared to the amount of ami, discharge appear ificant impact downstr	ne Sewage (toilet pa plastic bags) Dun enance Banl TE Discharge investi Storm water retrof ft Type of Land Us Area ava istinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam.	per, etc.)  Petroleu nping (bulk)  Excessi k Erosion  Other: gation Stream daylighting it Other: existing vegetation: e description: mall discharge; flow mostly clear ar ischarge has a color and/or odor, the ischarge is very small compared to to ow and any impact appears to be mi	um (oil sheen)       Ot         ive Sedimentation	her: utfall stabi not have dry v iaining; or app ny erosion pro
UNLY       FLOATA         OTHER       Exce         ONCERNS:       Need         POTENTIAL RESTORAT       Ino         If yes for daylighting:       Length of vegetative cove         If yes for itormwater:       Is stormwaer currently co         Yes       No         OUTFALL       Heat         SEVERITY       corr         (circle #)       strong         SKETCH/NETEC       SKETCH/NETEC	BLES: Nor ss Trash (paper/p ls Regular Mainte FION CANDIDAT on trolled? investigated vy discharge with a di ng smell. The amount pared to the amount of am; discharge appear ificant impact downstr 5	ne Sewage (toilet pa plastic bags) Dun enance Ban TE Discharge investi Storm water retrof ft Type of Land Us Area ava istinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam. 4	per, etc.)       Petroleu         nping (bulk)       Excessi         k Erosion       Other:         gation       Stream daylighting         it       Other:         existing vegetation:	um (oil sheen)       Ot         ive Sedimentation	her: hutfall stabi not have dry v laining; or app ny erosion pro
UNLY       FLOATA         OTHER       Exce         ONCERNS:       Need         POTENTIAL RESTORAT       Ino         Ino       If yes for daylighting:         Length of vegetative cove       If yes for tormwater:         Is stormwaer currently co       Yes No         Yes       No         OUTFALL       Hea         SEVERITY:       corr         (circle #)       strong         SKETCH/NOTES:       Strong	BLES: Nor ISS Trash (paper/p IS Regular Mainte IS Regular Mainte FION CANDIDAT FION CANDIDAT ontrolled? investigated vy discharge with a din pared to the amount of am, discharge appear ificant impact downstr 5	ne Sewage (toilet pa plastic bags) Dun enance Banl TE Discharge investi Storm water retrof ft Type of Land Us Area ava istinct color and/or a of discharge is significant of normal flow in receiving s to be having a eam. 4	per, etc.)       Petroleu         nping (bulk)       Excessi         k Erosion       Other:         gation       Stream daylighting         it       Other:         existing vegetation:	am (oil sheen)       Ot         ive Sedimentation	her:



		.0	Γ.	~ /				
WATERSHED	SUBSHED: (A) A VLIGS	Keservoir	0	DATE: <u>(</u>	14/08	ASSES	SED BY: Y	iends
JURVEY REA	CHID: WKO4	<u>  TIME: X : 52</u>	AM/PM	PHOTO III	<b>):</b> (Camera-Pic	:#) 伝表	/# /,`;	2
SITE ID: (Con	udition-#) SC- <u>0</u>   LAT	<u>41°51 '7.5</u>	" LONG /_	2022 !	<u>42.8</u> " LI	ИК	GPS (Ur	ıit ID)
					<u> </u>		0.1	
IIIE. MAD			Dam Beaver		Geological Forn		Other:	
	Arch Bottomless	# DARRELS:	MATERIAL:		NMENT:	DIMENSI Barrel dia	ONS: (if varial meter: 4.	ole, sketch)
	Box Elliptical	Double	Metal		t flow-aligned		Height	(II) (ff)
FOR ROAD/	Circular	Triple	Other:	Do	not know			(II)
CROSSINGS			L	Curr		Culvert ler	ngth: 6	Ə (ft)
ONLY	Condition. (Evidence of)	n 🗖 Downstream	a coour bolo		it	,	Width:	(ft)
	Sediment deposition	Failing emb	ankment	🔲 Sli	ght $(2^{\circ} - 5^{\circ})$			
	Other ( <i>describe</i> ):			ОЪ	vious (>5°)	Roadway	elevation:	<u>50 (ft)</u>
					L			
POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	moval 🔲 Culve	rt repair/rep	placement 🔲 U	Jpstream sto	orage retrofit	
no			epair 🛛 Other	: Mainter	Nonal to	Remar	Pulum 2	rve
IS SC ACTING	G AS GRADE CONTROL	MNO Y	es 🗌 Unkn	own	storting to	clos p	ipe	
	EXTENT OF PHYSICAL BLC	OCKAGE:		BLO	CKAGE SEVER	ITY: (circl	e #)	
	Temporary Unknow	wn	A structure such as	a dam or	A total fish blocka	ge on a	A temporary bar	rier such as a
If yes for			road culvert on a 3 greater stream bloc	rd order or cking the	tributary that would	d isolate a	beaver dam or a the very head of	blockage at
fish barrier	CAUSE:	ron: (in)	upstream movemer	nt of	or partial blockage	that may	very little viable	ish habitat
	Flow too shallow Water D	epth: (in)	passage device pre	esent.	anadromous fish.	nigration of	above it; natural as waterfalls.	barriers such
<u>```</u>	Other:		5		4 2		<u></u>	
NOTES/SKET	CH:				<u> </u>		<u> </u>	<u></u>
								1
2								
						*		
)					P			
Ľ <u></u>	an ang ang ang ang ang ang ang ang ang a				KEPORT	ED TO AUT	HORITIES	YES NO

Stream Crossing SC

WATESHED/SUBSHED: []]       []		P \$ 2 \$ 2	0							
SIRREY REACH ID: U.S. (2.4)       ITME: (1.22.2)       INOR 72.2 (2.4)       INT       GPS (Unit ID)         SIRE ID: (Conductive)       SC. Q.2.       INT       GPS (Unit ID)       GPS (Unit ID)         SIRE ID: (Conductive)       SC. Q.2.       INT       GPS (Unit ID)       GPS (Unit ID)         TYPE: [S] Road Crossing [] Railroad Crossing [] Mammade Dam ]       Beave Dam ]       Geological Formation ]       Other:         Arch ]       Barrel diameter: [] (C)       [] (C)       [] (Conductive)	WATERSHED	SUBSHED: Nallas	Keservoir		DAT	ге: _(_	14108	ASSE	SSED BY: Frin	nds
STE ID: (Conditioned):       SC_Q2	<b>SURVEY REA</b>	CHID: WROY	TIME: <u>9</u> :23	AM/PM	Рно	ото ID	:(Camera-Pic	: #)	/# 9,10	)
TYPE: S Read Crossing Railroad Crossing Mannuade Dam Beaver Dum Geological Formation Other:       Other:       # BARRELS:       MATERIAL:       MATERIAL:       Concrete Material       Display       Display       Display       Barrel display       Display <td< td=""><td>SITE ID: (Con</td><td>dition=#) SC-<u>O</u> LAT</td><td>41.0 51 13.</td><td><u>.3</u>" Long ]</td><td>1200</td><td>25 !</td><td><u>45.3"</u> LI</td><td>мк</td><td>GPS (Unit )</td><td><i>ID</i>)</td></td<>	SITE ID: (Con	dition=#) SC- <u>O</u> LAT	41.0 51 13.	<u>.3</u> " Long ]	1200	25 !	<u>45.3"</u> LI	мк	GPS (Unit )	<i>ID</i> )
SNAFE:       Box       Box <t< td=""><td>TYPE: 🗹 Roa</td><td colspan="8">TYPE: 🕅 Road Crossing 🔲 Railroad Crossing 🗌 Manmade Dam 📄 Beaver Dam 🗌 Geological Formation 🔲 Other:</td></t<>	TYPE: 🗹 Roa	TYPE: 🕅 Road Crossing 🔲 Railroad Crossing 🗌 Manmade Dam 📄 Beaver Dam 🗌 Geological Formation 🔲 Other:								
CAUSINGS       CONDITION: [Exidence d]	FOR ROAD/ RAILROAD	SHAPE:         Arch       Bottomless         Box       Elliptical         Circular       Other:	# BARRELS: Single Double Triple Other:	MATERIAL:		ALIGI	NMENT: w-aligned t flow-aligned not know	DIMENSI Barrel dia	IONS: (if variable, meter: Height:	<i>sketch)</i> (ft) (ft)
POTENTIAL RESTORATION CANDIDATE       Fish barrier removal       Culvert repair/replacement       Upstream storage retrofit         no	ONLY	CONDITION: (Evidence of)	Downstrean	n scour hole ankment		CULV	ERT SLOPE: t ght (2° – 5°) vious (>5°)	Roadway	Width:	(ft) (ft)
IssC ACTING AS GRADE CONTROL       No       Yes       Unknown         IssC ACTING AS GRADE CONTROL       No       Yes       Unknown         Isst barrier       Partial       Tomporary       Unknown         If yes for       Total       Porto to high       Water Drop:       (in)         Partial       Drop too high       Water Drop:       (in)       A structure such as a dam or partial blockage on a more model of order or grader stream blocking that would isolate a stream with very lifet value fish habitation and colvet to a structure such as a dam or partial blockage on a more model of anadromous fish, no fish partial blockage on a matching that would isolate a stream with very lifet value fish habitation and colvet to a structure such as a dam or partial blockage that may interfere with stream blocking that may interfere with very lifet value fish habitation and the stream with very lifet value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and the stream with very lift value fish habitation and	POTENTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culv	vert re	pair/rep	blacement 🔲 l	Jpstream st	orage retrofit	
Extrem of Physical BLOCKAGE       BLOCKAGE SEVERITY: (circle #)	IS SC ACTING	G AS GRADE CONTROL	$\square$ No $\square$ V	ag 🗍 Unb					- available - an Arran	
Image: State of the state		EXTENT OF PHYSICAL RLO	CKAGE:			BLO	CKAGE SEVER	ITY: (circ)	le #)	
NOTES/SKETCH:	If yes for fish barrier	CAUSE: Drop too high Water Dr Flow too shallow Water Dr Other:	op: (in)	A structure such road culvert on a greater stream bl upstream moven anadromous fish passage device p	as a da 3rd oro locking nent of ; no fish present	um or der or the n	A total fish blocka tributary that woul significant reach c or partial blockage interfere with the r anadromous fish.	ge on a d isolate a of stream, e that may nigration of	A temporary barrier beaver dam or a blo the very head of a s very little viable fish above it; natural bar as waterfalls.	such as a ockage at stream with habitat rriers such
	) Nomma (Gramm			5		4	3		2 1	
REPORTED TO AUTHORITIES YES NO	)	с <b>н</b> :								
	<u> </u>						REPOR	FED TO AUT	THORITIES 🗌 YE	s 🗌 No

			R	Reach Level A	ssessment	RCH	
SURVEY REACH	D: <u>1205</u> WT	RSHD/SUBSHD: WA	Ikus Res	DATE:	Asses	SED BY:	
START TIM	ie: <u>4 : 20</u> AM/PM	) LMK:	END TIME:_	5:43 AM/PM	LMK:	GPS ID:	-
LAT41 º 51 '	07.8" LONG 7	20 25 142.8"	LAT 41 ° 51 '	14.6 " LONG ]	2 ° 25 ' 36	<b>?</b> 11	
DESCRIPTION: Per	sch illering ist	cluat	DESCRIPTION:	84 ONFAMP DU	we culvert		
RAIN IN LAST 24 HO	DURS 🗆 Heavy rain	□ Steady rain	PRESENT CONDITIONS	6 🗆 Heavy rain	□ Steady rain		
SUPPOUNDING LAN			Urben/Desidential		Dvercast	Partly cloudy	-
SURROUNDING LAN	☐ Golf cour	se 🗆 Park	$\Box$ Crop	Pasture	Cother: High	L Institutional	
Average	CONDITIONS (chec	k applicable)	REACH	SKETCH AND SI	TE IMPACT TRA	ACKING	
BASE FLOW AS %	□ 0-25%	□ 50%-75%	Simple planar sketch	of survey reach. Tra	ack locations and II	Ds for all site impacts	
CHANNEL WIDTH	□25-50 %	₩ 75-100%	within the survey re features	each (OT, ER, IB,SC, deemed appropriate	UT, TR, MI) as we Indicate direction	ll as any additional	
DOMINANT SUBSTR	ATE	inites	8/2	18 01-01			~
□ Silt/clay (fine or	slick)	bble $(2.5 - 10")$	5/1 6	See X Y		đ.	
Gravel (0.1-2.4	⊔ Bo 5") □ Rei	uider (>10") 1 rock	(X) (45)	14	ş	ne.	
		+ x \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	- 11/		~	NO AR	
WATER CLARITY	Ø Clear □Turbid	(suspended matter)		10	Jul	2 er s -	
$\Box$ Stained (clear, n	$(aturally colored) \square ($	Jpaque (milky)	1 A 1 105		0	1	
Uner (chemicals,	ayes)		4.5%	K and .	and the second s		
AQUATIC PLANTS	Attached: none	s ⊈some □ lots	I MA TH	14. 7		r	
IN STREAM	Floating: Anone	$\Box$ some $\Box$ lots					
WILDLIFE IN OR	(Evidence of) Ster	Blue herony	T X 1	<b>X</b>			
AROUND STREAM	☐ Snails ☑ Dther	r LyDeer	.51	and the second s		5622	
<u>/</u>		750/		F.	1	LT->	
STREAM SHADING	Halfwav (>50%)	215% coverage)	\$ 24	Hree Dunch	)7	1 No It perosi	
(water surface)	□ Partially shaded	(≥25%)	1 M M	rel .	- Andrew	< (	
	Unshaded (< 259	%)	1 N Bloc	w.	Some	1 3550	
CHANNEL	Downcutting	Bed scour	- Chele	Davale	Line provide	1	
DYNAMICS	Widening	Bank failure	Cr. W 1 100%	e-ivent		19.64	
	Headcutting	Bank scour	or station			C. W.	
Unknown	Aggrading		1 1.	L as which		V - Laboratoria	
	Sed. deposition	Channelized	15 10	an in the second s	"An Amount of the		
CHANNEL	Height: LT bank	<u> </u>	1224	Del	an a		
DIMENSIONS	RT bank	2.1 (ft)	The second second	WZYXY	-12-	Bunts	
(FACING	Width: Bottom	11. b (ft)		5 4	01-201	1 Steel	
DOWNSTREAM)	Top	14,5 (ft)	/ / ma pos	H St /	e 1	180	1
ß	TEACH ACCESSIBILITE	(n)		mar ( " )	1 Si Key	(**)	Longus
Good: Open area :-	Fair: Forested or	Difficult. Must cross	4 3 15 1	no cohoric	s' '(il' !	an a	
public ownership.	developed area	wetland, steep slope, or	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		4	4.083 3	n de
sufficient room to	adjacent to stream. Access requires tree	sensitive areas to get to stream. Few areas to		aot	580 374	10st Across	Bara
stockpile materials, easy stream channel	removal or impact to	stockpile available			Sterry	OT-OT	
access for heavy	landscaped areas.	and/or located a great		01-0	indite /	1	
equipment using	small or distant from	Specialized heavy	5-1814	CAM.		18 Cobsel	1
s s	stream.	equipment required.				-	No. And Concerning of Concerni
NOTES: (higgost nime	tem vou see in survey	each) V	741.	~		1	-
	you see in suivey h	1 Juni	las of jean ins	· 1			
r		- neto	- Alson	) V			
		· · · · ·	AND NO	3			
			r:: V*	REPOR	TED TO AUTHORI	TIES 🗌 YES 🕅 NO	

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well- suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lac of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 (13)2 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more than one- half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambar surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetatio has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks or both sides of the stream eroding a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to proper or infrastructure.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16 Over	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<u></u>	Ontimal	Subartina)		
VEGETATED Buffer Width	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Vidth of buffer zone <10 feet: litt or no riparian vegetation due to human activities.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
7	Kight Bank 10 9	8 7 6	5 (4) 3	2 1 0
LOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
Floodplain Habitat	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non- wetland habitat, evidence of standing/ponded water	Either all wetland or all non- wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
LOODPLAIN	No evidence of floodplain encroachment in the form of fill material, land development, or	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on leadedbie function
Encroach- /ient	manmade structures		effect on floodplain function	noodbiaiu inncriou
ENCROACH- Ment		but not effecting floodplain function		flandalaia functi

[		-			Storm Water	r Outfalls	ΟΤ
WATERSHED/SUBSHEI	»: Walker I	Lisuoiz		Date: <u>6 / 3</u>	/_0% Asse	SSED BY: 🏷	27,6k
JURVEY REACH ID: \	1205 T	IME: <u>5</u> : <u>0</u> , AM/R	$\overline{\mathbb{A}}$	Рното ID: (Came	era-Pic #) 🞸 -	3 /#	· · · · · · · · · · · · · · · · · · ·
SITE ID (Condition-#): O	T- <u>0 </u> L	AT <u>41° 51 11.5</u>	('' Lo	NG 72º 25 130	<u>?.]</u> " LMK	G	PS: (Unit ID)
BANK: LT RT Head FLOW: None Trickle Moderate	TYPE:	MATERIAL:	Metal Brick	SHAPE: Sin Circular De SHAPE: Sin Circular De SHAPE: Sin Sin Circular De Sin	gle <b>DIMENS</b> ouble iple Diamete	SIONS: r:(in)	SUBMERGED:
Substantial	Open channel	Concrete DE Other:	arthen	Trapezoid  Parabolic  Other:	Depth: Width (Top):_ " (Bottom):_	<u>(in)</u> (in) (in)	NOT APPEICABLE
CONDITION: None Chip/Cracked Peeling Paint	ODOR: NO Gas Sewage Rancid/Sour	DEPOSITS/STAINS	5:	VEGGIE DENSITY None Normal Inhibited	PIPE BER     Brown     Other:	THIC GROW	TH: None
Corrosion	Sulfide	Paint Other:		Excessive Other:	Good Good Suds	Odors () Algae ()	No pool Colors Doils Floatables
FOR COLOR: FLOWING TURBIDI ONLY FLOATA	TY: Mon BLES: Non	ar Brown G e Slight Cloudine e Sewage (toilet	rey	Yellow     Green       Cloudy     Opaq       Cloudy     Petrol	n 🗌 Orange 🗍 ue eum (oil sheen)	Red 🛄 Othe	r: r:
OTHER L Exce CONCERNS: Need	ss Trash (paper/pl s Regular Mainter	astic bags) 🗌 Du nance 🗌 Ba	umping ( ink Erosi	bulk) 🗌 Excession on 🔣 Other	ssive Sedimentation	on nullo? Dee	O Channel
POTENTIAL RESTORAT	ION CANDIDAT	E 🖾 Discharge inves	stigation ofit	Stream daylightin	ng 🗌 Local stre	eam repair/out	fall stabilization
If yes for daylighting:							
Length of vegetative cover	• from outfall:	ft Type of	of existin	g vegetation:		Slope:	°
If yes for stormwater:							
Is stormwater currently con	ntrolled?	Land U	Jse descr	iption:	No		- 
	v discharge with a dis	Area a	vailable:				
SEVERITY: stron (circle #) strea signif	g smell. The amount of aared to the amount of m; discharge appears icant impact downstre	f discharge is significant normal flow in receiving to be having a am.	Small disc discharge discharge flow and a	harge; flow mostly clear has a color and/or odor, 1 is very small compared to ny impact appears to be	and odorless. If the the amount of the stream's base minor / localized.	Outfall does not discharge; staini of causing any e	have dry weather ing; or appearance prosion problems.
	5	4		(3)		2	1
SKETCH/NOTES:	Very De	up col ch		el Mron	h Re	siont	val
	propert	y. Dwn	er e	states p	no) wor	us Fr	j -ywg
\	- 1141g	should !	Spriv	y. Frish	cultury;	> 3	putunal
, )	1 alve	. ir cha	me		REPORTED TO	AUTHORITIES	: 🗌 YES 🗌 NO

WATERSHED/SUBSHE	D: 1/14 D	· So. MID	]	DATE: 6 / 3 /	0% ASSE	SSED RV.	1< 07
JURVEY REACH ID:	LIZOS TI	$\frac{CSCNGLC}{ME: 5 : 25 AM/RN}$	ิก	PHOTO ID: (Camera-	Pic #) 10	/#	33,101,0
SITE ID (Condition-#): C	T- DZ LA	T41051 13.5	S "Lo	NG 72 ° 25 1401	" LMK		GPS: (Un
						<u> </u>	
BANK: LT MRT Head FLOW: None Trickle	TYPE:	MATERIAL: Concrete	Metal Brick	SHAPE: Single Single Circular Doub Elliptical Triple Other:	DIMENS le Diameter	SIONS: er: <u>(in</u>	SUBME SUBME No Parti Fully
Moderate Substantial Other:	Open channel	Concrete E	arthen	<ul> <li>Trapezoid</li> <li>Parabolic</li> <li>Other:</li> </ul>	Depth: Width (Top): " (Bottom):	<u>(in)</u> <u>42 (in)</u> <u>30 (in)</u>	NOT APPA
CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:	ODOR: DNO Gas Rancid/Sour Sulfide Other:	DEPOSITS/STAINS	s:	VEGGIE DENSITY: None Normal Inhibited Excessive Other:	PIPE BEN Brown Other: POOL QU Good Suds Other:	NTHIC GR Oran UALITY: Odors Algae	OWTH: age Gree No pool Colors Floatable
FOR FLOWING ONLY     COLOR TURBIT       OTHER     Exc Exc CONCERNS:	ITY:     Clea       ITY:     None       ABLES:     None       ess Trash (paper/pla       ds Regular Mainten	r Brown G C Slight Cloudin e Sewage (toilet astic bags) D hance Ba	Brey [ ess [ paper, e pumping ank Eros	Yellow Green Cloudy Opaque tc.) Petroleur (bulk) Excessiv sion Other:	Orange n (oil sheen) /e Sedimentati	] Red [] C	Other:
FOR     COLOR       FLOWING     TURBIN       ONLY     FLOATA       OTHER     Exc       CONCERNS:     Nee   POTENTIAL RESTORANT IN CONCERNATION	Clea Clea Clea Clea Clea None Clea Clea None Clea Clea None Clea	r Brown G e Slight Cloudin e Sewage (toilet astic bags) D hance Ba E Discharge inve Storm water retr	brey [ ess [ paper, e pumping ank Eros estigation rofit	Yellow Green Cloudy Opaque tc.) Petroleur (bulk) Excessiv sion Other:	Orange n (oil sheen) /e Sedimentati  Local str	Red C	Other: Dther: /outfall stabi
FOR     COLOR       FLOWING     TURBIN       ONLY     FLOATA       OTHER     Exc       CONCERNS:     Nee       POTENTIAL RESTORA       Ino     If yes for daylighting:       Length of vegetative coval       If yes for stormwater:	Clea     ITY: Clea     None     None     Strash (paper/pla     ds Regular Mainten     TION CANDIDATH     er from outfall:	r Brown G G Slight Cloudin e Sewage (toilet astic bags) D hance Ba C Discharge inve Storm water retr ft Type	irey [ ess [ paper, e pumping ank Eros estigation rofit of existi	Yellow Green Cloudy Opaque tc.) Petroleur (bulk) Excessiv sion Other: Stream daylighting Other: ing vegetation:	Orange [] n (oil sheen) /e Sedimentati Local str	Red C C	Dther: Dther: /outfall stabi
FOR     COLOR       FLOWING     TURBIT       ONLY     FLOAT/       OTHER     Exc       CONCERNS:     Nee       POTENTIAL RESTORA       Ino     If yes for daylighting:       Length of vegetative cov       If yes for stormwater:       Is stormwater currently c       Yes     No	Clea  lea	r Brown G G Slight Cloudin e Sewage (toilet astic bags) D hance Ba G Discharge inve Storm water retr ft Type Land Area a	brey [ ess [ paper, e pumping ank Eros estigation rofit of existi	Yellow       Green         Cloudy       Opaque         Cloudy       Opaque         Cloudy       Petroleur         tc.)       Petroleur         (bulk)       Excessiv         sion       Other:         Other:       Other:         on       Stream daylighting         Other:       Other:         ing vegetation:          cription:	Orange  n (oil sheen) /e Sedimentati Local str	Red C C C C C C C C C C C C C C C C C C C	Dther: Dther: /outfall stabi
FOR FLOWING ONLY     COLOR TURBIT FLOAT/ FLOAT/       OTHER     Exc CONCERNS:       OTHER     Exc Exc CONCERNS:       POTENTIAL RESTORA       Ino       If yes for daylighting:       Length of vegetative cov/       If yes for stormwater:       Is stormwater currently c       Yes     No       OUTFALL     Hea SEVERITY: (circle #)		r Brown G G C Slight Cloudin e Sewage (toilet astic bags) D D hance Ba C Discharge inve Storm water retr ft Type Land Area a f discharge is significant nomal flow in receiving to be having a am.	irey [ ess [ paper, e pumping ank Eros estigation rofit of existi Use desc available Small die discharg flow and	Yellow       Green         Cloudy       Opaque         Cloudy       Opaque         Cloudy       Petroleur         (bulk)       Excessiv         sion       Other:         a       Stream daylighting         Other:       Other:         a       Other:         a       Stream daylighting         cription:       Compare         cription:       Compare </td <td>Orange  Orange  Orange</td> <td>Red C C C C C C C C C C C C C C C C C C C</td> <td>Dther: Dther: /outfall stabi</td>	Orange   Red C C C C C C C C C C C C C C C C C C C	Dther: Dther: /outfall stabi	
FOR       COLOR         FLOWING       TURBIT         ONLY       FLOAT/         OTHER       Exc         CONCERNS:       Nee         POTENTIAL RESTORA       Nee         Ino       If yes for daylighting:         Length of vegetative cover       If yes for stormwater:         Is stormwater currently c       Not         OUTFALL       Heat         SEVERITY:       stromstre         (circle #)       stre         SKETCH/NOTES:       SKETCH/NOTES:	Clea     ITY:     Clea     None     NBLES:     None     None     Sorrash (paper/pla     None     Sorrash (paper/pla     None     TION CANDIDATH     Controlled?     investigated     avy discharge with a dist     ng smell. The amount o     npared to the amount of     am; discharge appears     inficant impact downstree	r Brown G G Slight Cloudin e Sewage (toilet astic bags) D nance Ba Discharge inve Storm water retr ft Type Land Area a f discharge is significant nomal flow in receiving to be having a am.	irey [ ess [ paper, e pumping ank Eros estigation rofit of existi Use desc available Small dis discharg flow and	Yellow       Green         Cloudy       Opaque         Cloudy       Opaque         Cloudy       Petroleur         (bulk)       Excessiv         sion       Other:         a       Stream daylighting         Other:       Other:         ing vegetation:	Orange   Red C C	Dther: Dther: Outfall stabi	

Stream Crossing

WATERSHED	SUBSHED: Worken's	> RECENDITY	D	ATE: 6	13108	ASSE	SSED BY: 35 77 64	
URVEY REA	CHD: WROS	TIME: 5 : 47	AM/PM PH	IOTO ID	: (Camera-Pic	: #)	/#	
SITE ID: (Cor	udition-#) SC- <u>02</u> LAT	4105114	6" LONG 72°	25 !	<u>36.9"</u> LI	ИК	GPS (Unit ID)	
The second second								
ITTE: Drown Crossing   Kallroad Crossing   Manmade Dam   Beaver Dam   Geological Formation   Other:         Shape:       # Bappel S:								
For Road/ Railroad	SHAPE: Arch Bottomless Box Elliptical Circular Other:	# BARRELS:	MATERIAL: Concrete Metal Other:	ALIGI	NMENT: ow-aligned t flow-aligned not know	DIMENSI Barrel dia	IONS: (if variable, sketch) ameter: $\underline{S_{A} \cup C}$ (ft) Height: $\underline{\delta \cdot S + A \pm}$ (ft) $\overline{\delta \cdot O + C \pm}$	
ONLY	CONDITION: (Evidence of) Cracking/chipping/corrosion Sediment deposition Other (describe):	Looks 6005 n 🔲 Downstream 🗍 Failing emb	n scour hole vankment	CULV	<b>ERT SLOPE:</b> tt ght $(2^\circ - 5^\circ)$ vious (>5°)	Roadway	$\begin{array}{c} \text{ength:} & (ff) \\ \text{Width:} & \underline{\neg ft} \underbrace{et}_{f}(ff) \\ & \underline{\neg ft} \underbrace{Lt} \\ \text{elevation:} & \underline{22}_{f}(ff) \end{array}$	
POTÉNTIAL I	RESTORATION CANDIDATE	Fish barrier re	emoval 🗌 Culvert repair 🔲 Other:	repair/rej	placement 🔲 U	Jpstream st	torage retrofit	
IS SC ACTIN	G AS GRADE CONTROL		es 🗌 Unknow	'n				
	EXTENT OF PHYSICAL BLO	CKAGE:		BLO	CKAGE SEVER	ITY: (circi	le #)	
If yes for fish barrier	Total Partial     Temporary Unknow CAUSE:     Drop too high Water Dr     Flow too shallow Water Dr     Other:	vn rop: (in) epth: (in)	A structure such as a road culvert on a 3rd of greater stream blockin upstream movement of anadromous fish; no fi passage device prese	dam or order or g the f sh nt.	A total fish blocka tributary that woul significant reach o or partial blockage interfere with the r anadromous fish.	ge on a d isolate a f stream, e that may nigration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
Norraleura			5	4	4 3		2 1	
		sojo tien	10% Sedio	s Fron	Report			

Stream	Cros	sinc

Stream Crossing	SC
-----------------	----

WATERSHED	SUBSHED:	Walkers	Reservoisz	A	DAT	ге: <u>6</u>	13 108	ASSE	ESSED BY: BWMA
JRVEY REA	CHD: WR	<u>05</u>	TIME: 4:34	AM/PM	Рно	ото ID	:(Camera-Pic	#) #7	/#
SITE ID: (Con	dition-#) SC-	<u>01</u>   Lat (	41.051.09	LA" LONG	<u>72°</u>	25 '	<u>41.4_" LN</u>	ИК	<b>GPS</b> (Unit ID)
TYPE: NROE	ad Crossing	] Railroad Crossin	ng 🗌 Manmade	Dam 🗌 Beav	er Da	.m 🔲	Geological Forn	nation	] Other:
FOR ROAD/ RAILROAD	SHAPE: Arch Box Circular Other:	Bottomless Elliptical	# BARRELS: Single Double Triple Other:	MATERIAL: Concrete Metal Other:		ALIGN Flo	NMENT: w-aligned t flow-aligned not know	DIMENS Barrel dia	BIONS: (if variable, sketch) ameter: $5344725$ (ft) Height: $74745$ (ft) 6.25767
CROSSINGS ONLY	CONDITION	: (Evidence of) chipping/corrosion deposition	n Downstrear ゴ Failing emb	n scour hole pankment		CULV Fla Slig	ERT SLOPE: t ght $(2^\circ - 5^\circ)$ vious (>5°)	Roadway	ength:(ft) Width: $9 H H (ft)$ 9 F H H (ft) 9 F H H (ft) 9 F H H (ft) 9 F H H (ft)
POTENTIAL I	RESTORATION	N CANDIDATE	Fish barrier re	emoval 🗌 Culv repair 🔲 Othe	vert re er:	pair/rep	olacement 🔲 U	Jpstream s	torage retrofit
IS SC ACTING	G AS GRADE (	CONTROL	No Y	es 🗌 Unk	nown	l			v
	EXTENT OF	PHYSICAL BLO	CKAGE:			BLO	CKAGE SEVER	ITY: (circ	cle #)
If yes for fish barrier	Total Temporar CAUSE: Drop too l Flow too s	Partial y Unknov high Water Dr shallow Water De	vn rop: (in) epth: (in)	A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p	as a da 3rd ord locking hent of no fish present	am or der or the	A total fish blockat tributary that woul significant reach c or partial blockage interfere with the r anadromous fish.	ge on a d isolate a f stream, e that may nigration of	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
NOTES/SUPT				5		4	3		2 1
NOTES/SKET	CH:	100/0	A Sectoria	150	- Se	usime 	rip iop L L	275 0 2099.	t- bress grassmit
							Report	FED TO AU	THORITIES 🗌 YES 🗌 NG
			(1999)						transd



#### APPENDIX B

#### Upland Assessment Field Forms

## HSI

WATERSHED: AWER	SUBWATERSH	ED: CAM	\$	<b>UNIQUE SITE</b>	ID: 54	CB-HS1-C
DATE: $\underline{/(6)/07}$	ASSESSED BY:	FB,DB	CAMERA ID:		PIC#:	
MAP GRID:	LAT	<u> </u>	_" LONG°	1 11	LMK#	
A. SITE DATA AND BASIC CLASSIFICATION Name and Address: <u>No nonc</u> <u>Sound</u> or well & construction Woloch	Category:	Comm Institut	ercial X Industrial onal Municipal ort-Related	Miscellaneous Golf Course Marina Animal Faci	e ility	
SIC code (if available): NPDES Status:	Basic Desc	ription of Op	peration: 2 of GIL Lolo	ock		INDFX*
Unregulated Vinknown	<u> </u>		· ·			II (DDD)K
<b>B.</b> VEHICLE OPERATIONS N/A (Skip to	part C)			Observed I	Pollution Sou	rce?
<b>B1.</b> Types of vehicles:  Fleet vehicles	School buses	Other	•			
B2. Approximate number of vehicles:						
<b>B3.</b> Vehicle activities (circle all that apply):	Maintained R	epaired Re	cycled Fueled W	ashed Stored		0
<b>B4.</b> Are vehicles stored and/or repaired outs Are these vehicles lacking runoff diversion i	nethods? $\Box Y$ $\Box$	$\square N \square Can'$	t Tell Can't Tell			0
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? 🗌 Y	N N	Can't Tell			0
B6. Are uncovered outdoor fueling areas pre-	esent? Y	]N 🔽 Car	i't Tell			0
B7. Are fueling areas directly connected to s	torm drains?	Y AN	🗌 Can't Tell			Ο.
<b>B8.</b> Are vehicles washed outdoors? Y Does the area where vehicles are washed dis	$\square N  \boxed{X} Can'$	t Tell ´ rm drain? [	]Y 🗌 N 🖾 Car	n't Tell		Ο
C. OUTDOOR MATERIALS N/A (Skip to	part D)			Observed I	Pollution Sou	rce?
<b>C1.</b> Are loading/unloading operations preser If yes, are they uncovered <i>and</i> draining towa	nt? 🛛 Y 🔲 N urds a storm drain	I □ Can't n inlet? □	Tell ]Y []N []Car	n't Tell		O
<b>C2.</b> Are materials stored outside? X T Where are they stored? grass/dirt area	N Can't Tell concrete/asph	If yes, are	they 🗌 Liquid 🕅 S and area	Solid Description	n: Dict	Ø
C3. Is the storage area directly or indirectly	connected to stor	rm drain (cire	cle one)? 🗌 Y 📋	N 🚺 Can't Te	211	0
C4. Is staining or discoloration around the a	rea visible?	Y [] N [	🛛 Can't Tell	<u>^</u>		0
C5. Does outdoor storage area lack a cover?	Y N	🔀 Can't Te	211			0
C6. Are liquid materials stored without seco	ndary containme	nt? 🗌 Y	🗌 N 🛛 Can't Tel	1		0
C7. Are storage containers missing labels or	in poor conditio	on (rusting)?		an't Tell		0
D. WASTE MANAGEMENT 🗌 N/A (Skip t	o part E)			Observed I	Pollution Sou	rce?
<b>D1.</b> Type of waste (check all that apply):	🗌 Garbage 🗡	Construction	materials 🗌 Hazar	rdous materials	******	0
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	<i>ly)</i> :  No cover Overflowing	/Lid is open	Damaged/poor c	condition	eaking or	0
D3. Is the dumpster located near a storm dra If yes, are runoff diversion methods (be	in inlet? 🔲 Y [ rms, curbs) lacki	□ N □ Can <sup>*</sup> ng? □ Y	t Tell	l		O
E. PHYSICAL PLANT N/A (Skip to part	F)			Observed I	Pollution Sou	rce?
E1. Building: Approximate age: <u>20</u> Evidence that maintenance results in discha	yrs. Condition rge to storm drai	n of surfaces	Clean Stair liscoloration)? Y	ned 🕅 Dirty 🗌	] Damaged know	0 0

\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

## HSI

E2. Parking Lot: Approximate age yrs. Condition: Clean Stained Dirty Breaking up Surface material Paved/Concrete Gravel Permeable Don't know	Ø						
E3. Do downspouts discharge to impervious surface? Y N Don't know None visible Are downspouts directly connected to storm drains? Y N Z Don't know	0						
E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? 🔀 Y 🗌 N 🗌 Can't Tell	0						
F. TURF/LANDSCAPING AREAS N/A (skip to part G) Observed Pollution Source	e?						
F1. % of site with: Forest canopy% Turf grass _262% Landscaping% Bare Soil 80%	Ø						
F2. Rate the turf management status: High Medium Low	0						
F3. Evidence of permanent irrigation or "non-target" irrigation Y Can't Tell	0						
F4. Do landscaped areas drain to the storm drain system?							
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? 🗌 Y 🗌 N 🙀 Can't Tell	0						
G. STORM WATER INFRASTRUCTURE N/A (skip to part H) Observed Pollution Source	e?						
G1. Are storm water treatment practices present?  Y N X Unknown If yes, please describe:	0						
G2. Are private storm drains located at the facility? Is trash present in gutters leading to storm drains? If so, complete the index below.	0						
Index Rating for Accumulation in Gutters							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							
Litter 1 2 3 4 5							
G3. Catch basin inspection – Record SSD Unique Site ID here: Condition: Dirty Clean							
H. INITIAL HOTSPOT STATUS - INDEX RESULTS							
Not a hotspot (fewer than 5 circles and no boxes checked) Rotential hotspot (5 to 10 circles but no boxes checked)							
Confirmed hotspot (10 to 15 circles and/or 1 box checked) Severe hotspot (>15 circles and/or 2 or more boxes checked)	<u>1)</u>						
Follow-up Action:							
Suggest follow-up on-site inspection							
Test for illicit discharge							
Include in future education effort							
Check to see if hotspot is an NPDES non-filer							
Pervious area restoration; complete PAA sheet and record							
Unique Site ID here:							
Schedule a review of storm water pollution prevention plan							
Notes:							
Follow needed - orwale industry							
pipes & debris in yever							
and large durt piles							
gu practices unknown							

ĸ

7/16/08 TULWERE BROOK Mada brock Autohnisian - Hetrope opportunity . Joon montenence - alconort, odd forebay if nore Small DVI pipes directorying to V.S. signa times

#### HSI

WATERSHED: Takker	SUBWATERSHED:	Unique Sit	EID: 172-HS1-0
DATE: <u>7 / 16/08</u>	ASSESSED BY: (B, DB) C	Camera ID:	PIC#:
MAP GRID:	LAT 41 º 49 · 37" LO	DNG 72º 28 153"	LMK#
A. SITE DATA AND BASIC CLASSIFICATION			
Name and Address:	Category: Commercial Institutional	Industrial Miscellaneous	e a construction of the second se
VUT MARTENANO	Transport-Rela	ated Marina	
SIC code (if available):	Basic Description of Operation		office
NPDES Status: Regulated	nct V Lorge garag	r, salt sand 5-	torage 1 INDEX*
		/ - /	
B. VEHICLE OPERATIONS IN/A (Skip fo	part ()	Observed	Pollution Source?
B1. Types of vehicles: Fleet vehicles	$\square$ School buses $\square$ Other: $(\square)$	<u>umpli</u>	
<b>B2.</b> Approximate number of vehicles:	Maintained Presided	Edit Winter	
<b>B4</b> Are vehicles stored and/or repaired outs	ide? V N Can't Tell	Frieled Washed Stored	<u>'</u>
Are these vehicles lacking runoff diversion r	methods? $\square$ Y $\square$ N $\square$ Can't $\square$	<u>rell</u>	0
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? 🗌 Y 🗌 N 🛛 Can't T	Cell	, O
B6. Are uncovered outdoor fueling areas pre	esent? 🖾 Y 🗌 N 🗍 Can't Tell		Ø
<b>B7.</b> Are fueling areas directly connected to s	otorm drains? 🕅 Y 🔲 N 🗌 Ca	an't Tell	X
<b>B8.</b> Are vehicles washed outdoors? Y	$\square$ N $\blacksquare$ Can't Tell		0
C. OUTDOOR MATERIALS N/A (Skip to	part D)		Pollution Source?
C1. Are loading/unloading operations preser	nt? 🗹 Y 🗌 N 🗍 Can't Tell		
If yes, are they uncovered and draining towa	urds a storm drain inlet? 🗌 Y [	N Can't Tell	
C2. Are materials stored outside? X T Where are they stored? T grass/dirt area	$N \square Can't Tell If yes, are they [$ $X ] concrete/asphalt \square bermed area$	Liquid A Solid Description	n: defet
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)	)? $\square$ Y $\square$ N $\square$ (Can't T	ell O
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 🕅 Can'	't Tell	O
C5. Does outdoor storage area lack a cover?	🅅 Y 🗌 N 🗌 Can't Tell		<u>کر</u>
C6. Are liquid materials stored without seco	ndary containment? 🗌 Y 🗌 N	🔀 Can't Tell	O
C7. Are storage containers missing labels or	in poor condition (rusting)? $\Box$ Y	🗌 N 🖾 Can't Tell	O
D. WASTE MANAGEMENT 🗌 N/A (Skip to	o part E)	Observed	Pollution Source?
<b>D1.</b> Type of waste (check all that apply):	A Garbage 🕅 Construction materi	ials 🔲 Hazardous materials	O
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	<i>ly)</i> : ⊠ No cover/Lid is open □ Da ⊠ Overflowing	amaged/poor condition	Leaking or
<b>D3.</b> Is the dumpster located near a storm dra	in inlet? $\square$ Y $\square$ N $\square$ Can't Tell	Con't Tall	O
E. PHYSICAL PLANT N/A (Skip to part )	F)	Observed	Pollution Source?
E1. Building: Approximate age: 50	yrs. Condition of surfaces: $\Box C$	lean 🗌 Stained 🗍 Dirtv 🛛	Damaged O
Evidence that maintenance results in discha	rge to storm drains (staining/discolo	ration)?	t know O

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e.

\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

# HSI

<b>E2.</b> Parking Lot: Approximate age <u>7</u> ° yrs. Condition: Cle Surface material Paved/Concrete Gravel Permeat	an [ ble [		tair	ned kn		Di	ty		Breal	king	up					de de la companya de la		0	
E3. Do downspouts discharge to impervious surface? Y I Are downspouts directly connected to storm drains?		] D Y	on'	t kn N	iow		Nc on'i	one v t kno	visib ow	le								0	
E4. Evidence of poor cleaning practices for construction activities	(staiı	ns le	adi	ng t	to st	torn	ı dr	ain)	? 🗌	Y [	21	1	] Ca	ın't	Tel	1	. 1	0	
F. TURF/LANDSCAPING AREAS N/A (skip to part G)	C. A.L								0	oser	ved	Pol	Infid	n S	Som	rce	2		
F1. % of site with: Forest canopy $\textcircled{O}$ % Turf grass $\underline{\iota O}$ % L	andsc	api	ng _	$\bigcirc$	_%	Ba	re S	Soil	0	%								0	
F2. Rate the turf management status: High Medium	Low															C Distances		0	
F3. Evidence of permanent irrigation or "non-target" irrigation	] Y [	N الک	1 [	]C	an'	t Te	11										(	0	
F4. Do landscaped areas drain to the storm drain system?	] Y		N		] Ca	ın't	Tel	1										0	
F5. Do landscape plants accumulate organic matter (leaves, grass clipping	gs) on	adja	icen	t im	perv	viou	s sur	face	? [	] Y [	1	٧¥	<sup>†</sup> Ca	n't	Tell	l		0	
G. STORM WATER INFRASTRUCTURE N/A (skip to pa	rt H)								Ol	oser	ved	Pol	lutio	on S	Sou	rce	2		A REFERENCE
<b>G1.</b> Are storm water treatment practices present? $\Box$ Y $[X]$ N $[x]$	Unl	mov	vn	If y	es,	plea	ise o	lesc	ribe:							10000		0	
<b>G2.</b> Are private storm drains located at the facility? Is trash present in gutters leading to storm drains? If so, c	J U ompl	nkn ete	own the :	ı inde	ex t	pelo	w.											0	
Index Rating f	for A	ccur	nula	atio	n in	Gu	tter	s		2:141								,	
Sediment 1 2	□3					Π	4		Г	mny	<u>/</u>	5						·	
Organic material 1 2	3					$\Box$	4				$\Box$	5							
	3						4					5							
G3. Catch basin inspection – Record SSD Unique Site ID here:				onc	11110	n: [	<u> </u>	Dirty	/ [		an				d n			1975	
Not a hotspot (fewer than 5 circles and no hoves checked)	Pote	ntia	1 ho	ten	ot (	'5 tc	10	circ	-les h	nut n	o bo	Vec	che	cle	<u>له.</u>			ine stray	
Confirmed hotspot (10 to 15 circles and/or 1 box checked)	Seve	ere h	ots	pot	(>1	5 ci	rcle	s an	nd/or	2 oi	mo	re b	oxe	s ch	eck	eđ)			
Follow-up Action:												Γ							
Refer for immediate enforcement											1								
Test for illicit discharge																			
Include in future education effort																			
Check to see if hotspot is an NPDES non-filer																			
Pervious area restoration; complete PAA sheet and record																			
Unique Site ID here:		ļ								_									
Notes:																			
( DUN DOI TOUT											<u> </u>	ļ							
											—								
																$\square$			
												<u> </u>							
											-								
	-									_									
													$\left  - \right $			$\mid - \mid$	$\left  - \right $		

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## HSI

WATERSHED: Makek	SUBWATERSHED: Walker	UNIQUE SITE ID: WR - HSI	-01
DATE: $\underline{7/16/08}$	ASSESSED BY: LB, DB CAMERA ID:	PIC#: 3698-3	701
MAP GRID:	LAT 41. 51 . 11 "LONG 72. 25	<u>'45</u> " LMK#	
A. SITE DATA AND BASIC CLASSIFICATION			
Name and Address: <u>ft 31 off of IS4</u>	Category: Commercial Industrial Institutional Municipal	Miscellaneous Golf Course Marina	
	- Basic Description of Operation:	Animal Facility	
SIC code (if available):	DOT Communer 1 of		
Unregulated Unknown		IND	EX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)	Observed Pollution Source?	
B1. Types of vehicles: 🗌 Fleet vehicles	School buses Other: Velnice Party	va lite	
B2. Approximate number of vehicles: 150			
<b>B3.</b> Vehicle activities (circle all that apply):	Maintained Repaired Recycled Fueled Wa	shed stored Parking	۹,
<b>B4.</b> Are vehicles stored and/or repaired outs Are these vehicles lacking runoff diversion t	ide?  Y  X N  Can't Tell nethods?  Y  N  Can't Tell		C
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? Y N X Can't Tell Pouss lo	oil leaks/sediment	3
B6. Are uncovered outdoor fueling areas pre-	esent? 🗌 Y 💢 N 🗌 Can't Tell	El salting sanding	) ·
B7. Are fueling areas directly connected to s	torm drains? 🗌 Y 💢 N 📄 Can't Tell		)
<b>B8.</b> Are vehicles washed outdoors? Y Does the area where vehicles are washed dis	🖄 N 🔲 Can't Tell charge to the storm drain? 🗌 Y 🔲 N 🥅 Can	't Tell	<b>)</b>
C. OUTDOOR MATERIALS 🕅 N/A (Skip to	part D)	Observed Pollution Source?	
C1. Are loading/unloading operations present	nt? 🔍 Y 🕅 N 🗌 Can't Tell		<u>ר</u>
If yes, are they uncovered and draining towa	$\frac{1}{2} \frac{1}{2} \frac{1}$	't Tell	J
C2. Are materials stored outside? $\Box$ Y X Where are they stored? $\Box$ grass/dirt area	N Can't Tell / If yes, are they Liquid S concrete/asphalt bermed area	olid Description: C	C
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)? 🕅 Y 🔲	N 🗌 Can't Tell	C
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔣 N 📋 Can't Tell		)
C5. Does outdoor storage area lack a cover?	$\square$ Ý $\square$ N $\square$ Can't Tell		C
C6. Are liquid materials stored without seco	ndary containment? 🗌 Y 🗌 N 🗌 Can't Tell		C
C7. Are storage containers missing labels or	in poor condition (rusting)?  Y N Ca	n't Tell	C
D. WASTE MANAGEMENT 🕅 N/A (Skip t	o part E)	Observed Pollution Source?	];
<b>D1.</b> Type of waste (check all that apply):	Garbage Construction materials Hazar	dous materials	<b>)</b>
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	ly):  No cover/Lid is open Damaged/poor c Overflowing	ondition Leaking or	C
<b>D3.</b> Is the dumpster located near a storm dra	in inlet? Y N Can't Tell		<b>)</b>
E. PHYSICAL PLANT N/A (Skip to part	F)	Observed Pollution Source?	
E1. Building: Approximate age:	yrs. Condition of surfaces: 🗌 Clean 🗌 Stair	ed Dirty Damaged	C
Evidence that maintenance results in discha	rge to storm drains (staining/discoloration)?	□ N □ Don't know	2

\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

WR-451-01

#### HSI

,				
<b>E2.</b> Parking Lot: Approximate age $D$ yrs. Condition: $\Box C$ Surface material Reved/Concrete $\Box$ Gravel $\Box$ Perme	lean Stained	Dirty Dereak	ing up	8
E3. Do downspouts discharge to impervious surface? Y CAre downspouts directly connected to storm drains?	$N \square Don't known                                   $	w None visible	÷	0
E4. Evidence of poor cleaning practices for construction activitie	es (stains leading to	$\rightarrow$ storm drain)?	Y N N Can't Tel	
<b>F. TURF/LANDSCAPING AREAS</b> X N/A (skip to part G)			served Pollution Sou	rce?
<b>F1.</b> % of site with: Forest canopy % Turf grass %	Landscaping 9	% Bare Soil "	%	ΤΟ
F2. Rate the turf management status: High Medium	 ] Low			0
F3. Evidence of permanent irrigation or "non-target" irrigation		n't Tell		0
F4. Do landscaped areas drain to the storm drain system?	Y N D	Can't Tell		0
F5. Do landscape plants accumulate organic matter (leaves, grass clippi	ngs) on adjacent imp	ervious surface?	Y 🗌 N 🗌 Can't Tell	
G. STORM WATER INFRASTRUCTURE N/A (skip to p	art H)	Ob	served Pollution Sou	rce?
<b>G1.</b> Are storm water treatment practices present? $\Box$ Y X N [	🗌 Unknown If ye	s, please describe:		X
<b>G2.</b> Are private storm drains located at the facility? $\mathbf{X}$ Y $\mathbf{D}$ N	Unknown	· · · · · · · · · · · · · · · · · · ·		R
Is trash present in gutters leading to storm drains? If so,	complete the inde	x below.		×ø
Index Rating	g for Accumulation	in Gutters	1+1	
Sediment 1 2	⊠3	- F1 $-$ F1		
Organic material $\Box$ 1 $\boxtimes$ 2		4	$\Box$ 5	
Litter 1 2	3	4	5	
<b>G3.</b> Catch basin inspection – Record SSD Unique Site ID here:	Condi	tion: 📋 Dirty 📋	Clean	
H. INITIAL HOTSPOT STATUS - INDEX RESULTS				
Not a hotspot (lewer than 5 circles and no boxes checked) $\Box$	Severe hotspot	t (5 to 10 circles bi $>15$ circles and/or $\sim$	It no boxes checked)	(be:
Follow-up Action:				
Refer for immediate enforcement				
Suggest follow-up on-site inspection				
Test for illicit discharge				
$\square$ Check to see if hotspot is an NPDES non-filer				
X Onsite non-residential retrofit				
Pervious area restoration; complete PAA sheet and record				
Unique Site ID here:		parting		
Schedule a review of storm water pollution prevention plan				<u>'  </u>
Notes:		Vuot.		
Siv runoff from parking lot				
directly enters wetland area				
& likely contains end anon				
Sediments & Salts. Retrofit				
pessible with large buffer.			50F4-	
			1/1/4/30	1 Autor /an
			1 Invasilie	
			Cat to: 1	a day h
	۵-6		Mari	> & Solue
			· 34	plantz
				1 >

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WR-4157-D] 1/16/06 Horsport Univerticar - 4105/ 11" 72° 25' 45" Dot commuter let - WR. submatershed Droivage averland to SE corner Discharge to wetland Wide grass strip between curb & wethout could be used for Swele PROPOSED: Existing: ξO curb-3 DOUBLE CB

. . . . .
### HSI

WATERSHED: The dak	SUBWATERSHED: Gage	-5	UNIQUE SITE	1D: GB-451-	02
DATE: 7 1161 08	ASSESSED BY: KING	CAMERA ID:	•	PIC#:	
MAP GRID:	LAT 410 51 30 "	LONG <u>72°25</u>	.09"	LMK#	
A. SITE DATA AND BASIC CLASSIFICATION					
Name and Address:	Category: Commerci	al 🔀 Industrial	Miscellaneous		
LAN FAVORS ICE LOPAM	- Transport-	Related	Marina		
Dismbrition	- Desig Deservation of Oracus		🗌 Animal Faci	lity	
SIC code (if available):	Distant uton of Opera	ition:			
Unregulated Unknown	UISINDUITON (a	ATC: I		[IN]	)EX*
B. VEHICLE OPERATIONS N/A (Skip to	part C)		Observed P	allution Source?	
<b>B1.</b> Types of vehicles: M Fleet vehicles	School buses 🕅 Other: C	avs/mcles let	-	onderon source	
B2. Approximate number of vehicles: 20	18 wheelers 40 common	ster vehicles		· · · · ·	
<b>B3.</b> Vehicle activities (circle all that apply)	Maintained Repaired Recyc	led Fueled Wa	shed Stored		Ø
<b>B4.</b> Are vehicles stored and/or repaired outs Are these vehicles lacking runoff diversion	ide? ⊠Y □N □Can't Te methods? □Y □N ⊠Car	ell n't Tell			0
B5. Is there evidence of spills/leakage from	vehicles? 🗌 Y 🗌 N 🔯 Can	i't Tell			0
B6. Are uncovered outdoor fueling areas pro	esent? Y X N Can't 7	Fell			0
<b>B7.</b> Are fueling areas directly connected to a	storm drains? 🖄 Y 🗌 N 🕅	Can't Tell Qual	- امار ح		Ø
<b>B8.</b> Are vehicles washed outdoors? Y	□ N K Can't Tell				$\overline{\frown}$
Does the area where vehicles are washed dis	scharge to the storm drain?	∐ N □ Can	<u>'t Tell</u>		
C. OUTDOOR MATERIALS [] N/A (Skip to	part D)		Observed P	ollution Source?	
C1. Are loading/unloading operations prese	nt? X Y N Can't Tell		'+ Tall		0
C2 Are materials stored outside? X V	$N \square Can't Tell$ If yes are the		olid Description		
Where are they stored? grass/dirt area	Concrete/asphalt bermed	area		•	0/
C3. Is the storage area directly or indirectly	connected to storm drain (circle o	one)? 🛛 Y 🔲 ]	N 🗌 Can't Tel	1	Ø
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 📈 C	Can't Tell			0/
C5. Does outdoor storage area lack a cover?	Y N Can't Tell			ŝ.	Ø
C6. Are liquid materials stored without seco	ndary containment? Y	N 🕅 Can't Tell			0
C7. Are storage containers missing labels or	in poor condition (rusting)?	Y 🖾 N 🗌 Ca	n't Tell		0
D. WASTE MANAGEMENT N/A (Skip t	o part E)		Observed P	ollution Source?	
<b>D1.</b> Type of waste (check all that apply):	Garbage 🗌 Construction ma	aterials 🗌 Hazar	dous materials	le la	Ō
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	<i>ly</i> ):  No cover/Lid is open Overflowing	Damaged/poor co	ondition □Le ・♪	eaking or	0
<b>D3.</b> Is the dumpster located near a storm dra	in inlet? 🗌 Y 🗌 N 📉 Can't Te				ò
II yes, are runoff diversion methods (be	rms, curbs) lacking? $[Y ]$	N [24 Can't Tell			
L. THISICAL FLANT LIN/A (Skip to part			Observed P	ollution Source?	
E1. Building: Approximate age:	yrs. Condition of surfaces:	Clean 🗌 Stain	ed 🗌 Dirty 🗌	Damaged	0
Evidence that maintenance results in discha	rge to storm drains (staining/disc	oloration)?		inow	<u> </u>

\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

GBHS102

# HSI

E2. Parking Lot: Approxim Surface material 🕅 Pa	ate age <u>9</u> yrs. Condition ved/Concrete Gravel	: X Clear Permeabl	n [ e [	] S ] Do	tain on't	ed kno	w	Dir	ty [	]]	Breal	cing	up						(	Э	
E3. Do downspouts discharg Are downspouts d	ge to impervious surface?	Y DN ins?		]D Y	on'i	kno N	ow 	] Do	No on't	ne kno	visibl ow	e			••••••			ALL DECEMBER	(	ø	
E4. Evidence of poor cleani	ng practices for construction	activities (	stair	ıs le	adiı	ng to	o sto	orm	dra	in)	? 🗌	Y [	]1	v D	fc.	an't	Tel	1	. (	Э	
F. TURF/LANDSCAPING	AREAS 🗌 N/A. (skip to p	art G)						1.4			Ob	serv	ved	Pol	luti	on (	Sou	rce	2		
F1. % of site with: Forest ca	nopy% Turf grass 💆	🦾 % Lar	ndsc	apiı	1g <u> </u>	D	%	Bar	re S	oil		%						1	(	O	
F2. Rate the turf manageme	nt status: 🕅 High 🗌 Medi	um 🗌 L	ow															10.000	. (	D,	7
F3. Evidence of permanent	irrigation or "non-target" irrig	gation 🕅	Υ	<u>]</u> N		] Ca	ın't	Tel	1									2020 2020 2020	Ø		
F4. Do landscaped areas dra	in to the storm drain system?	X	Y		N		Ca	n't ]	[[]									0		Ø	
F5. Do landscape plants accum	ulate organic matter (leaves, gra	ss clippings	) on	adja	cent	imp	erv	ious	surf	face	?	Υ	1	1	] Ca	ın't	Tel	1	(	О .	
G. STORM WATER INFR	ASTRUCTURE 🗌 N/A (sł	cip to part	<i>H</i> )								Ob	ser	ved	Pol	luti	on	Sou	rce	?∟		
G1. Are storm water treatment practices present? Y N M Unknown If yes, please describe:													. (	C							
G2. Are private storm drains located at the facility? X Y N Unknown No Is trash present in gutters leading to storm drains? If so, complete the index below.														(	С						
Index Rating for Accumulation in Gutters														40.0400							
Sediment	$\frac{\text{Clean}}{\Box 1}$		72				T				F	ilthy		5							
Organic material	$\square 1$ $\square 2$	Γ	$\frac{1}{3}$				ן ן		+ 1				П	5							
Litter		Ē	3				[	<u> </u>	1					5							
G3. Catch basin inspection	- Record SSD Unique Site II	) here:	angeral to	Jacob State	C	ondi	itio	n: [	<u>]</u> D	irty	/	Cle	an	de=49-44	1		es di serà			100000-000	10000
H. INITIAL HOTSPOT STATUS - INDEX RESULTS																					
Not a hotspot (fewer tha	n 5 circles and no boxes chec	ked) XI	Pote	ntia	l ho	tspo	t (:	5 to	10	circ	cles b	ut n	o bo	oxes	che	ecke	ed)				
Confirmed hotspot (10	to 15 circles and/or 1 box che	cked) 🛄 S	Seve	re h	ots	<u>oot (</u>	$\frac{>1}{1}$	$\frac{5 \text{ cir}}{1}$		s ar	nd/or	$\frac{2 \text{ or}}{1}$	mo	ore b	oxe	s cl	ieck	ed)			
<b>Follow-up Action:</b>	orcement									_		_	-	<u> </u>		_					
Suggest follow-up on-si	te inspection											_	+								
Test for illicit discharge						-														_	
Check to see if hotspot i	on effort s an NPDES non-filer													<u>  </u>							
Onsite non-residential re	etrofit													ļ							
Pervious area restoration	i; complete PAA sheet and re	cord										_		<u> </u>							
Unique Site ID her	e:																				
Schedule a review of sto	rm water pollution prevention	n plan																			
Notes:																					

e C

# HSI

WA RSHED: Tank	SUBWATERSHED: (FAA2 5	UNIQUE SITE	ID:GB-HSI-01								
DATE: 7/16/08	Assessed By: $\angle \beta$ , $\nabla \beta'$ CAMERA ID:	-	PIC#: 3687								
MAP GRID:	LAT <u>1051'38</u> " LONG <u>78</u>	515"	LMK#								
A. SITE DATA AND BASIC CLASSIFICATION											
Name and Address: Industrial Park West	Category: Commercial X Industrial Institutional Municipal	Miscellaneous Golf Course Marina Animal Faci	lity								
SIC code (if available):	Basic Description of Operation: Afice Bui	Iding - Gev	ber Technologies								
NPDES Status: Regulated	and the forst ball and a call of the st	1920 Butter	INDEX*								
Difference Conservations											
R1 Types of vehicles: Elect vehicles School bypes W Other Community of the local state of											
B1. Types of vehicles: Fleet vehicles School buses X Other: <u>Commuter</u> vehicles											
<b>B2.</b> Approximate number of venicles:	(Maintained) Panairad Pagualad Evalad Wa	ahad Stand									
<b>B4.</b> Are vehicles stored and/or repaired outs	ide? Y XN Can't Tell										
Are these vehicles lacking runoff diversion	$\frac{1}{1} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2} + \frac{1}$		• O								
<b>B5.</b> Is there evidence of spills/leakage from	vehicles? 🗌 Y 🔎 N 🗌 Can't Tell		0								
B6. Are uncovered outdoor fueling areas pre	esent? 🗌 Y 🖾 N 🗌 Can't Tell		0								
B7. Are fueling areas directly connected to s	torm drains? 🗌 Y 🕅 N 🗌 Can't Tell		0								
<b>B8.</b> Are vehicles washed outdoors? $\Box$ Y	$\square$ N $\square$ Can't Tell	2+ Toll	0								
C. OUTDOOR MATERIALS X N/A (Skip to	(part D)	Observed F	Collution Source?								
C1. Are loading/unloading operations preser	nt? Y X N Can't Tell	- Observed I	ondion Source.								
If yes, are they uncovered and draining towa	urds a storm drain inlet? 🗌 Y 🗌 N 🗌 Can	't Tell									
<b>C2.</b> Are materials stored outside? Y X Where are they stored? grass/dirt area	N Can't Tell If yes, are they Liquid S concrete/asphalt bermed area	olid Descriptior	<sup>n</sup> 0								
C3. Is the storage area directly or indirectly	connected to storm drain (circle one)?	N 🗌 Can't Te	II O								
C4. Is staining or discoloration around the a	rea visible? 🗌 Y 🔲 N 📈 Can't Tell		0								
C5. Does outdoor storage area lack a cover?	Y N Can't Tell		0								
C6. Are liquid materials stored without seco	ndary containment? 🗌 Y 🏹 N 🗌 Can't Tell		O								
C7. Are storage containers missing labels or	in poor condition (rusting)? $\Box$ Y $\Box$ N $\Box$ Ca	n't Tell	. O								
<b>D.</b> WASTE MANAGEMENT $\lambda$ N/A (Skip t	o part E)	Observed P	'ollution Source?								
<b>D1.</b> Type of waste (check all that apply):	Garbage Construction materials Hazar	dous materials	0								
<b>D2.</b> Dumpster condition ( <i>check all that app</i> evidence of leakage (stains on ground)	<i>ly)</i> :  No cover/Lid is open  Damaged/poor co Overflowing	ondition	eaking or O								
<b>D3.</b> Is the dumpster located near a storm dra If yes, are runoff diversion methods (be	in inlet? LYLNLCan't Tell rms. curbs) lacking? LYLN Can't Tell		O								
E. PHYSICAL PLANT N/A (Skip to part	F)	Observed F	'ollution Source?								
E1. Building: Approximate age: Evidence that maintenance results in discha	yrs. Condition of surfaces: Clean Stain rge to storm drains (staining/discoloration)? Y	ed Dirty N Don't 1	Damaged O know O								

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\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

### 6B HSI OI

Hotspot Site Investigation

HSI

	•					<b></b>		<u> </u>								Angelerer	and the second
E2. Parking Lot: Approx	imate age	yrs. Condition: 🗌 Clea	n	Stair	ned	ΠI	Dirty		Break	cing	up					(	Э
Surface material	Paved/Concrete	📙 Gravel 🔲 Permeab	le 🗌	Don't	kno	w											
E3. Do downspouts disch Are downspouts	arge to impervio directly connect	ous surface? Y N eted to storm drains?		Don'	t kn N	ow [	] No Don'	one t kn	visibl ow	e						(	С
E4. Evidence of poor clea	ning practices f	or construction activities (	stains	leadi	ng te	o sto:	rm dr	ain)	?	ΥĽ	] N		Ca	n't T	ell	(	0
F. TURF/LANDSCAPING	GAREAS	NA (skip to part G)							Ob	serv	ed I	Poll	utio	n So	urce	?[	
F1. % of site with: Forest	canopy%	Turf grass <u> 70</u> % La	ndsca	ping_	( Ù 🕼	%]	Bare 8	Soil		%							0
F2. Rate the turf manager	nent status: 🕅	High 🗌 Medium 🔲 I	Low														0
F3. Evidence of permanent	nt irrigation or "	non-target" irrigation	Υ	N []	₫)C	an't 🛛	[ell									. (	0
F4. Do landscaped areas drain to the storm drain system? X V Can't Tell													(	0			
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? 🗌 Y 🗌 N 🔀 Can't Tell												:11	(	0			
G. STORM WATER INFRASTRUCTURE N/A (skip to part H) Observed Pollution Source												urce	?				
G1. Are storm water treat	ment practices j	present? 🛛 Y 🗌 N 🗌	Unkn	own	Ify	es, pl	ease	desc	ribe:						-		о 
G2. Are private storm dra	ins located at th	e facility? X IN	] Unl	mowi	1											. (	0
Is trash present i	n gutters leading	g to storm drains? If so, co	omplet	the	inde	x be	low.		:								
	Clean	Index Rating fo	or Acc	umula	atioi	1 m (	rutter	S	<u>न</u>	iltby							
Sediment			73				74		1	inury		5					
Organic material		$\square^2$									H	5					
Litter		$\square 2$ $\square 2$									H	5					
C3 Catch basin inspectio	n – Record SSI	Unique Site ID here			'ond			Dirt	<i></i>	Cle	<u></u> an	<u> </u>					
H. INITIAL HOTSPOT	STATUS - IND	EX RESULTS					· 🛄 י		<u>у Ц</u>		<u>an</u>						
Not a hotepot (fewer t	han 5 circles an	$d$ no hoves checked) $\Box$	Poten	tial ho	ten		to 1(		cles h	aut no	a ha	VAC	che	-bed		2	
$\Box$ Confirmed hotspot (1	0 to 15 circles a	und/or 1 box checked)	Sever	e hots	not	(>15	circle	es ai	nd/or	$\frac{2}{2}$ or	moi	re ho	oxes	chec	keď	•	
Follow-up Action.	0 10 10 0101000														T	, 	
Refer for immediate e	nforcement			_			_										
Suggest follow-up on	site inspection																
Test for illicit dischar	ee mepeenen																
Include in future educ	ation effort																
Check to see if hotspo	t is an NPDES :	non-filer		en.	210	tha	1.10	42	ah		k						
Onsite non-residential	retrofit				rier	wa	- pm	ר יא	910	shir	1				_	ļ	
Pervious area restorat	ion; complete P	AA sheet and record		Ør		2012	$\langle \dot{r} \rangle$	an	d		)						
Unique Site ID I	nere:			1 ton	1.0	M			No	J.							
Schedule a review of	storm water pol	lution prevention plan			1			- 403									
Notes:		Scaliment front									T						
Stormwater	o Kintion V	nivin be installed															
the state	Secol M																
	Goillord																
the the second	A.	5-1															
1 3 3 20 48 M		A. i.															
	and	mil															
		121															
		<u> </u>						1									

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GTS-HS1-01 1/16/08 Gerber Drike - Stormweter Letro Fit · EXISTING-BASIN, NO SED. FOREBAY "SIGNIFICANT SED. ACUMULATION · INLET NOT IDENTIFIED OUTLET & RIPRAP CHANNEL FULL OF TREES & SHAVES · Recall that evosion was present domestream

### HSI

WATERSHED: Tanker	SUBWATERSHE	D: Clark		<b>UNIQUE SITE</b>	D: ("B-K	HCI-OI
DATE: 716108	ASSESSED BY:	KB, DB	CAMERA ID:	<u>_</u>	PIC#:	
MAP GRID:	LAT	0 <u>t</u> t	LONG°	11	LMK#	
A. SITE DATA AND BASIC CLASSIFICATION						
Name and Address:	Category:		al 🗌 Industrial	Miscellaneous		
Supprise Evergy	_		al [] Municipal Related	Golf Course		
rt.30	_		Related	Animal Faci	lity	
SIC code (if available):	Basic Desc	ription of Opera	ition:			
NPDES Status: Regulated	propar	e				INDEX*
	1					LIBLA
B. VEHICLE OPERATIONS N/A (Skip to	part C)			Observed P	ollution Sour	ce?
<b>B1.</b> Types of vehicles: K Fleet vehicles	School buses	Other:	***			
<b>B2.</b> Approximate number of vehicles:	propave	trucks	-	· · · · · · · · · · · · · · · · · · ·		
<b>B3.</b> Vehicle activities (circle all that apply):	Maintained Re	epaired Recyc	led Fueled Wa	ashed Stored		0
<b>B4.</b> Are vehicles stored and/or repaired outsi Are these vehicles lacking runoff diversion r	de? [] Y [] 1 nethods? [] Y	N 🗌 Can't Te	ell n't Tell		· · · · · · · · · · · · · · · · · · ·	0
B5. Is there evidence of spills/leakage from	vehicles? 🗌 Y	$\square$ N $\bigvee$ Can	't Tell			0
B6. Are uncovered outdoor fueling areas pre	sent? 🗌 Y 📋	N 🕅 Can't 🛛	[ell			0
B7. Are fueling areas directly connected to s	torm drains?	]Y 🗌 N 🗌	Can't Tell			0
<b>B8.</b> Are vehicles washed outdoors? Y	N Can't	Tell		N. 70. 11	******	0
C. OUTDOOR MATERIALS N/A (Skip to	part D)					
C1. Are loading/unloading operations preser	<u>t? Йү П</u> и	Can't Tell	n de la service de la service. I	Observed P	ollution Sour	
If yes, are they uncovered and draining towa	rds a storm drain	inlet? $\Box$ Y	□N KICar	i't Tell		0
C2. Are materials stored outside? $\mathbf{K}$ Y	N 🗌 Can't Tell	If yes, are the	y 🗌 Liquid 🗍 S	olid Description	1:	
Where are they stored?  grass/dirt area	Concrete/aspha	alt 🗍 bermed	area			O
C3. Is the storage area directly or indirectly of	connected to stor	m drain (circle o	one)? 🗌 Y 🔲	N 🗹 Can't Tel	1	0
C4. Is staining or discoloration around the ar	ea visible? 🗌 Y	<u> </u>	an't Tell			0
C5. Does outdoor storage area lack a cover?	XY 🗆 N	Can't Tell				0
C6. Are liquid materials stored without second	ndary containmer	nt? KY D	N 🗌 Can't Tell			0
C7. Are storage containers missing labels or	in poor conditior	n (rusting)? 🕅	Y 🗌 N 🗌 Ca	n't Tell Rust		0
D. WASTE MANAGEMENT N/A (Skip to	part E)			Observed P	ollution Sour	ce?
<b>D1.</b> Type of waste (check all that apply):	] Garbage 🔲 🤇	Construction ma	terials 🗌 Hazar	dous materials		0
<b>D2.</b> Dumpster condition ( <i>check all that apple</i> evidence of leakage (stains on ground)	y):  No cover/ Overflowing	Lid is open	Damaged/poor c	ondition Le	aking or	0
D3. Is the dumpster located near a storm dra	n inlet? 🗌 Y 🗌	] N 🗌 Can't Te	211			0
If yes, are runoff diversion methods (ber	ms, curbs) lackin	lg?∐Y []]	N ∐ Can't Tell		Constant Section	
E. PRISICAL FLANT [] N/A (Skip to part I	Lessen and the second			Observed P	ollution Sour	ce?
E1. Building: Approximate age: $30-40$	yrs. Condition	of surfaces:	] Clean 🔲 Stain	ed 🗌 Dirty 🔲	Damaged	0
Evidence that maintenance results in dischar	ge to storm drain	as (staining/disc	oloration)? 🗌 Y	🗌 N 🗌 Don't k	now	0
	r					and a state of the

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\*Index: O denotes potential pollution source; denotes confirmed polluter (evidence was seen)

CB-F151-01

	[SI

E2. Parking Lot: Approximate age	_ yrs. Condition: $\Box C$	lean [	]S	tain	led kno		Dirt	у 🗌	] Bre	akir	ıg u	ıp							О	
E3. Do downspouts discharge to imperv	ious surface? Y	N [		$\frac{n}{n}$	t kno	ow		Non	e visi	ible			·····							
Are downspouts directly conne	cted to storm drains?		Y		N		]Do	n't k	now										U 	
E4. Evidence of poor cleaning practices	for construction activitie	es (stai	ns le	adi	ng te	o st	orm	drai	n)? [	] Y		] N		Ca	n't	Tel	1	) سېر	0	
F. TURF/LANDSCAPING AREAS	N/A (skip to part G)								(	Dbse	erve	ed F	Poll	utic	on S	oui	rce	2		
<b>F1.</b> % of site with: Forest canopy%	5 Turf grass%	Landsc	api	1g _		%	Bar	e So	i1	%	)	<u> </u>							0	
<b>F2.</b> Rate the turf management status:	] High 🗌 Medium 🗌	] Low																	0	
<b>F3.</b> Evidence of permanent irrigation or	"non-target" irrigation	<u> </u>	<u>_</u> }	1	] Ca	an't	Tel												<u>O</u>	
F4. Do landscaped areas drain to the storm drain system?       Y       N       Can't Tell														0						
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? Y N Can't Tell														0						
G. STORM WATER INFRASTRUCTURE N/A (skip to part H) Observed Pollution Source?													?							
G1. Are storm water treatment practices present? 🗌 Y 🖄 N 🗋 Unknown If yes, please describe:													0							
G2. Are private storm drains located at the facility? Y N Unknown Is trash present in gutters leading to storm drains? If so, complete the index below.													0							
	Index Rating	g for A	ccur	nula	tior	1 in	Gut	ters												
Clean Filthy																				
Organic material	$\square^2$										L r	$\exists$	5							
Litter	$\square 2$												5							
G3. Catch basin inspection – Record SS	D Unique Site ID here:			С	ond	itio	n: [	] Di	ty		lea	n								
H. INITIAL HOTSPOT STATUS - IN	DEX RESULTS																			
Not a hotspot (fewer than 5 circles and	nd no boxes checked)	] Pote	ntia	l ho	tspc	ot (	5 to	10 c	ircles	s but	t no	bo	xes	che	cke	d)				
Confirmed hotspot (10 to 15 circles	and/or 1 box checked)	] Seve	re l	ots	<u>pot (</u>	(>1:	5 cir	cles	and/o	or 2	or 1	mor	e bo	oxes	s ch	eck	ed)			
Follow-up Action:																				
Refer for immediate enforcement																				
Test for illicit discharge																				
Include in future education effort																				
Check to see if hotspot is an NPDES	non-filer																			
Consite non-residential retrofit	<b>PAA</b> sheet and record				$\neg$															
Unique Site ID here:	AA sheet and record																-			
Schedule a review of storm water po	llution prevention plan								+							_				
Notes.																				
110113.								+											$\neg$	
									1										$\neg$	
									-										-+	<del></del>
					$\neg$														-+	<u> </u>
				i			-+													
									1											
L			4		I		I		. 1	لــــــــــــــــــــــــــــــــــــــ	1	ł			l		L	·		

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WATERSHED: Tanker	SUBWATERSHED: CLARES	UNIQUE SITE ID: CR -NSA -01					
DATE: 1/10/08	Assessed By: CB, DB	CAMERA ID:	PIC#:				
A. NEIGHBORHOOD CHARACTERIZ	ATION						
Neighborhood/Subdivision Name:	igh Manor	Neighborhood Area (ac	cres) <b>1</b>				
If unknown, address (or streets) surveyed	1()		50				
Homeowners Association?	Unknown If yes, name and conta	ct information.	[39](45				
Residential (circle average single family	o lot size):						
Single Family Attached (Duplexes, R	ow Homes) $< \frac{1}{8}  \frac{1}{8}  \frac{1}{4}  \frac{1}{3}  \frac{1}{3}  a$	cre 🔲 Multifamily (Apts, Townho	omes, Condos)				
Single Family Detached	$<\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	cre 🛛 Mobile Home Park					
Estimated Age of Neighborhood: <u>50</u>	years Percent of Homes with Gara	ges: $0\%$ With Basements $0\%$	• INDEX*				
Sewer Service? Y N			O				
Index of Infill, Redevelopment, and Rem	odeling 🖄 No Evidence 🔲 <5% o	of units $\Box$ 5-10% $\Box$ >10%	O				
Record percent observed for each depending on applicability	of the following indicators, and/or site complexity	Percentage Comments/Notes					
B. YARD AND LAWN CONDITIONS							
B1. % of lot with impervious cover		40					
<b>B2.</b> % of lot with grass cover		40	0				
B3. % of lot with landscaping (e.g., mule	ched bed areas)	20					
<b>B4.</b> % of lot with bare soil		0	Ô				
*Note: B1 through B4 must tota	1 100%						
<b>B5.</b> % of lot with forest canopy		10	0				
<b>B6.</b> Evidence of permanent irrigation or '	'non-target" irrigation	100/09)	Ŏ				
		High: 50	0				
B7. Proportion of <i>total neighborhood</i> turn	f lawns with following	Med: 4()					
management status:							
<b>P9</b> Outdoor guimming pools? DV Vb							
<b>BO.</b> but a strack is smalled.			O				
<b>B9.</b> Junk of trash in yards? $[Y]$			O I				
C. DRIVEWAYS, SIDEWALKS, AND C							
C1. % of driveways that are impervious		100					
C2. Driveway Condition Clean	Stained Dirty Breaking up		Ø				
C3. Are sidewalks present? $\Box$ Y X N	If yes, are they on one side of street	or along both sides					
What is the distance between the	with lawin chippings/leaves [] Rece	lving 'non-target' irrigation	· · · · · · · · · · · · · · · · · · ·				
Is net waste present in this area?	$\nabla \nabla \Box N \Box N/\lambda$		<u> </u>				
<b>C4.</b> Is curb and gutter present? $X$ Y	$\square$ N If yes, check all that apply:						
Clean and Dry 🗌 Flowing of	or standing water 🕅 Long-term car p	parking 🗌 Sediment	0				
Organic matter, leaves, lawn	clippings Trash, litter, or debr	is 🗌 Overhead tree canopy	$\diamond$				

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\* INDEX: O denotes potential pollution source; ♦ denotes a neighborhood restoration opportunity

# CB -NSA=01 Neighborhood Source Assessment

# NSA

D. ROOFTOPS															
D1. Downspouts are directly connected to storm drains or sanita	ry se	wer												$\diamond$	0
D2. Downspouts are directed to impervious surface					()										
D3. Downspouts discharge to pervious area					96										
D4. Downspouts discharge to a cistern, rain barrel, etc.															
*Note: C1 through C4 should total 100%															
D5. Lawn area present downgradient of leader for rain garden?	Ŕ	Υ[	]N										1000		$\diamond$
E. COMMON AREAS															
E1. Storm drain inlets? Y N If yes, are they stenciled? Catch basins inspected? Y N If yes, include U	۲ 🗌 nique	7 🔀 e Sit	N e ID	Con from	ditic n SS	n: 🕅 D sl	Cl heet:	lean		Dirt	y	·			<b>()</b>
E2. Storm water pond? Y N Is it a wet pond or What is the estimated pond area? <a href="https://www.statication.org">to a wet pond or wet pond or wet pond or wet pond or wet pond area?</a>	] dry 1t 1 a	pon cre	id?	Is > 1 a	it ov .cre	ergr	own	?	Y	נ 🗌	N		2014 1014 1014 1014 1014		$\diamond$
E3. Open Space? Y X N If yes, is pet waste present?	] Y	נ 🗌	N di	umpi	ing?		Υ[	N						•••••	0
Buffers/floodplain present: Y N If yes, is encr	oach	men	t evi	ident	? 🗌	Y		N							
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOM	<b>MEN</b>	DAI	ION	<b>S</b> -						19 s.1		ë: ::			
Based on field observations, this neighborhood has significant i	ndica	tors	for	the f	ollo	wing	<u>д: (с</u>	heck	all	that	app	ly)			0
Nutrients Oil and Grease Trash/Litter Bacteria	Q	Sed	imeı	nt [	] Ot	her									0
Recommended Actions	De	scri	be R	leçoj	nme	ende	d A	ctior	is:			ł			
Specific Action		Bett	er	(a	ndy	xaf	)EV-9	10	11	Inc	ren	sed			
Onsite retrofit potential?				rei	N	iol	25	la	Ś	ea	5.	,			
Better lawn/landscaping practice?			V				,								
Better management of common space?															
Pond retrofit?															
$\Box \text{ Other action(s)}$															
NSA Pollution Severity Index															
Severe (More than 10 circles checked)															
$\square High \qquad (5 to 10 circles checked)$															
Moderate (Fewer than 5 circles checked)															
None (No circles checked)															
Neighborhood Destanation Opportunity Index															
High (More than 5 diamonds checked)															
Moderate (3-5 diamonds checked)	<u> </u>														
(Fewer than 3 diamonds checked)															
	<b> </b>														
										<b> </b>					
	L			L						L	L				

NOTES:

Neighborhood Source Assessment



WATERSHED: TAKERhoopn	SUBWATERSHED: TUCKOR	RSHED: TUCKER UNIQUE SITE ID: TB-USA-O)					
DATE: 71/6/08	Assessed By: CAMERA ID:						
A. NEIGHBORHOOD CHARACTERIZ	ATION						
Neighborhood/Subdivision Name:		Neighl	oorhood Area (acr	res) 106 (HS)			
If unknown, address (or streets) surveyed Mlada Brook Ave	# Duke, Amberst						
Homeowners Association? Y N	Unknown If yes, name and cont	act information:					
Residential (circle average single family	o lot size):		······				
Single Family Attached (Duplexes, R	ow Homes) $<\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{3}$ $\frac{1}{3}$	acre Multifamily	y (Apts, Townhon	nes, Condos)			
Estimated Age of Neighborhood:	$\frac{\sqrt{4}}{\sqrt{4}}$ $\frac{\sqrt{2}}{\sqrt{2}}$ $\frac{1}{\sqrt{2}}$	acre Mobile Ho	me Park	INDEX*			
Sewer Service? $\mathbf{X} \mathbf{Y} \square \mathbf{N}$		1903. <u>100</u> 70 Willing		INDEA-			
Index of Infill Redevelopment and Rem	odeling No Evidence 0<5%	of unite V 5 10%	>109/	0			
Record percent observed for each	of the following indicators		~10%				
depending on applicability	and/or site complexity	Percentage Co	omments/Notes				
B. YARD AND LAWN CONDITIONS				A State			
<b>B1.</b> % of lot with impervious cover		50					
<b>B2.</b> % of lot with grass cover		30		0			
<b>B3.</b> % of lot with landscaping (e.g., muld	ched bed areas)	20		$\diamond$			
<b>B4.</b> % of lot with bare soil		6		0			
*Note: B1 through B4 must tota	l 100%	• •					
<b>B5.</b> % of lot with forest canopy		20		$\diamond$			
B6. Evidence of permanent irrigation or '	'non-target" irrigation			0			
		High: <u>100</u>		0			
<b>B7.</b> Proportion of <i>total neighborhood</i> turk	f lawns with following	Med:					
management status:		Low:					
B8 Outdoor swimming pools? VIV []N	Can't Tell Estimated # 1/						
<b>B9</b> Junk or trash in wards? $\nabla$	$\frac{1}{N} \int Can't Tell$			0			
C1. % of driveways, Side walks; and C							
C1. % of driveways that are impervious		100					
C2. Driveway Condition X Clean	Stained Dirty Breaking up			O			
C3. Are sidewarks present? $[A Y ] N$	uith lawn clippings/leaves.	or along both side	s 🛄				
What is the distance between the	sidewalk and street?		gauon	0			
Is net waste present in this area?	$ \nabla \nabla \nabla N \Box N/\lambda $						
<b>C4.</b> Is curb and gutter present? $\mathbf{X}$ Y	$\square$ N If yes, check all that apply:			U			
Clean and Dry 🗌 Flowing of	or standing water Long-term car	parking 🗌 Sediment		0			
Organic matter, leaves, lawn	clippings	ris 🗌 Overhead tree c	anopy	$\diamond$			

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\* INDEX: O denotes potential pollution source; ♦ denotes a neighborhood restoration opportunity

TB-NSA -01 Neighborhood Source Assessment

# NSA

D. Downspouts are directly connected to storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer         D2. Downspouts are directed to impervious surface       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer         D3. Downspouts discharge to a cistern, rain barcl, etc.       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer         D4. Downspouts discharge to a cistern, rain barcl, etc.       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewere red of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construction of the storm drains or sanitary sewer       Image: Construct	D BOOFTOPS		1.2.1	in the second			127			a de la	
Bit Downspouls are directed to mark sum of same jewer       JC         Disconspouls discharge to a cistem, rain barrel, etc.       JC         Bit Downspouls discharge to a cistem, rain barrel, etc.       JC         *Note: C1 through C4 should total 100%       SE         So Laws area present downgriden of leader for rain garden? *[] Y [] N       Set	D1 Downspouts are directly connected to storm drains or sanit	ary sewer						2012		$\sim$	
Dis Downspouls and uncrede to impervious area       PC         Dis Downspouls discharge to a cistern, rain barrel, etc.       *Noire: Cl through Cl should total 100%         Dis Lownspouls discharge to a cistern, rain barrel, etc.       *Noire: Cl through Cl should total 100%         Dis Lownspouls discharge to a cistern, rain barrel, etc.       *Noire: Cl through Cl should total 100%         Dis Lawn area present downgradient of leader for rain garden? *[Y    N       N         E1. Storm drain inlets?       Y    N         If CostMictory ARLAS       N         E2. Storm water pond?       Ext P    N         What is the estimated pond area?       Ward Addee (M about 1 aree   >-1 larce         E3. Open Space?       Y    N       H yes, is pet waste present?         E3. Open Space?       Y    N       H yes, is pet waste present?       Y    N         Bactor field observations, this neighborhood has significant indicators for the following: (check all that apply)       Imate in a diagonery Addee (A citons: Specific Actions         Specific Action       Describe Recommended Actions:       Specific Actions         Specific Action       Describe Recommended Actions:       Mark Addee (M about Addee (M a	<b>D2</b> Downspouts are directed to impervious surface		/	0						<u> </u>	
D3. Downspouts discharge to a cistern, rain barrel, etc.       90         PMOE: C1 through C4 should total 100%         D5. Lawn area present downgradient of leader for rain garden? 2 Y   N         D5. Lawn area present downgradient of leader for rain garden? 2 Y   N         C (MMON Arenas)         E1. Storm drain inlets? 2 Y   N If yes, are they stenciled? Y   N Condition: 2 Clean   Dirty         Catch basins inspected? () Y   N If yes, include Unique Site ID from SSD sheet:         E2. Storm water pool? BY   N If yes, is plug we pool of   dry pool?   as it overgrown? [X Y   N         What is the estimated pool area? 2 M/4 debc () about 1 acre  > 1 acre         E3. Open Space?   Y   N If yes, is plug we pool of   dry pool?   a cre  > 1 acre         E3. Open Space?   Y   N If yes, is plug we present? Y   N dumping?   Y   N         Baffers/floodplain present:       Y   N If yes, is encroachment evident?   Y   N         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         Outrients = Oli and Grease       Describe Recommended Actions:         Specific Action       Better lawn/landscaping practice?         Better lawn/landscaping practice?       Describe Recommended Actions:         Specific Action       WM be lawy h for Model         MUD of actrolfi?       WM be lawy h for Model         Multi-family Parking Lot Retrofit?       WM be lawy h for Model	<b>D2</b> . Downspotts are directed to impervious surface		$\frac{l}{\alpha}$								200
DA. Downspotis discharge to a clatter, ran barrel, etc.         *Note: cf. through Cf should total 100%         D5. Lawn area present downgradient of leader for rnin garden? * Y   N         D5. Lawn area present downgradient of leader for rnin garden? * Y   N         D5. Lawn area present downgradient of leader for rnin garden? * Y   N         Catch basin singeter?         Catch basin singeter?         D5. Lawn area present downgradient of leader for rnin garden? * Y   N         Catch basin singeter?         E2. Storm water pool?         What is the estimated pool area?         D7 may basin singeter of the single for the sing	D3. Downspouts discharge to pervious area			2							
"More CI infruging CS should total 100%         DS: Lawn area present downgradient of leader for rain garden? [] Y ] N         ED: Lawn area present downgradient of leader for rain garden? [] Y ] N         Catch basins inspected? [] Y ] N If yes, include Unique Site ID from SSD sheet:         E2: Storm water pond? [] Y ] N If yes, is net doe Unique Site ID from SSD sheet:         E3: Open Space? [] Y ] N If yes, is net water present? [] Y ] N dumping? [] Y ] N         Buffers/floodplain present: [] Y ] N If yes, is network present? [] Y ] N dumping? [] Y ] N         Buffers/floodplain present: [] Y ] N If yes, is network present? [] Y ] N dumping? [] Y ] N         Buffers/floodplain present: [] Y ] N If yes, is network present? [] Y ] N dumping? [] Y ] N         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         O         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         O         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         O         Better lawnlandscaping practice?         Better management of common space?         P Pond retrofit?         Multi-family Parking Lot Retrofit?         O there action(s)         Initial Assessment         None         None (No circles checked)	<b>D4.</b> Downspouts discharge to a cistern, rain barrel, etc.										
Ds. Lawn area present downgradient of redue for rain garden? * * Y _ IN         E COMMON ARLAS         E 1. Storm drain inlets? * Y _ IN If yes, are they stenciled? * Y _ IN Condition: * Clean _ Dirty         Catch basins inspected? * Y _ IN If yes, include Unique Site ID from SSD sheet:	*Note: C1 through C4 should total 100%				•				110000	~	
EVENTION AREAS         E1. Storm drain inlets?       Y       N If yes, are they stenciled?       Y       N Condition:       Clean       Dury         Catch basins inspected?       Y       N If yes, include Unique Site ID from SSD sheet:       Image: Clean of the stence of	<b>D5.</b> Lawn area present downgradient of leader for fain garden?						24.55			$\underline{\mathbf{v}}$	
EI. Storm drain index? [\screen V ] N If yes, are they stenciled? [\screen V ] N Condition: [\screen D ] http://www.screen D [\screen V ] N If yes, include Unique Site ID from SSD sheet:	E. COMMON AREAS				1.124					<u></u>	
Catch basins inspected? Y N If yes, include Unique Site ID from SSD sheet:   E2. Storm water pond? By it overgrown? Y N   What is the estimated pond area? Mck4/efc about 1 acr > 1 acr   E3. Open Space? Y N If yes, is pet waste present? Y N   Buffers/floodplain present: Y N N dumping? Y N   Buffers/floodplain present: Y N N dumping? Y N   P. NUTICAL NEIGHBORHOOD ASSISSMENT AND RECOMMENDATIONS   Based on field observations, this neighborhood has significant indicators for the following: (check all that apply) O   Omite retrofit potential? Describe Recommended Actions:   Specific Action Forwalt Forwalt   Multi-family Parking Lot Retrofit? Describe Recommended Actions:   Multi-family Parking Lot Retrofit? Mcd Howagh, for Mode   Other action(s) Multi-family Parking Lot Retrofit?   Initial Assessment Moderate (Fewer than 5 circles checked)   Moderate (Fewer than 5 circles checked)   Moderate (Fewer than 3 diamonds checked)   Moderate (3-5 diamonds checked)	E1. Storm drain inlets? $\mathcal{L}$ Y $\square$ N If yes, are they stenciled?	₩Y I N	Conditio	on: LZ	Clean	L Dir	ty			$\diamond$	
E2. Storm water point? Laxy	Catch basins inspected? V Y IN If yes, include U	Jnique Site ID	from SS	SD shee	et:	··· · · · · · ·				0	-
E3. Open Space?       Y       N       If yes, is pet waste present?       Y       N       dumping?       Y       N         Buffers/floodplain present:       Y       N       If yes, is encroachment evident?       Y       N         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)       O         Invitents       Oil and Grease       Trash/Litter       Bacteria       Sceliment       O         Recommended Actions       Specific Action       Describe Recommended Actions:       For Actions       The Action of the Actions         Specific Action       Describe Recommended Actions:       For Action of the Actions       The Action of the Actions         Metonshite retrofit potential?       Describe Recommended Actions:       For Action of the Actions       Action of the Actions         Better nanagement of common space?       Better thaning Parking Lot Retrofit?       MM be log Act Ill Mungh for whole       MM be log Action of the Actions         Initial Assessment       Severe (More than 10 circles checked)       MM be log Action of the Action of th	E2. Storm water pond? KY N Is it a K wet pond or What is the estimated pond area?	dry pond? ut 1 acre $2 >$	Is it ov 1 acre	ergrov	/m? [凶	.Ү []]	N			æ,	122
Buffers/floodplain present:       Y       N       If yes, is encroachment evident?       Y       N         EINITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)       O         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)       O         Recommended Actions:       Secure 2         Specific Action       Describe Recommended Actions:         Better lawn/landscaping practice?       Better management of common space?         Better management of common space?       Pond retrofit?         Other action(s)       Nuti-family Parking Lot Retrofit?         Initial Assessment       Nume (More than 10 circles checked)         Moderate (So to 10 circles checked)       None (No circles checked)         Moderate (3-5 diamonds checked)       Moderate (3-5 diamonds checked)         Moderate (3-5 diamonds checked) </td <td>E3. Open Space? Y N If yes, is pet waste present?</td> <td>]Y ∐N du</td> <td>mping?</td> <td>□ Y</td> <td>ΠN</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td>	E3. Open Space? Y N If yes, is pet waste present?	]Y ∐N du	mping?	□ Y	ΠN					0	
EXITING NEIGHBORHOOD ASSESSMENT AND RECOVINENDATIONS         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         Nutrients       Oil and Grease         Commended Actions       Describe Recommended Actions:         Specific Action       Found 1         Mathematication       Describe Recommended Actions:         Better lawn/landscaping practice?       Describe Recommended Actions:         Better lawn/landscaping practice?       Describe Recommended Actions:         Better lawn/landscaping practice?       Multi-family Parking Lot Retrofit?         Multi-family Parking Lot Retrofit?       Multi-family Parking Lot Retrofit?         Other action(s)       Multi-family Parking Lot Retrofit?         NSA Pollution Severity Index       Mathematicaping practices checked)         Moderate (Fewer than 5 circles checked)       Moderate (Fewer than 5 circles checked)         Moderate (Fewer than 5 circles checked)       Moderate (Fewer than 5 diamonds checked)         Moderate (3-5 diamonds checked)       Moderate (3-5 diamonds checked)         Moderate (3-5 diamonds checked)       Mathematicaping practice         Moderate (3-5 diamonds checked)       Mathematicaping practice         Moderate (3-5 diamonds checked)       Mathematicaping practice         Mathematicaping practice       Mathematicaping practice	Buffers/floodplain present: 🗌 Y 🗌 N If yes, is enc	roachment evid	lent?	]Y [	] N						
Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)       Image: Content of Content	F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOM	MENDATION	8				4.54			122	
Nutrients       Oil and Grease       Trash/Litter       Bacteria       Sediment       Other         Recommended Actions       Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         Better lawn/landscaping practice?       Better lawn/landscaping practice?       Image: Specific Action       Image: Specific Action       Image: Specific Action         Multi-family Parking Lot Retrofit?       Image: Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         Initial Assessment       Image: Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         NSA Pollution Severity Index       Image: Specific Action       Image: Specific Action       Image: Specific Action       Image: Specific Action         Severe       (More than 10 circles checked)       Image: Specific Action       Image: Specific Action       Image: Specific Action         None       (No circles checked)       Image: Specific Action       Image: Specific Action       Image: Specific Action <td>Based on field observations, this neighborhood has significant i</td> <td>indicators for t</td> <td>he follo</td> <td>wing:</td> <td>(check</td> <td>all that</td> <td>t app</td> <td>ly)</td> <td></td> <td>0</td> <td></td>	Based on field observations, this neighborhood has significant i	indicators for t	he follo	wing:	(check	all that	t app	ly)		0	
Recommended Actions       Describe Recommended Actions:         Specific Action       Fornd I pend along Yale 4 Checklaw         Better lawn/landscaping practice?       Better management of common space?         Pond retrofit?       Multi-family Parking Lot Retrofit?         Other action(s)       Mugh - Gor whole         Initial Assessment       Moderate (Fewer than 5 circles checked)         Moderate (3-5 diamonds checked)       Moderate (3-5 diamonds checked)         Moderate (3-5 diamonds checked)       Modera	Nutrients Oil and Grease Trash/Litter Bacteri	a 🗌 Sedimen	t 🗌 O	her						0	
Specific Action Specific Actio	Recommended Actions	Describe R	ecomm	ended	Action	IS:			1		
Image: Consider retrofit potential?       Attempting to Shall be anti-execting to common space?         Image: Consider retrofit?       Multi-family Parking Lot Retrofit?         Image:	Specific Action	Found	1.	pone	h ar	lone	٦	Yale	- 4(	<i>Cha</i> t	ham
□       Better lawn/landscaping practice?         □       Better management of common space?         □       Pond retrofit?         □       Other action(s)         Initial Assessment       Multi-family Parking Lot Retrofit?         □       Other action(s)         Initial Assessment       Image: Common space?         NSA Pollution Severity Index       Image: Common space?         □       Severe (More than 10 circles checked)         □       Image: Common space?         □       Moderate (Fewer than 5 circles checked)         □       Moderate (Fewer than 5 circles checked)         □       Moderate (3-5 diamonds checked)         □       Image: Common space?         1       Image: Common space?         0       Moderate (3-5 diamonds checked)         □       Image: Common space?         1       Image: Common space? <td>Onsite retrofit potential?</td> <td>althout</td> <td>n to</td> <td>o Sh</td> <td>rall</td> <td>tor</td> <td>-er</td> <td>the</td> <td>e-ir</td> <td>etat</td> <td>abort</td>	Onsite retrofit potential?	althout	n to	o Sh	rall	tor	-er	the	e-ir	etat	abort
□ Better management of common space?   □ Pond retrofit?   □ Multi-family Parking Lot Retrofit?   □ Other action(s)   Initial Assessment   NSA Pollution Severity Index   □ Severe (More than 10 circles checked)   □ □   □ □   □ □   □ □     None (No circles checked)   □ □     None (No circles checked)     □   □   □   □   □   □   □   □   □   □   □   □   □     □    □   □   □   □    □   □   □   □   □   □   □   □   □   □	Better lawn/landscaping practice?	other	anad	<u> </u>	- tot	Tent	A		-	. [	
Image: Point Periodit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   Moderate (Fewer than 5 circles checked)   Moderate (Sto 10 circles checked)   Moderate (Fewer than 5 circles checked)   Moderate (Sever than 5 circles checked)   Moderate (Sever than 5 circles checked)   Moderate (3-5 diamonds checked)	Better management of common space?	IMAL	$\int$			· · · · ·	n'			r	
Initial Assessment     NSA Pollution Severity Index     Severe     (More than 10 circles checked)     High     (Sto 10 circles checked)     Moderate     Neighborhood Restoration Opportunity Index     High     Moderate     (3-5 diamonds checked)     Moderate     Moderate     Moderate     Moderate     Moderate     Moderate     More than 5 diamonds checked)     Moderate	Multi family Parking L at Petrofit?	1 hour p	e lar	l l	Mon	gh.	tor	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	hole	-	
Initial Assessment     NSA Pollution Severity Index     Severe (More than 10 circles checked)     High (5 to 10 circles checked)     Moderate (Fewer than 5 circles checked)     None (No circles checked)     Neighborhood Restoration Opportunity Index     High (More than 5 diamonds checked)     Moderate (3-5 diamonds checked)     Moderate (3-6 diamonds checked)     Moderate (3-6 diamonds checked)     Moderate (3-6	$\Box \text{ Other action(s)}$		hei	Table	sort	read					
NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   Moderate (3-5 diamonds checked)	Initial Assessment										
NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   Moderate (3-5 diamonds checked)											
Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   Nighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)   I Low (Fewer than 3 diamonds checked)   Moderate (3-5 diamonds checked)	NSA Pollution Severity Index										
High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)     Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)   I Low   (Fewer than 3 diamonds checked)   Moderate (3-5 diamonds checked)	Severe (More than 10 circles checked)										
Moderate (Fewer than 5 circles checked)   None   Neighborhood Restoration Opportunity Index   High   Moderate (3-5 diamonds checked)	$\square High \qquad (5 to 10 circles checked)$										
None (No circles checked)     Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   X Low (Fewer than 3 diamonds checked)   Image: A state of the state of t	Moderate (Fewer than 5 circles checked)									+	
Neighborhood Restoration Opportunity Index         High (More than 5 diamonds checked)         Moderate (3-5 diamonds checked)         Low (Fewer than 3 diamonds checked)         PMA could be Networked         See Shean Assessment form	$\Delta$ None (No circles checked)										
High     (More than 5 diamonds checked)       Moderate (3-5 diamonds checked)       X Low     (Fewer than 3 diamonds checked)       PMA could be vetretted       See Stream Assessment forms	Neighborhood Restoration Opportunity Index									+	
<ul> <li>Mage (note han o damondo checked)</li> <li>Moderate (3-5 diamonds checked)</li> <li>Low (Fewer than 3 diamonds checked)</li> <li>Pond could be petroffled</li> <li>See Stream Assessment forms</li> </ul>	$\square$ High (More than 5 diamonds checked)										
X Low (Fewer than 3 diamonds checked) <sup>1</sup> pind could be vetretted See stream assessment forms	Moderate (3-5 diamonds checked)										
<sup>1</sup> pend could be retrofitted See stream assessment forms	Low (Fewer than 3 diamonds checked)									+	
See stream assessment forms	* pond and I have not all al										
see stream assessment forms	In a contor the ACMALAND										_
	See stream assessment forms										

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Neighborhood Source Assessment



	<u> </u>			
WATERSHED: WR / (B	SUBWATERSHED:	UNIQUE SITI	D: WR-NS	A-01
DATE: <u>7/16/08</u>	ASSESSED BY: ABDE	CAMERA ID:	WS Comon	PIC#:
A. NEIGHBORHOOD CHARACTERIZ	ZATION			
Neighborhood/Subdivision Name:	T. Vernon Apts.	Neig	hborhood Area (ac	cres) 10-3020
If unknown, address (or streets) surveyed	d:			(33 Acres
Homeowners Association? X V N	Unknown If yes, name and con	tact information: 1	antal	L GIS
Residential (circle average single family	v lot size):			
Single Family Attached (Duplexes, F	Row Homes) $< \frac{1}{8}  \frac{1}{8}  \frac{1}{4}  \frac{1}{3}  \frac{1}{3}$	acre 🕅 Multifam	ily (Apts, Townho	omes, Condos)
Single Family Detached	$<\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	acre Mobile H	ome Park	
Estimated Age of Neighborhood: 10	years Percent of Homes with Gar	ages: <u>/</u> % With	Basements%	INDEX*
Sewer Service? Y N	11: 23.1			O
Index of Infili, Redevelopment, and Ren	10  deling [V]  No Evidence [] < 5%	of units [_] 5-10% [	」>10%	O de
depending on applicability	and/or-site complexity	Percentage	Comments/Notes	
B. YARD AND LAWN CONDITIONS				
<b>B1.</b> % of lot with impervious cover		50		
<b>B2.</b> % of lot with grass cover		30		0
<b>B3.</b> % of lot with landscaping (e.g., mul	ched bed areas)	20		$\diamond$
<b>B4.</b> % of lot with bare soil		0		0
*Note: B1 through B4 must tota	ıl 100%			
<b>B5.</b> % of lot with forest canopy		20		$\diamond$
<b>B6.</b> Evidence of permanent irrigation or	"non-target" irrigation	N		0
		High: <u>180</u>		0
<b>B7.</b> Proportion of <i>total neighborhood</i> tur	f lawns with following	Med:		
management status.		Low:		
B8. Outdoor swimming pools?	Can't Tell Estimated #			$\bigcirc$
<b>B9.</b> Junk or trash in vards? $\Box$ Y	N Can't Tell			0
C. DRIVEWAYS, SIDEWALKS, AND (	CURBS		7.1.1	
C1. % of driveways that are impervious		100		
C2. Driveway Condition Clean	Stained Dirty Breaking up			0
C3. Are sidewalks present? $\overrightarrow{X}$ Y $\square$ N	If yes, are they on one side of stree	t $\Box$ or along both sid	les	
Spotless Covered	with lawn clippings/leaves 🔲 Rec	eiving 'non-target' in	rigation	Ö
What is the distance between the	e sidewalk and street? ft.			$\diamond$
Is pet waste present in this area?	P 🗌 Y 🗌 N 🗌 N/A	· · · · · · · · · · · · · · · · · · ·		Ó
C4. Is curb and gutter present? $Y$	□ N If yes, check all that apply:			
Clean and Dry I Flowing	or standing water 🔀 Long-term car	parking 🗌 Sedime	nt	0
	clippings 📋 Trash, litter, or deb	ris 🔲 Overhead tree	canopy	$\diamond$

\* INDEX: O denotes potential pollution source;  $\Diamond$  denotes a neighborhood restoration opportunity

Neighborhood Source Assessment



D. ROOFTOPS				24										4 - S. -	je.	
D1. Downspouts are directly connected to storm drains or sanita	ry se	wer			V								1000	Ø	C	5
D2. Downspouts are directed to impervious surface													Colorado de la colora			
D3. Downspouts discharge to pervious area				· ·									10000		(	
D4. Downspouts discharge to a cistern, rain barrel, etc.																
*Note: C1 through C4 should total 100%		/		·			····	•					1824			
<b>D5.</b> Lawn area present downgradient of leader for rain garden?	Ū	Υ[	]N												8	
E. COMMON AREAS			1				1									Ż
E1. Storm drain inlets? Y N If yes, are they stenciled? Y Y N Condition: Clean Dirty											<	Ø				
Catch basins inspected? V V N If yes, include Unique Site ID from SSD sheet: NSX-01										-	(	<u> </u>				
E2. Storm water pond?       Y N       Is it a wet pond or dry pond?       Is it overgrown?       Y N         What is the estimated pond area?       <1 acre											•	$\diamond$				
E3. Open Space? Y N If yes, is pet waste present? Y N dumping? Y N								100600	(	0						
Buffers/floodplain present: 🗌 Y 💭 N If yes, is encr	oach	men	t evi	dent	?	] Y	1	N					1000			
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS																
Based on field observations, this neighborhood has significant indicators for the following: (check all that apply) Nutrients Oil and Grease Trash/Litter Bacteria Sediment Other (and the following)									(	С						
Recommended Actions	Des	scril	be R	ecor	nme	ende	d Ac	tion	s:							
Specific Action		$\overline{\mathcal{D}}$			s	~	Ric	لم				مر				
Onsite retrofit potential?		62	g		ren	5	100	9	ar	~6	pa	102				
Better lawn/landscaping practice?	Better lawn/landscaping practice?															
Better management of common space?																
Multi-family Parking Lot Retrofit?																
$\Box  \text{Other action(s)}$																
Initial Assessment																
NSA Pollution Severity Index																
Severe (More than 10 circles checked)																
Moderate (Fewer than 5 circles checked)																
None (No circles checked)																
Neighborhood Restoration Opportunity Index																
High (More than 5 diamonds checked)																
Moderate (3-5 diamonds checked)																
Low (Fewer than 3 diamonds checked)																
										1						

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WATERSHED: TANKUR	SUBWATERSHED: LTP.	UNIQUE SITE ID:	-NSA-OI						
DATE: <u>71/6/08</u>	ASSESSED BY:	CAMERA ID:	PIC#:						
A. NEIGHBORHOOD CHARACTERIZ	ZATION								
Neighborhood/Subdivision Name:		Neighborhood Are	a (acres) 13 (6-15)						
If unknown, address (or streets) surveyed:									
Homeowners Association? Y X N Unknown If yes, name and contact information:									
Residential (circle average single family	v lot size):								
Single Family Attached (Duplexes, Row Homes) $<\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{3}$ $\frac{1}{3}$ acre Single Family Detached $<\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$									
Estimated Age of Neighborhood: 50	years Percent of Homes with Gara	ages:% With Basements	% INDEX*						
Sewer Service? V 🗌 N			0						
Index of Infill, Redevelopment, and Ren	nodeling 🕅 No Evidence 🔲 <5%	of units  5-10%  >10%	0						
Record percent observed for each	of the following indicators,	Percentage Comments/No	otes						
B. YARD AND LAWN CONDITIONS	unit of site comprexity								
<b>B1.</b> % of lot with impervious cover		50							
<b>B2.</b> % of lot with grass cover		40	0						
B3. % of lot with landscaping (e.g., mulched bed areas)									
<b>B4.</b> % of lot with bare soil		0	Ó						
*Note: B1 through B4 must tota	l 100%								
<b>B5.</b> % of lot with forest canopy		0	$\diamond$						
<b>B6.</b> Evidence of permanent irrigation or	"non-target" irrigation		O C						
		High: 15	0						
<b>B7.</b> Proportion of <i>total neighborhood</i> tur	f lawns with following	Med: <u>80</u>							
management status.		Low: 0							
<b>B8.</b> Outdoor swimming pools? []Y []N	Can't Tell Estimated #		0						
<b>B9.</b> Junk or trash in yards? $X \square$	N $\Box$ Can't Tell $(AVS(1))$		Ø						
C. DRIVEWAYS, SIDEWALKS, AND C	CURBS								
C1. % of driveways that are impervious	N/A Way priving	95							
C2. Driveway Condition 🕅 Clean 🗌	Stained Dirty X Breaking up	f	0						
C3. Are sidewalks present? $\Box$ Y X N	I If yes, are they on one side of street	t 🗌 or along both sides 🗌							
Spotless Covered	with lawn clippings/leaves 🔲 Rec	eiving 'non-target' irrigation	O I						
What is the distance between th	What is the distance between the sidewalk and street?ft.								
Is pet waste present in this area?  Y Y N X N/A O									
C4. Is curb and gutter present? X Y N If yes, check all that apply:									
Organic matter leaves laws aligning and Track liter and the Dischart Contract of the second s									
U Organic matter, leaves, lawn clippings U Trash, litter, or debris Overhead tree canopy									

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\* INDEX: O denotes potential pollution source;  $\diamond$  denotes a neighborhood restoration opportunity

### LTR-NGA-OL Neighborhood Source Assessment



D1. Downspouts are directly connected to storm drains or sanitary sewer   D2. Downspouts are directed to impervious surface   D3. Downspouts discharge to a cistem, rain barrel, etc.   *Mote: C1 through C4 should total 100%   D5. Lawn area present downgradient of leader for rain garden?   P (1) Catch basins inspected?   MY (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	D. ROOFTOPS				6.5																						
D2. Downspouts are directed to impervious surface 5   D3. Downspouts discharge to pervious area 9.5   D4. Downspouts discharge to a cistern, rain barrel, etc. *Note: CI through C4 should total 100%   *Note: CI through C4 should total 100% D5   E4. Downspouts discharge to a cistern, rain barrel, etc. *Note: CI through C4 should total 100%   E5. Lawn area present downgradient of leader for rain garden? Y    N    Y    N   E6. Construct Are AS Pint Y    N    Yes, iare they stenciled?   E1. Storm drain inlets? AY    N    Yes, iare they stenciled?   E2. Storm water pond? Y    N    Yes, is pet wate present?   E3. Open Space? Y    N    Yes, is pet wate present?   E4. Open Space? Y    N    Yes, is pet wate present?   E4. Storm Are ASS Pint Y    N    Yes, is encroachment evident?   E3. Open Space? Y    N    Yes, is pet wate present?   E4. Storm Are Assessment Y    N    Yes, is encroachment evident?   E4. Storm Are Assessment Y    N    Yes, is encroachment evident?   E4. Storm Area Sciences and Bas significant indicators for the following: (check all that apply)   Onsite retrofit potential?   Pond retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Better management of cicles checked)   High (Nor ethan 10 cicles checked)   Moderate (Fewer than 5 circles checked)	D1. Downspouts are directly connected to storm drains or sanita	ary se	wer											1000	$\diamond$	C	)										
D3. Downspouts discharge to a cistem, rain barrel, etc.       9 5         P4. Downspouts discharge to a cistem, rain barrel, etc.       *Note: C1 through C4 should total 100%         D5. Lawn area present downgradient of leader for rain garden? [] Y ]] N       •         E4. Storm drain inlets? [] Y ]] N If yes, are they stenciled? [] Y ]] N Condition: [] Clean ]] Dirty       •         Catch basins inspected? [] Y ]] N If yes, include Unique Site ID from SSD sheet! [] A (5A, -01]       •         E2. Storm water pond? [] Y ]] N If yes, is pet water pond? [] Is it overgrown? [] Y ]] N       •         What is the estimated pond area? [] <1 carc ]] about 1 acre [] sto acre	D2. Downspouts are directed to impervious surface					5	~																				
D4. Downspouts discharge to a cistern, rain barrel, etc.         *Note: C1 through C4 should total 100%         D5. Lawn area present downgradient of leader for rain garden?       Y         F. COMMON AREAS         E1. Storm drain inlets?       Y         N Lawn area present downgradient of leader for rain garden?       Y         Norm drain inlets?       Y         N If yes, are they stenciled?       Y         N If yes, include Unique Site ID from SSD sheet       N/5A -01         E2. Storm water pond?       Y       N If yes, is released are leave 1 acre leave 1 acre leave         E3. Open Space?       Y       N If yes, is pet waste present?       Y       N dumping?         Buffers/Hoodplain present:       Y       N If yes, is encroachment evident?       Y       N         Based on field observations, this neighborhood has significant indicators for the following:       (check all that apply)       Image: State 1 acre       Image: State 1 acre       Image: State 1 acre         Nutrients       I and Grease       Trash/Litter       Based on field observations, this neighborhood has significant indicators for the following:       (check all that apply)       Image: State 2 acre         Multi-family Parking Lot Retrofit?       Describe Recommended Actions:       Image: State 2 acre       Image: State 2 acre       Image: State 2 acre       Image: State 2 acre	D3. Downspouts discharge to pervious area					9	5																				
*Note: CI through C4 should total 100%         D5. Lawn area present downgradient of leader for rain garden? □ Y □ N         E. COMMON AREAS         E1. Storm drain inlets? □ Y □ N If yes, are they stenciled? □ Y □ N. Condition: □ Clean □ Dirty         Catch basins inspected? □ Y □ N If yes, include Unique Site ID from SSD sheet <sup>10</sup> 1/5A - 01         E2. Storm water pood? □ Y □ N If yes, is an over pood □ dry pond? Is it overgrown? □ Y □ N         What is the estimated pond area? □ <1 acre □ about 1 acre □ > 1 acre         E3. Open Space? □ Y □ N If yes, is pet waste present? □ Y □ N dumping? □ Y □ N         Buffers/floodplain present: □ Y □ N If yes, is encroachment evident? □ Y □ N         FINITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)         Nutrients □ Oil and Grease □ Trash/Litter □ Bacteria □ Other         Recommended Actions         Specific Action         □ Onsite retrofit potential?         □ Better lawn/landscaping practice?         □ Better lawn/landscaping practice?         □ Better lawn/landscaping practice?         □ Better lawn/landscaping practice?         □ Outrients         □ Severie (More than 10 circles checked)         □ Multi-family Parking Lot Retrofit?         □ Outrients checked)         □ None (No circles checked)	D4. Downspouts discharge to a cistern, rain barrel, etc.					¥										1-0-1-											
D5. Lawn area present downgradient of leader for rain garden?       Y □ N       Image: Strength of the strengt of the strength of the strength of the streng	*Note: C1 through C4 should total 100%															C C C C C C C C C C C C C C C C C C C	2000200										
E. COMMON AREAS   E1. Storm drain inlets? Y   N If yes, are they stenciled? Y   N Condition: Crean   Dirty   Catch basins inspected? Y   N If yes, include Unique Site ID from SSD sheet! A / D / D / D / D / D / D / D / D / D /	D5. Lawn area present downgradient of leader for rain garden?		Υ[	]N	1											$\diamond$											
E1. Storm drain inlets? Y N If yes, are they stenciled? Y N Condition: Clean Dirty   Catch basins inspected? Y N If yes, include Unique Site ID from SSD sheet! A/AA01   What is the estimated pond area? -1 acre about 1 acre > I acre   E3. Open Space? Y N If yes, is pet waste present? Y N dumping? Y N   Buffers/floodplain present: Y N If yes, is pet waste present? Y N N   Paffers/floodplain present: Y N If yes, is encroachment evident? Y N   Buffers/floodplain present: Y N If yes, is encroachment evident? Y N   Based on field observations, this neighborhood has significant indicators for the following: (check all that apply) Nutrients O noisite retrofit potential? Better management of common space? Pond retrofit? On retrofit potential? Better management of common space? Pond retrofit? Other action(s) Initial Assessment NSA Pollution Severity Index Severe (More than 10 circles checked) Moderate (Fewer than 5 circles checked) Moderate (Fewer than 5 circles checked) Mone (No circles checked) Moderate (Gas diamonds checked) Construction schecked Con	E. COMMON AREAS																										
Catch basins inspected? Y N If yes, include Unique Site ID from SSD sheet/ N J SA O   E2. Storm water pond? Y N Is it a wet pond or dry pond? Is it overgrown? Y N   What is the estimated pond area? <1 acre	E1. Storm drain inlets? X IN If yes, are they stenciled? Y N Condition: Clean Dirty												attate		$\diamond$												
E2. Storm water pond? □ Y □ N Is it a □ wet pond or □ dry pond? Is it overgrown? □ Y □ N       w         What is the estimated pond area? □ <1 acre □ about 1 acre □ > 1 acre       acre □ > 1 acre         E3. Open Space? □ Y □ N If yes, is pet waste present? □ Y □ N dumping? □ Y □ N       w         Buffers/floodplain present: □ Y □ N If yes, is encroachment evident? □ Y □ N       w         Buffers/floodplain present: □ Y □ N If yes, is encroachment evident? □ Y □ N       w         Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)       w         Nutrients □ Oil and Grease □ Trash/Litter □ Bacteria □ Sediment □ Other       w         Recommended Actions       Describe Recommended Actions:         Specific Action       Describe Recommended Actions:         □ Onsite retrofit potential?       Describe Recommended Actions:         □ Better namagement of common space?       Describe Recommended Actions:         □ Other action(s)       Describe Recommended Actions:         Initial Assessment       □         NSA Pollution Severity Index       □         □ Severe (More than 10 circles checked)       □         □ Moderate (Fewer than 5 circles checked)       □         □ Moderate (Fewer than 5 diamonds checked)       □         □ Moderate (3-5 diamonds checked)       □         □ Moderate (3-5 diamonds checked) <td colspan="11">Catch basins inspected? <math>\mathbb{K}</math> Y <math>\square</math> N If yes, include Unique Site ID from SSD sheet <math>\mathbb{M}^{1}</math> <math>\mathbb{N}</math> SA <math>-01</math></td> <td></td> <td></td> <td>Ô</td> <td></td>	Catch basins inspected? $\mathbb{K}$ Y $\square$ N If yes, include Unique Site ID from SSD sheet $\mathbb{M}^{1}$ $\mathbb{N}$ SA $-01$													Ô													
E3. Open Space? Y N If yes, is pet waste present? Y N N dumping? Y N   Butfers/floodplain present: Y N If yes, is encroachment evident? Y N   FINTIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS Based on field observations, this neighborhood has significant indicators for the following: (check all that apply) Nutrients O O Feiffic Action Onsite retrofit potential? Better nanagement of common space? Pond retrofit? Multi-family Parking Lot Retrofit? O Other action(s) Initial Assessment NAME Severe (More than 10 circles checked) Moderate (Fewer than 5 circles checked) Moderate (Fewer than 5 circles checked) Moderate (Grewer than 5 diamonds checked) Moderate (3-5 diamonds checked) Low (Fewer than 3 diamonds checked)	E2. Storm water pond? Y X N Is it a wet pond or dry pond? Is it overgrown? Y N What is the estimated pond area? <a block"="" href="https://wet.no.com/states/st&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;math&gt;\diamond&lt;/math&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Buffers/floodplain present: Y N If yes, is encroachment evident? Y N   F.INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS   Based on field observations, this neighborhood has significant indicators for the following: (check all that apply) O   Nutrients Oil and Grease Trash/Litter Bacteria   Secommended Actions Describe Recommended Actions:   Specific Action Describe Recommended Actions:   Onsite retrofit potential? Describe Recommended Actions:   Better nanagement of common space? Pond retrofit?   Pond retrofit? Multi-family Parking Lot Retrofit?   Other action(s) Initial Assessment   NSA Pollution Severity Index Severe (More than 10 circles checked) Moderate (Fewer than 5 circles checked) Mone (No circles checked) Moderate (Fewer than 5 diamonds checked) Moderate (3-5 diamonds checked) Moderate (3-5 diamonds checked) Moderate (3-5 diamonds checked) Moderate (3-5 diamonds checked)&lt;/td&gt;&lt;td&gt;E3. Open Space? Y X N If yes, is pet waste present?&lt;/td&gt;&lt;td&gt;] Y&lt;/td&gt;&lt;td&gt;[] 1&lt;/td&gt;&lt;td&gt;N di&lt;/td&gt;&lt;td&gt;ımpi&lt;/td&gt;&lt;td&gt;ing?&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;Y [&lt;/td&gt;&lt;td&gt;] N&lt;/td&gt;&lt;td&gt;Ī&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;1000&lt;/td&gt;&lt;td&gt;:&lt;i&gt;•&lt;/i&gt;&lt;/td&gt;&lt;td&gt;Ο.&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;EINITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS   Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)   Image: Specific Action   Image: Specific Action&lt;/td&gt;&lt;td&gt;Buffers/floodplain present: Y N If yes, is encr&lt;/td&gt;&lt;td&gt;oach&lt;/td&gt;&lt;td&gt;men&lt;/td&gt;&lt;td&gt;t evi&lt;/td&gt;&lt;td&gt;dent&lt;/td&gt;&lt;td&gt;? 🗌&lt;/td&gt;&lt;td&gt;] Y&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;N&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)   Nutrients Oil and Grease   Trash/Litter Bacteria   Sectific Action   Onsite retrofit potential?   Better lawn/landscaping practice?   Better management of common space?   Pond retrofit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (S to 10 circles checked)   Moderate (Fewer than 5 circles checked)   Moderate (3-5 diamonds checked)   High (More than 5 diamonds checked)&lt;/td&gt;&lt;td&gt;F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOM&lt;/td&gt;&lt;td&gt;MENI&lt;/td&gt;&lt;td&gt;DAT&lt;/td&gt;&lt;td&gt;ION&lt;/td&gt;&lt;td&gt;s ·&lt;/td&gt;&lt;td&gt;2.P&lt;/td&gt;&lt;td&gt;(*&lt;sup&gt;*&lt;/sup&gt;.&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;2. L.A.&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;E&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Nutrients Oil and Grease   Trash/Litter Bacteria   Sectific Action   Onsite retrofit potential?   Better lawn/landscaping practice?   Better management of common space?   Pond retrofit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   None (No circles checked)   None (No circles checked)   High (More than 5 diamonds checked)   High (More than 5 diamonds checked)   Low (Fewer than 3 diamonds checked)&lt;/td&gt;&lt;td&gt;Based on field observations, this neighborhood has significant i&lt;/td&gt;&lt;td&gt;ndica&lt;/td&gt;&lt;td&gt;tors&lt;/td&gt;&lt;td&gt;for&lt;/td&gt;&lt;td&gt;the f&lt;/td&gt;&lt;td&gt;ollo&lt;/td&gt;&lt;td&gt;wing&lt;/td&gt;&lt;td&gt;g: (c&lt;/td&gt;&lt;td&gt;heck&lt;/td&gt;&lt;td&gt;k all&lt;/td&gt;&lt;td&gt;that&lt;/td&gt;&lt;td&gt;app&lt;/td&gt;&lt;td&gt;ly)&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;0&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Recommended Actions   Specific Action   Onsite retrofit potential?   Better lawn/landscaping practice?   Better management of common space?   Pond retrofit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment  NSA Pollution Severity Index Severe (More than 10 circles checked) High (5 to 10 circles checked) None (No circles checked) None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Low (Fewer than 3 diamonds checked)&lt;/td&gt;&lt;td&gt;Nutrients Oil and Grease Trash/Litter Bacteria&lt;/td&gt;&lt;td&gt;1X&lt;/td&gt;&lt;td&gt;Sed&lt;/td&gt;&lt;td&gt;imeı&lt;/td&gt;&lt;td&gt;ıt 🗌&lt;/td&gt;&lt;td&gt;] Ot&lt;/td&gt;&lt;td&gt;her _&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;U&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Specific Action   Onsite retrofit potential?   Better lawn/landscaping practice?   Better management of common space?   Pond retrofit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment    NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Low (Fewer than 3 diamonds checked)&lt;/td&gt;&lt;td&gt;Recommended Actions&lt;/td&gt;&lt;td&gt;De&lt;/td&gt;&lt;td&gt;scri&lt;/td&gt;&lt;td&gt;be R&lt;/td&gt;&lt;td&gt;ecoi&lt;/td&gt;&lt;td&gt;nme&lt;/td&gt;&lt;td&gt;ende&lt;/td&gt;&lt;td&gt;d A&lt;/td&gt;&lt;td&gt;ctio&lt;/td&gt;&lt;td&gt;ns:&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;ŧ&lt;/td&gt;&lt;td&gt;_&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;☐ Onsite retrofit potential? ☐ Better lawn/landscaping practice? ☐ Better management of common space? Pond retrofit? ☐ Multi-family Parking Lot Retrofit? ☐ Other action(s) Initial Assessment NSA Pollution Severity Index ☐ Severe (More than 10 circles checked) ☐ High (5 to 10 circles checked) ☐ Moderate (Fewer than 5 circles checked) ☐ None (No circles checked) ☐ None (No circles checked) ☐ Moderate (3-5 diamonds checked) ☐ Moderate (3-5 diamonds checked) ☐ Low (Fewer than 3 diamonds checked)&lt;/td&gt;&lt;td&gt;Specific Action&lt;/td&gt;&lt;td&gt;D&lt;/td&gt;&lt;td&gt;eter&lt;/td&gt;&lt;td&gt;the&lt;/td&gt;&lt;td&gt;&lt;math&gt;\sim&lt;/math&gt;&lt;/td&gt;&lt;td&gt;PON&lt;/td&gt;&lt;td&gt;nd.&lt;/td&gt;&lt;td&gt;fo&lt;/td&gt;&lt;td&gt;r&lt;/td&gt;&lt;td&gt;Sto&lt;/td&gt;&lt;td&gt;n&lt;/td&gt;&lt;td&gt;&lt;math&gt;\wedge&lt;/math&gt;&lt;/td&gt;&lt;td&gt;dv&lt;/td&gt;&lt;td&gt;Ai&lt;/td&gt;&lt;td&gt;25&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Better lawn/landscaping practice?   Better management of common space? Pond retrofit? Multi-family Parking Lot Retrofit? Other action(s) Initial Assessment NSA Pollution Severity Index Severe (More than 10 circles checked) High (5 to 10 circles checked) Moderate (Fewer than 5 circles checked) None (No circles checked) Neighborhood Restoration Opportunity Index High (More than 5 diamonds checked) Moderate (3-5 diamonds checked) Low (Fewer than 3 diamonds checked)&lt;/td&gt;&lt;td&gt;Onsite retrofit potential?&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;19&lt;/td&gt;&lt;td&gt;00&lt;/td&gt;&lt;td&gt;45&lt;/td&gt;&lt;td&gt;idi&lt;/td&gt;&lt;td&gt;l&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;_&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Better management of common space?   Pond retrofit?   Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   High (More than 5 diamonds checked)   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)&lt;/td&gt;&lt;td&gt;Better lawn/landscaping practice?&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;Į&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Multi-family Parking Lot Retrofit?   Other action(s)   Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   High (More than 5 diamonds checked)   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)&lt;/td&gt;&lt;td&gt;Better management of common space?&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)&lt;/td&gt;&lt;td&gt;Multi-family Parking L of Retrofit?&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Initial Assessment   NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)&lt;/td&gt;&lt;td&gt;&lt;math display=">\Box  \text{Other action(s)}</a>																										
NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Low (Fewer than 3 diamonds checked)	Initial Assessment																										
NSA Pollution Severity Index   Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)																											
Severe (More than 10 circles checked)   High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   None (No circles checked)   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)	NSA Pollution Severity Index																										
High (5 to 10 circles checked)   Moderate (Fewer than 5 circles checked)   None (No circles checked)   Neighborhood Restoration Opportunity Index   High (More than 5 diamonds checked)   Moderate (3-5 diamonds checked)   Moderate (3-5 diamonds checked)	Severe (More than 10 circles checked)																										
Moderate (Fewer than 5 circles checked)         None       (No circles checked)         Neighborhood Restoration Opportunity Index         High       (More than 5 diamonds checked)         Moderate (3-5 diamonds checked)         Low       (Fewer than 3 diamonds checked)	High (5 to 10 circles checked)																										
Neighborhood Restoration Opportunity Index         High       (More than 5 diamonds checked)         Moderate (3-5 diamonds checked)         Low       (Fewer than 3 diamonds checked)	Moderate (Fewer than 5 circles checked)																										
Neighborhood Restoration Opportunity Index       Image: Constraint of the second	[] None (No choices checked)																										
High     (More than 5 diamonds checked)       Moderate (3-5 diamonds checked)       Low       (Fewer than 3 diamonds checked)	Neighborhood Restoration Opportunity Index																										
Moderate (3-5 diamonds checked)       Low       (Fewer than 3 diamonds checked)	High (More than 5 diamonds checked)					******																					
X Low (Fewer than 3 diamonds checked)	Moderate (3-5 diamonds checked)																										
	Low (Fewer than 3 diamonds checked)																										
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Neighborhood Source Assessment

NSA

WATERSHED:       Tucket       SUBWATERSHED:       Gages       UNIQUE SITE ID:       NSA -0(         DATE:       7/16/08       ASSESSED BY:       K.B., DE       CAMERA ID:       PIC#: 3/94/-       (-         A. NEICHBORHOOD CHARACTERIZATION       Neighborhood/Subdivision Name:       Value View Dr       Andrewet Way       Neighborhood Area (acres)       55 (         If unknown, address (or streets) surveyed:       Value View Dr       Andrewet Way       Neighborhood Area (acres)       55 (         Homeowners Association?       Y       N       Unknown If yes, name and contact information:									
DATE:       716/08       ASSESSED BY:       K-B, DB       CAMERA ID:       PIC#: ₹4/4~         A. NEIGHBORHOOD CHARACTERIZATION       Neighborhood/Subdivision Name:       Value view tr / Andrews Way       Neighborhood Area (acres)       55 (C         If unknown, address (or streets) surveyed:       V       V       V       Neighborhood Area (acres)       55 (C         Homeowners Association?       Y       N       Unknown If yes, name and contact information:									
A. NEIGHBORHOOD CHARACTERIZATION         Neighborhood/Subdivision Name:       Value View & Andweits, Way       Neighborhood Area (acres)       55 (         If unknown, address (or streets) surveyed:       Value       Neighborhood Area (acres)       55 (         Homeowners Association?       Y       N       Unknown If yes, name and contact information:									
Neighborhood/Subdivision Name:       Valley View to / Andweines Way       Neighborhood Area (acres) _55 (C         If unknown, address (or streets) surveyed:       Neighborhood Area (acres) _55 (C         Homeowners Association?       Y       N       Unknown If yes, name and contact information:         Residential (circle average single family lot size):									
If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;         If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;         If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;         If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;         If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;         If unknown, address (or streets) surveyed:       Image: Construction of the following indicators;									
Homeowners Association?       Y       N       Unknown If yes, name and contact information:         Residential (circle average single family lot size):									
Residential (circle average single family lot size):         Single Family Attached (Duplexes, Row Homes)         Single Family Detached         Single Family Detached $< \frac{1}{4}$ $\frac{1}{4}$									
□ Single Family Attached (Duplexes, Row Homes)       <1/8									
Single Family Detached       <¼ ¼ ½(1)>1 acre       Mobile Home Park         Estimated Age of Neighborhood:       25 years       Percent of Homes with Garages:       95 % With Basements       0 %         Sewer Service?       Y       N       Clock       Map       0       %         Index of Infill, Redevelopment, and Remodeling       No Evidence       <5% of units									
Estimated Age of Neighborhood:       25 years       Percent of Homes with Garages:       95 % With Basements       0 %         Sewer Service?       Y       N       100 & e       0       %         Index of Infill, Redevelopment, and Remodeling       No Evidence       <5% of units									
Sewer Service?       Y       N       C       Image: Sewer Service       O         Index of Infill, Redevelopment, and Remodeling       No Evidence       <5% of units									
Index of Infill, Redevelopment, and Remodeling       Index of Local No Evidence       <5% of units									
Record percent observed for each of the following indicators,									
depending on applicability and/or site complexity Percentage Comments/Notes									
B. YARD AND LAWN CONDITIONS									
B1. % of lot with impervious cover $\gamma \gamma$									
B2. % of lot with grass cover									
B3. % of lot with landscaping (e.g., mulched bed areas)									
<b>B4.</b> % of lot with bare soil $\bigcirc$									
*Note: B1 through B4 must total 100%									
B5 % of lot with forest canopy									
<b>B6</b> Evidence of permanent irritection of "new tenset" injustice									
Bo. Evidence of permanent imgation of non-target imigation									
<b>B7.</b> Proportion of <i>total neighborhood</i> turf lawns with following									
management status:									
Low:									
B8. Outdoor swimming pools? XY N Can't Tell Estimated # S									
<b>B9.</b> Junk or trash in yards? $\Box$ Y $\bigtriangleup$ N $\Box$ Can't Tell									
C. DRIVEWAYS, SIDEWALKS, AND CURBS									
C1. % of driveways that are impervious $\square$ N/A $\land \bigcirc \bigcirc$									
C2. Driveway Condition 🖾 Clean 🗌 Stained 🗌 Dirty 🗌 Breaking up									
C3. Are sidewalks present? Y X N If yes, are they on one side of street or along both sides									
Spotless Covered with lawn clippings/leaves Receiving 'non-target' irrigation									
What is the distance between the sidewalk and street?ft.									
Is pet waste present in this area? Y N N/A									
C4. Is curb and gutter present? Y N If yes, check all that apply:									
Clean and Dry Flowing or standing water Long-term car parking Sediment									
Organic matter, leaves, lawn clippings Trash, litter, or debris 🖾 Overhead tree canopy									

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INDEX: O denotes potential pollution source;  $\diamond$  denotes a neighborhood restoration opportunity

GB-NSA-01

### Neighborhood Source Assessment

# NSA

D. ROOFTOPS				1.5	1								i i			
D1. Downspouts are directly connected to storm drains or sanita	ry se	wer										ro-Filolo 19.00		$\diamond$	C	)
D2. Downspouts are directed to impervious surface				1	29	_							Contraction of			
D3. Downspouts discharge to pervious area				2	10	5								5		
D4. Downspouts discharge to a cistern, rain barrel, etc.					t								1000			
*Note: C1 through C4 should total 100%																
<b>D5.</b> Lawn area present downgradient of leader for rain garden?		Υļ	₫n											4	Ø	
E. COMMON AREAS																
<b>E1.</b> Storm drain inlets? $X \square N$ If yes, are they stenciled?	<u> </u>	7 🕅	'N	Con	ditic	)n: [	A CI	lean		Dirt	у				$\diamond$	
Catch basins inspected? X N If yes, include Unique Site ID from SSD sheet:											- 33		0			
E2. Storm water pond? Y X N Is it a wet pond or dry pond? Is it overgrown? Y N N What is the estimated pond area? <a href="https://www.storm.com"></a> A storm of the storm. Storm of the s												$\diamond$				
E3. Open Space? Y X If yes, is pet waste present? Y N dumping? Y N									0							
Buffers/floodplain present: 📉 Y 🔲 N If yes, is encr	oach	men	t evi	dent	?K	ţΥ		N								
F. INITIAL NEICHBORHOOD ASSESSMENT AND RECOMM	IENI	DAT	ION	S .								Ęć.				
Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)																
Nutrients Oil and Grease Trash/Litter Bacteria Sediment Other									0							
Recommended Actions Describe Recommended Actions:																
Specific Action	specific Action roadwary Tuppo venents															
Better lawn/landscaping practice?				.,		-										
Better management of common space?																
Pond retrofit?																
Multi-family Parking Lot Retrofit?																
Other action(s)																
Initial Assessment																
NGA Dellestier Consulta Indon																
$\square$ Severe (More than 10 circles checked)																
High (5 to 10 circles checked)																
Moderate (Fewer than 5 circles checked)	<u> </u>															
None (No circles checked)																
Net-the school Destance from One sectors its Indee																
High (More than 5 diamonds checked)																
Moderate (3-5 diamonds checked)																
Ever than 3 diamonds checked)																

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WATERSHED: JANK	SUBWAT	ERSHED: (-B	UNIQUE SITE ID: (R-451-01						
DATE: 1/16/06	ASSESSE	DBY: KZ/DZ	CAMERA ID: 145 South						
MAP GRID	RAIN IN J	LAST 24 HOURS Y XN	PIC#						
A. LOCATION									
A1. Street names or neighborhood surveyed: Judismid Fach West									
A2. Adjacent land use:  Resident Mur	ial 🗌 Com nicipal 🔲	mercial 🛛 Industrial 🗌 Ins Transport-Related	titutional						
A3. Corresponding HSI of NSA fiel	ld sheet? If	so, circle HSI or NSA and recor	rd its Unique Site ID here						
B. STREET CONDITIONS									
B1. Road Type: Arterial Co	ollector D	Local Alley Other:							
B2. Condition of Pavement: New Good Cracked Broken									
B3. Is on-street parking permitted X Y N If yes, approximate number of cars per block:									
<b>B4.</b> Are large cul-de-sacs present?		I							
<b>B5.</b> Is trash present in curb and gutt	$\frac{2}{2}$ = $\frac{1}{2}$	Index Rating f	for Accumulation in Gutters						
use the index to the right to record a	imount.	Clean	Eilthy						
	Sediment	$\square$							
Organ	ic Material		$\square 3 \square 4 \square 5$						
	Litter								
C. STORM DRAIN INLETS AND CATCH BASINS									
C1. Type of storm drain conveyance: open X enclosed mixed									
C2. Percentage of inlets with catch basin storage:									
Sample 1-2 catch basins per NSA/I	- ISI	C3. Catch basin #1	C4. Catch basin #2						
Latitude		<u> 11º 51 ' 38 "</u>	<u>41°51'35"</u>						
Longitude		72° 25' 15 "	<u>n°25'19 "</u>						
LMK #									
Picture #		101-3687	101-3688						
Current Condition		🗶 Wet 🗌 Dry	🛛 Wet 🗋 Dry						
Condition of Inlet		Clear Obstructed	Clear Obstructed						
Litter Accumulation		Y YN	NY N						
Organics Accumulation		□Y 😡 N	XY DN						
Sediment Accumulation		XY 🗌 N	XY DN						
Sediment Depth (in feet)		_ <b>Q.5</b> ft.	<u> </u>						
Water Depth		<u> </u>	<u> </u>						
Evidence of oil and grease		Y N	Y N						
Sulfur smell		Y N	Y N						
Accessible to vacuum truck		Y IN	YY DN						
D. NON-RESIDENTIAL PARKING	5 LOT (>2	acres)							
D1. Approximate size: / O acres									
D2. Lot Utilization: 🕺 Full 🗌 Ab	out half ful	11 🗌 Empty							
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)									
D4. Is lot served by a storm water treatment practice? $X \square N$ If yes, describe: $B_{A5W}$									
D5. On-site retrofit potential: Excellent 🖾 Good 🗌 Poor									







WATERSHED: ANK	SUBWATERSHED	: CTS	UNIQUE SITE ID: 557-01							
DATE: <u>7/16/08</u>	ASSESSED BY:	KB/DB	CAMERA ID: US	Sm						
Map Grid	RAIN IN LAST 24	HOURS Y XN	PIC#							
A. LOCATION										
A1. Street names or neighborhood s	urveyed:	$171 \rightarrow 1$								
	<u> </u>	rk Kd Judie	smal 9-arks							
A2. Adjacent land use:  Resident Mur	ial 🗌 Commercial nicipal 🔲 Transpor	A Industrial Ins	titutional							
A3. Corresponding HSI or NSA fiel	d sheet? If so, circle	e HSI or NSA and recor	rd its Unique Site ID here	>						
B. STREET CONDITIONS										
<b>B1.</b> Road Type: Arterial Co	B1. Road Type: Arterial Collector Local Alley Other:									
B2. Condition of Pavement: New Good Cracked Broken										
B3. Is on-street parking permitted	Y IN If yes,	approximate number of	f cars per block:							
B4. Are large cul-de-sacs present? XY N										
<b>B5</b> Is trash present in curb and gutter? If so										
use the index to the right to record a		Filthy								
	Sediment [	1 2	$\Box_3 \Box_4$	$\Box 5$						
Organ	ic Material	$\boxed{1}$ $\boxed{1}$ $\boxed{1}$ $2$	3 📈 4							
	Litter		3 4	5						
C. STORM DRAIN INLETS AND CATCH BASINS										
C1. Type of storm drain conveyance:  open enclosed mixed										
C2. Percentage of inlets with catch	oasin storage:	N/A								
Sample 1-2 catch basins per NSA/I	ISI C3.	Catch basin #1	C4. Catch ba	ısin #2						
Latitude	<u> </u>	50'12"	<u>41°60 '</u>	07 "						
Longitude	<u>_72</u> °	21, 17"	<u>72° 27 '</u>	25 "						
LMK #										
Picture #	101-	3716	101-37-	20						
Current Condition	<u> </u>	⊴Wet ∐Dry		Dry						
Condition of Inlet		Clear Obstructed		Dbstructed						
Litter Accumulation	L		<u> </u>	JN						
Organics Accumulation	¥									
Sediment Accumulation	<u>L</u>	<u>ar ln</u>		JN						
Sediment Depth (in feet)		tt.	0.5	<u>ft.</u>						
Evidence of oil and groom		$\frac{1}{2}$ $\frac{5}{11}$ $\frac{11}{11}$		<u>tt.</u>						
Sulfur smell	<u></u>			<u>IN</u>						
Accessible to vacuum truck	L									
D. NON-RESIDENTIAL PARKING	GLOT (>2 acres)									
D1. Approximate size: acres										
D2. Lot Utilization:  Full About half full Empty										
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)										
D4. Is lot served by a storm water tr	eatment practice? [	Y X N If yes, desc	cribe:							
D5. On-site retrofit potential: Excellent Good Poor										

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WATERSHED: TANK	SUBWATERS	HED: LTR	UNIQUE SITE ID: 17R-NEA-OV						
DATE: <u>7116108</u>	ASSESSED B	Y: KE/DE	CAMERA ID: 1. C Sport						
MAP GRID	RAIN IN LAS	T 24 HOURS Y XN	PIC #						
A. LOCATION									
A1. Street names or neighborhood s	urveyed:								
Comphell Dr									
A2. Adjacent land use: Resident	ial Commen	rcial 🗌 Industrial 🗌 Ins	titutional						
A3 Corresponding HSI or NSA field	d cheet? If co	airolo HSI or NSA and room	dita Unione Site ID Loss 11C + O(						
D. Conserver Conserver		CHCIE HISI OF NSA and recor	a is onique site in here <u>NGA-07</u>						
B. STREET CONDITIONS	<u> </u>								
BI. Road Type: Arterial	ollector KL	ocal Alley Other:							
B2. Condition of Pavement: Sew Good Cracked Broken									
<b>B3.</b> Is on-street parking permitted $\bigvee Y \sqcup N$ If yes, approximate number of cars per block:									
B4. Are large cul-de-sacs present? Y XN									
<b>B5.</b> Is trash present in curb and gutt	or Accumulation in Gutters								
use the index to the right to record a	mount.	Clean	Filthy						
	Sediment	$\square_1$ $\square_2$							
Urgan	IC Material	$\square_1 \square_2$							
C. STORM DRAIN INLETS AND CATCH BASINS									
C1. Type of storm drain conveyance: open relosed mixed									
C2. Percentage of inlets with catch basin storage: $\Box N/A$ $\Delta h \mu h \mu h$									
Sample 1-2 catch basins per NSA/I	HSI	C3. Catch basin #1	C4. Catch basin #2						
Latitude		41049:32"	<u>41°49'32"</u>						
Longitude		72° 2a ' 07 "	<u>72° 79 '07 "</u>						
LMK #									
Picture #									
Current Condition		Wet MDry	Wet M Dry						
Litter Accumulation		UClear Obstructed							
Organics Accumulation									
Sediment Accumulation									
Sediment Depth (in feet)		/ ft.							
Water Depth		<u> </u>							
Evidence of oil and grease		Y N	Y N						
Sulfur smell									
Accessible to vacuum truck			YY ∐ N						
D. NON-RESIDENTIAL PARKING LOT (>2 acres)									
D1. Approximate size:acres									
D2. Lot Utilization: L Full At	out half full	_ Empty							
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)									
D4. Is lot served by a storm water treatment practice? Y N If yes, describe:									
D5. On-site retrofit potential: Excellent Good Poor									

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E. MUNICIPAL POLLUTANT REDUCTION	ON STRATEGIES		
E1. Degree of pollutant accumulation in the	e system: 🗌 High 🗌 M	ledium 🗌 Low 🗌 N	one
<b>E2.</b> Rate the feasibility of the following pol	lution prevention strategie	es:	
Street Sweeping:	High Moderate		
Storm Drain Stenciling:	High Moderate		
Catch Basin Clean-outs:	High Moderate		
Parking Lot Retront Potential:		LANLOW	
T CATCH BASIN SKETCHES		1	
		(B	
		W	
Notes:			
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Tonleev						I			
WATERSHED: Carlos T	SUBWATE	RSHED: (3		UNIQUE SITE	ID: (B-A	15A-01			
DATE: <u>7116108</u>	ASSESSED	BY: KB/A	973	CAMERA ID:	WS So	m			
MAP GRID	RAIN IN L	AST 24 HOURS		PIC#					
A. LOCATION				I					
A1. Street names or neighborhood s	urveyed:	Hoh mon	on Tho	ily Park	l				
A2. Adjacent land use: Residenti	al 🗌 Comn icipal 🔲 T	nercial 🔲 Indu ransport-Related	strial 🗌 Ins	titutional					
A3. Corresponding HSI or NSA fiel	d sheet? If s	o, circle HSI of N	ISA and recor	rd its Unique Si	te ID here <u>VS</u>	A-01			
B. STREET CONDITIONS						12			
B1. Road Type: Arterial Collector X Local Alley Other:									
<b>B2.</b> Condition of Pavement: New & Good Cracked Broken									
<b>B3.</b> Is on-street parking permitted $\boxed{Y}$ $\boxed{Y}$ N If yes, approximate number of cars per block:									
B4. Are large cul-de-sacs present? Y YN									
<b>B5.</b> Is trash present in curb and gutte	ndex Rating f	for Accumulatio	n in Gutters						
use the index to the right to record a	mount.	Clean			Filt	hy			
	Sediment	区 1	2	3	4	5			
Organ	ic Material		$\square 2$						
C. STORM DRAIN INLETS AND CATCH BASINS									
<b>C1.</b> Type of storm drain conveyance	: 🗌 open	🕅 enclosed 🔲	mixed						
<b>C2.</b> Percentage of inlets with catch l	basin storage		N/A						
Sample 1-2 catch basins per NSA/F	ISI	C3. Catch bas	in #1	C4	. Catch basin #2	2			
Latitude		410 501	5( "	<u>41° 50 '87 "</u>					
Longitude		720 26'	46"	7)	·26.54	11			
LMK #						·			
Picture #		101-371	0	1	01-3711				
Current Condition		Wet M	Dry		Wet Dr	у			
Condition of Inlet		Clear 🗌	Obstructed			structed			
Litter Accumulation		ΔY X	N		Y N				
Organics Accumulation			N		□y ≱n				
Sediment Accumulation		XY 🗆	N	j	ZY □N				
Sediment Depth (in feet)		<u>i</u>	ft.		0.5 ft.				
Water Depth			ft		<u>0,5</u> ft.				
Evidence of oil and grease			N		Y N				
Sulfur smell			N		Y MN				
D. NON-RESIDENTIAL PARKING LOT (>2 acres)									
D1. Approximate size: acres									
D2. Lot Utilization: Full About half full Empty									
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)									
D4. Is lot served by a storm water treatment practice? $\Box$ Y $\Box$ N If yes, describe:									
D5. On-site retrofit potential: Excellent Good Poor									

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E. MUNICIPAL POLLUTANT REDUCTI	ION STRATEGIES
E1. Degree of pollutant accumulation in th	e system: 🗌 High 🛛 Medium 🗌 Low 🗌 None
E2. Rate the feasibility of the following po	Ilution prevention strategies:
Street Sweeping:	High Moderate Low
Storm Drain Stenciling:	High Moderate Low
Catch Basin Clean-outs:	High Moderate Low
Parking Lot Retrofit Potential:	High K Moderate Low
CATCH BASIN SKETCHES	
#1	#2
Notes:	

Streets and Storm Drains  $\mathbf{SSD}$ 

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		NSA-01							
WATERSHED: COCCO Tawa	SUBWATERSHED: WALLER	- Chuts UNIQUE SITE ID: WR-COROCOR							
DATE: <u>7/6/08</u>	ASSESSED BY: KR DB	CAMERA ID:							
Map Grid	RAIN IN LAST 24 HOURS Y	XN PIC# 3705							
A. LOCATION									
A1. Street names or neighborhood s MI. Vernon Apartment	urveyed:								
A2. Adjacent land use: 🕅 Resident	al Commercial Industrial icipal Transport-Related	Institutional							
A3. Corresponding HSI or NSA fiel	d sheet? If so, circle HSI or NSA a	nd record its Unique Site ID here NSA -WR-C							
B. STREET CONDITIONS									
<b>B1.</b> Road Type: Arterial Co	ollector DLocal DAlley D	Other:							
<b>B2</b> Condition of Devements [] No.		1							
B2. Condition of Pavement:	W Good Cracked Bro	ken							
B3. Is on-street parking permitted	<u>'</u> Y <u>N</u> If yes, approximate nu	imber of cars per block: <u>25 / building</u>							
<b>B4.</b> Are large cul-de-sacs present?	<u> </u>								
<b>B5.</b> Is trash present in curb and gutte	r? If so, Index I	Rating for Accumulation in Gutters							
use the index to the right to record a	mount. No Clean	Filthy							
	Sediment 1								
Organ	L itter	$ \begin{bmatrix} 2 \\ 12 \end{bmatrix} \begin{bmatrix} 3 \\ 12 \end{bmatrix} \begin{bmatrix} 4 \\ 15 \end{bmatrix} \begin{bmatrix} 5 \\ 15 \end{bmatrix} $							
C STORM DRAIN INLETS AND (	ATCH BASINS								
C. STORNEDRAINFINEETS AND CATCH DASINS									
C2 Percentage of inlets with catch 1	$\sim$ open A cherosed $\square$ mixed	u							
Sample 1-2 catch basins per NSA/F	ISI C3. Catch basin #1	C4. Catch basin #2							
Latitude	UIOFD 159 "								
Longitude	-77.07.6.76.	17.07( 177.11							
LMK #									
Picture #									
Current Condition	Wet M Drv	Wet NDry							
Condition of Inlet		ucted XClear Obstructed							
Litter Accumulation									
Organics Accumulation									
Sediment Accumulation	TY XN								
Sediment Depth (in feet)	tt.	<u> </u>							
Water Depth	ft.	Ø ft.							
Evidence of oil and grease									
Sulfur smell									
Accessible to vacuum truck									
D. NON-RESIDENTIAL PARKING	LOT (>2 acres) $N/A$								
D1. Approximate size: acres									
D2. Lot Utilization: Full About half full Empty									
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)									
D4. Is lot served by a storm water tr	eatment practice? 🗌 Y 🗌 N If	yes, describe:							
D5. On-site retrofit potential: Excellent Good Poor									

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	E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES				
	E1. Degree of pollutant accumulation in the system: High Medium K Low None				
	Street Sweeping:				
	Storm Drain Stenciling: Catch Basin Clean-outs: High Moderate Low				
	Parking Lot Retrofit Potential:				
	CATCH BASIN SKETCHES				
	and bullar i 1				
1-	p-1 () Ogal )				
14					
Bu	PARYANI-LOT				
	VCB2				
	10.11.7 5.59				
	Building 51, 301				
	PRH 10(3268				
	Notes:				
	PIC # 3706 Tis small catch area draining behind				
	Building (41 50 57.3) [72 26 19.0], leaf letters & debuild				
	in words.				
l					



WATERSHED: TAVK	SUBWATERSHE	D: CALES	UNIQUE SITE ID: (R-1/5 A-0)		
DATE: 1/16/186	ASSESSED BY:	(B/DB	CAMERA ID: $\left[ \frac{1}{\sqrt{5}} \right]$		
MAP GRID	RAIN IN LAST 2	$\frac{1}{4 \text{ Hours } \square Y \land N}$	PIC#		
A. LOCATION					
A1. Street names or neighborhood surveyed:					
- Valley View Dr. / Andrew Way					
A2. Adjacent land use: Residential Commercial Industrial Institutional					
Municipal Transport-Related					
A3. Corresponding HSI or NSA field sheet? If so, circle HSI or NSA and record its Unique Site ID here NSA -01					
B. STREET CONDITIONS					
B1. Road Type: Arterial Collector Local Alley Other:					
B2. Condition of Pavement: New Good Cracked Broken Ale Protection Gauge					
B3. Is on-street parking permitted $X Y \square N$ If yes, approximate number of cars per block: $Q$					
B4 Are large cul-de-sacs present? XV N					
<b>B5</b> Is trash present in ourb and mitter? If so					
use the index to the right to record a	mount.		File		
<u>_</u>	Sediment				
Organ	ic Material	$\overline{\mathbb{N}}_1$ $\overline{\mathbb{D}}_2$	$\square 3 \qquad \square 4 \qquad \square 5$		
	Litter	$\boxed{1}$ 1 $\boxed{2}$	$\square 3 \square 4 \square 5$		
C. STORM DRAIN INLETS AND CATCH BASINS					
C1. Type of storm drain conveyance: open venclosed mixed					
C2. Percentage of inlets with catch basin storage: $50  \square  \text{N/A}$					
Sample 1-2 catch basins per NSA/I	ISI C3	Catch basin #1	C4. Catch basin #2		
Latitude	<u>4</u>	° <u>51 '54</u> "	<u>41°51'59</u> "		
Longitude	17	° <u>74' 35</u> "	720 24 26 "		
LMK #					
Picture #	10	1-3694	101-3697		
Current Condition		Wet Dry	Wet Dry		
Condition of Inlet		Clear Obstructed	Clear Obstructed		
Litter Accumulation		Y V N	Y KN		
Organics Accumulation		Y N	Y ZN		
Sediment Accumulation		Y N	Y V N		
Sediment Depth (in feet)		<u> </u>	ft.		
Water Depth		<u>~().5</u> ft.	<u>~0.う</u> ft.		
Evidence of oil and grease		Y X N			
Sulfur smell		Y IN	Y N		
Accessible to vacuum truck		<u>Y</u> N	Y N		
D. NON-RESIDENTIAL PARKING LOT (>2 acres)					
DI. Approximate size:acres					
D2. Lot Utilization: Full About half full Empty					
D3. Overall condition of Pavement: Smooth (no cracks) Medium (few cracks) Rough (many cracks) Very Rough (numerous cracks and depressions)					
D4. Is lot served by a storm water treatment practice? Y N If yes, describe:					
D5. On-site retrofit potential: Excellent Good Poor					

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E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES
E1. Degree of pollutant accumulation in the system: High Medium Low None
E2. Rate the feasibility of the following pollution prevention strategies:
Street Sweeping:
Catch Basin Clean-outs:
Parking Lot Retrofit Potential: High Moderate Low
CATCH BASIN SKETCHES
#1 HATERIET ES HORE HORE #2 HORE HORE HC IS
Notes:

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### APPENDIX C

Photographs on CD



### APPENDIX D

### Vernon Regulatory Review Memorandum

#### MEMORANDUM

- TO: Technical Advisory Committee, Tankerhoosen River Watershed Management Plan and Town of Vernon Land Use Commissioners
- FROM: Erik Mas, P.E., Fuss & O'Neill, Inc.

DATE: June 9, 2008

RE: Stormwater and Low Impact Development (LID) Regulations in the Tankerhoosen River Watershed – Vernon Regulatory Review

#### 1.0 INTRODUCTION

Fuss & O'Neill is working with the Friends of the Hockanum River Linear Park, Inc., in collaboration with its project partners (Town of Vernon Planning Department, Town of Vernon Conservation Commission, North Central Conservation District, Hockanum River Watershed Association, Rivers Alliance of Connecticut, Inc, and the Belding Wildlife Trust) to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The watershed plan will identify action items that can be implemented by the watershed municipalities and private groups to protect and improve the health of the Tankerhoosen River watershed, which is a particularly valuable natural resource, demonstrated by the Class A water quality in the upper regions of the watershed that harbor the Belding Wild Trout Management Area, one of only two such Class I areas east of the Connecticut River.

A key element of the Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to better manage stormwater runoff associated with land development within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities, including Vernon, are faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the Town of Vernon to develop and implement an ordinance or other regulatory mechanism to satisfy Phase II stormwater regulatory requirements, while also strengthening the existing land use controls to protect natural resources within the Tankerhoosen River watershed.

This memorandum summarizes our review of Vernon's existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the Town's land use regulations. The information presented in this



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technical memorandum is intended to facilitate a discussion of these issues during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

#### 2.0 EXISTING REGULATORY MECHANISMS

Fuss & O'Neill reviewed the following documents and information provided by the Town, which are the primary regulatory mechanisms and related planning documents that address stormwater management and related natural resource protection issues in the Town of Vernon:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development.

#### 2.1 <u>Subdivision Regulations</u>

The Town's subdivision regulations (effective date: May 8, 2007) regulate the division of a tract or parcel of land with the purpose of sale or building development. The subdivision regulations address street and lot layout, water supplies, sanitary sewage facilities, stormwater drainage, utilities, open space, street widths, grades and construction, and other necessary improvements. The following is a summary of specific sections of the subdivision regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 5 Standards for Maps and Plans</u>: This section specifies requirements for maps and plans submitted with subdivision applications, including Site Development Plans, Construction Plans, and Grading Plans. Existing and proposed watercourses and stormwater management systems are required to be shown on the Site Development Plan. Grading Plans are required to include notations and details on erosion and sedimentation control methods.
- <u>Section 6.1.3 General Improvements, Open Space to be Dedicated</u>: The Planning and Zoning Commission may require the set aside of Open Space as part of a subdivision where the Commission finds the existing land applicable to one or more of the following:
  - o The policies and objectives of the Plan of Conservation and Development
  - Areas sensitive to development
  - Prime and important farmland soils
  - Natural Diversity Database Areas as updated by the Connecticut Department of Environmental Protection
  - o Unconsolidated Aquifers and Aquifer Protection Areas
  - Areas indicated for future community facility needs
  - Existing open areas and significant cultural and natural resources
  - o Potential open space system



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- o Land Use Plan and Strategy
- Significant natural and cultural resources inventory
- Viable vernal pools verified by the Town of Vernon Vernal Pool Study or by a qualified licensed professional
- <u>Section 6.1.3.2 General Improvements, Location of Open Space</u>: The protection and preservation of the Hockanum River, Ogden Brook, Tankerhoosen River, Gage's Brook, Railroad Brook, Walker's Reservoir East, Walker's Reservoir West, Valley's Fall's Pond, or a Vernal Pool indentified by the Town, is considered a priority when the parcel being subdivided contains portions of the aforementioned watercourses.

When the parcel being subdivided contains portions of land that would allow for the connection of the Shenipsit Trail, Hockanum River Trail, Risley Pond Trail, Land Trust Trail, Belding Path, Hockanum River Linear Park, Box Mountain Greenway, Talcottville & Tankerhoosen Trail/open space system, Ellington Trail System, Tolland Trail System, Bolton Greenways, Manchester Greenways, other potential greenway, linear park, or trail identified in the POCD or by the Department of Parks and Recreation, the provision and connection of these amenities shall be a priority in the design and or location of Open Space.

- <u>Section 6.1.3.3 General Improvements, Size of Open Space</u>: When Open Space is required, the minimum recommended amount of Open Space to be provided is 12% of the total area of land to be subdivided, 15% of the total area of land if the location of the subdivision is identified in the Land Use Plan and Strategy of the POCD, and 20% of the total land area if the location of the subdivision is identified as a Priority Area for Open Space Protection of the POCD.
- <u>Section 6.1.3.4.3 General Improvements, Open Space Standards</u>: Any land to be dedicated as Open Space shall be left in its natural state by the subdivider and shall not be graded, cleared, disturbed, or used as a temporary or permanent repository for stumps, brush, earth, building materials, debris, detention ponds, or basins.
- <u>Section 6.4 Lot Grading and Drainage</u>: Grading plans shall be submitted where substantial grading is required in order to provide a buildable site and shall employ standards and methods equal to or exceeding those set forth in the Erosion and Sediment Control Handbook (USDA, SCS, Storrs, Conn., 1976). Lot drainage should be coordinated with the general storm drainage patterns for the area, and drainage should be designed to avoid concentrated stormwater to adjacent lots.

Comment: Contains an outdated reference to a previous version of the State Erosion and Sedimentation Control Handbook. Revise the language to reference the current CT Erosion and Sedimentation Control Guidelines, as amended



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• <u>Section 6.5.1.1 - Street Grading and Improvement</u>: Roads shall be related appropriately to the topography, and streets shall be arranged so as to obtain as many as possible of the building sites at, or above, the grades of the streets.

Comments: consistent with fitting the development to the topography. Building sites above the grade of the streets provides opportunity for use of roadside swales. Consider adding a provision to allow elimination of curbing for roads for grades less than 5% to encourage the use of vegetated swales and similar LID stormwater management systems.

• <u>Section 6.6.6 - Cul-de-sac or Dead-End</u>: Cul-de-sac pavement shall be a uniform 45 foot radius except when an island is used, in which case the outside radius shall be 50 feet with an island radius of 20 feet.

Comment: The radius of cul-de sacs should be the minimum required to accommodate emergency and maintenance vehicles. Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.

• <u>Section 6.7.1 - Design Standards, Road Width</u>: Table 1 contains minimum pavement width for collector (32 ft), local (28 ft), and limited local roads (28 ft).

Comment: Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access. Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.

• <u>Section 6.7.2</u> - <u>Design Standards, Curbs</u>: Curbs shall be required on all new streets and shall conform to construction and design standards in the Appendix of the regulations.

Comment: The requirement for curbs on all new roads appears to preclude the use of curbless roads and open vegetated channels for stormwater management.

- <u>Section 6.9.1 Drainage and Storm Sewers, General Requirements</u>: The developer shall be fully responsible for constructing adequate facilities for the control, collection, conveyance and acceptable disposal of storm water, other surface water and subsurface water, whether originating within the sub- division area or in a tributary drainage area.
- <u>Section 6.9.2.2</u> <u>Drainage and Storm Sewers, Location of Stormwater Facilities</u>: The applicant may be required to dedicate either in fee or by drainage or conservation easement, land on both sides of existing watercourses to a distance to be determined by the Commission.



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 <u>Section 6.9.3 - Drainage and Storm Sewers, Drainage Discharge</u>: The discharge of all storm water from a subdivision shall be into suitable streams or other acceptable and suitable storm water drainage facilities having adequate capacity to carry the additional water. Sufficient and adequate facilities shall be constructed on private lots wherever necessary to prevent the flow of surface drainage from the property on which it originates onto adjacent property in sufficient quantity, concentration or velocity to cause damage or create a nuisance on adjoining property.

Comment: The Subdivision Regulations do not include post-development peak flow, volume control, or stormwater quality requirements.

• <u>Section 6.9.3 - Drainage and Storm Sewers, Drainage Design</u>: Designs shall be based on the maximum ultimate development of the entire watershed as permitted by the Zoning Regulations. On watersheds one square mile or over, the design of culverts, bridges and through watercourses shall be based upon not less than a 100-year storm. On watersheds of less than one square mile, the design for the through drainage system shall be for no: less than a 50-year storm. The drainage system for roads, including catch basins, inlets, pipes, underdrains and gutters within or abutting the subdivision shall be designed for not less than a 10-year storm.

Drainage ditches will, in general, not be permitted where it is feasible to install underground pipe.

Comment: This requirements restricts the use curbless roads and roadside vegetated swales in lieu of traditional curb, gutter, and piped drainage.

• <u>Section 6.12.1 - Sidewalks</u>: Sidewalks shall be required in all subdivisions on at least one side of all new streets, unless waived by a three-quarters vote of all members of the Commission, and may be required on both sides at the discretion of the Commission.

Comment: Sidewalks required on two side of the street increase impervious cover. Where practical, consider locating sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.

• <u>Section 6.14 - Certified Erosion and Sediment Control Plan</u>: A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre. A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

Comment: Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.


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• <u>Section 6.14.3 - Erosion and Sediment Control Plan</u>: a soil erosion and sediment control plan shall contain proper provisions to adequately control accelerated erosion and sedimentation and reduce the danger from storm water runoff on the proposed site based on the best available technology. Such principles, methods and practices necessary for certification are found in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985) as amended.

Plans for soil erosion and sediment control shall be developed in accordance with these regulations using the principles as out-lined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

- <u>Section 6.14.6 Conditions Relating to Soil Erosion and Sediment Control</u>: A performance bond may be required for the estimated costs of measures required to control soil erosion and sedimentation, as specified in the certified plan.
- <u>Section 13 Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This concept is consistent with LID principles to protect and preserve natural features of a site.

## 2.2 Zoning Regulations

Site development in the Town of Vernon must comply with the Vernon Zoning Regulations (effective date: May 8, 2007). The following is a summary of specific zoning regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 3.4 General Provisions, Collection and Disposal of Storm Drainage</u>: Proper provision shall be made for collection and disposal of storm water from roofs and parking areas through a pipe system connected to existing storm drains or carried to a natural watercourse or to an on-site area approved by the Town Engineer in compliance with the recommendations of the latest edition of the "Stormwater Quality Manual" of the Connecticut Department of Environmental Protection (DEP).
- <u>Section 3.18 General Provisions, Building Above or Below Center Line of Road</u>: Any lot or parcel of land with the top of foundation more than five (5) feet above or below the center line grade of the road opposite the midpoint of the front foundation wall requires a detailed site plan showing the existing and proposed topography, driveways, storm drainage, and other information.



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- <u>Section 3.25 General Provisions, Sidewalks</u>: Sidewalks shall be installed for all new developments in all areas, unless waived by a three-quarters vote of all members of the Commission.
- <u>Sections 4.1 through 4.25 Use Districts, Setbacks and Lot Dimensions</u>: These sections specify minimum setbacks and lot dimensions for various use districts in the Town of Vernon.

Comment: Minimum setbacks and frontage distances can increase impervious cover. Front yard setbacks, which dictate how far houses must be from the street, can extend driveway length. Large side setbacks and frontage distances influence the road length needed to serve individual lots. Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.

- <u>Section 7 Cluster Development</u>: Developers may vary the lot size requirements in Residential 40 and Residential 27 zoning districts, leaving a substantial area free of building lots (i.e., "cluster" development). The land area not allocated to building lots and streets shall be permanently reserved in open space and be readily usable for recreation or conservation.
- <u>Section 12 Off-street Parking and Loading</u>: Section 12.1 specifies parking ratios, which are the number of parking spaces that must be provided for particular uses. The Planning & Zoning Commission may reduce the number of off-street parking spaces which must be installed provided that the required number of spaces is reduced by no more than 20%, the number of spaces will not result in an increase of on-street parking, and the developer pays a fee of \$500 for each space eliminated (fee-in-lieu of parking). Section 12.3 specifies the minimum stall dimensions for off-street parking and truck loading spaces, which already appear to be at or near recommended minimum values.

Comment: Parking ratios typically represent the minimum number of spaces needed to accommodate the highest hourly parking rate at the site. In many cases, parking ratios far exceed parking demand, which refers to the number of spaces actually used for a particular land use. Parking ratios often result in far more spaces than are actually required because ratios are typically set as minimums and not maximums. This results in excessive impervious cover for many land uses. Existing parking ratio should be reviewed to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



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Shared parking is another strategy that reduces the number of parking spaces needed by allowing adjacent land uses to share parking lots, particularly when parking demands occur at different times during the day or week. Section 12.3 appears to allow for shared parking for non-residential uses, although it is unclear if the Town actively promotes shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Also consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Connecticut Stormwater Quality Manual, local stormwater management design manual, other sections of the Zoning regulations, or new/modified local stormwater management and LID regulations.

Model zoning regulations for parking were developed in 2003 for communities in northwestern Connecticut through a study sponsored by the Northwestern Connecticut Council of Governments (NWCCOG), the Litchfield Hills Council of Elected Officials (LHCEO), and the Connecticut DEP. This document provides a good starting point for reviewing and modifying local zoning regulations for parking to address impervious cover and stormwater management issues.

<u>Section 18 — Activities Requiring a Certified Erosion and Sediment Control Plan</u>: A soil
erosion and sediment control plan shall be submitted with any application for
development when the disturbed area of such development is cumulatively more than
one-half acre, except for a single family dwelling that is not a part of subdivision of land,
which is exempt from these soil erosion and sediment control regulations.

Comment: The section of the Zoning Regulations is consistent with the Erosion and Sediment Control Plan requirements (Section 6.14) of the Subdivision Regulations. Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.

 <u>Section 19 – Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

*Comment:* This section of the Zoning Regulations is consistent with Section 13 of the Subdivision Regulations.

## 2.3 Inland Wetlands & Watercourses Regulations

The Town of Vernon Inland Wetlands and Watercourses Regulations (effective date: October 2, 2006) regulate the removal or deposition of materials and the construction, obstruction, alteration, or pollution of wetlands and watercourses in the Town. The regulations make provisions for the protection, preservation, maintenance and use of inland wetlands and watercourses by minimizing their disturbance and pollution, maintaining and improving water



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quality in accordance with federal, state, and local authority, and preventing damage from erosion, turbidity, or siltation as well as preventing the loss of beneficial aquatic organisms.

 <u>Section 2 – Definitions, Regulated Activity</u>: Regulated activities include any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution, of such wetlands or watercourses. Any clearing, grubbing, filling, grading, paving, excavating, constructing, depositing, or removing of material and discharging of stormwater on the land within the following *upland review areas* is a regulated activity:

Resource	Upland Review Area
Wetland and Watercourse	100 ft.
Hockanum River, Ogden Brook, Tankerhoosen	200 ft.
River, Gage's Brook, Railroad Brook, Walker	
Reservoir West, Walker Reservoir East, and Valley	
Falls Pond	
Other	Agency Discretion*

\*The Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity. The Commission may rule that any other activity whether located within or outside the Regulated Area that is likely to have an affect on the wetlands or watercourses is a Regulated Activity.

Additionally, the Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity.

- <u>Section 2 Definitions, Significant Activity</u>: A "significant activity" includes any activity involving a deposition or removal of material which will or may have a substantial adverse effect on the Regulated Area or on another part of the inland wetland or watercourse system or an activity which substantially changes the natural channel or may inhibit the natural dynamics of a watercourse system or substantially diminishes the natural capacity of an inland wetland or watercourse to support desirable biological life, prevent flooding, supply water, assimilate waste, facilitate drainage, and/or provide recreation and open space, or any activity which would results in degrading a watercourse or the surface and/or groundwater of an inland wetland, such degradation to be measured by the standards of the Water Compliance Division of the Connecticut Department of Environmental Protection.
- <u>Section 4.3.2 Fee Schedule</u>: A technical review may be required by a consultant for certain regulated activities, including those that are within 200 feet of a watercourse of concern (including the Tankerhoosen River and its major tributaries), regulated activities proposed in a use district where the proposed activity exceeds the impervious coverage thresholds established in such districts, as well as parking space, building square footage, disturbance, and other thresholds.



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- <u>Section 4.3.4 Application Procedure</u>: Any person wishing to undertake a Regulated Activity must submit an application to the Commission. The application must include a map showing the location of the site, the nature and extend of the proposed activity, the location of the Regulated Areas, existing and proposed structures, two-foot elevation contours, all drainage to be engineered, areas where material may be deposited or removed, all proposed construction within Regulated Area, areas of significant vegetation. The application must also include a detailed description of the activity, a map drawn by a licensed surveyor if the proposed activity exceeds ½ acre, the names and address of property owners within 500 feet of the proposed activity, and any reasonable measures which would mitigate the impacts of the Regulated Activity.
- <u>Section 4.5 Evaluation of Proposed Activities</u>: This section specifies the information and criteria upon which the Commission makes its decision on an application. Section 4.5.2 includes factors related to erosion, siltation, and leaching; adverse effects on water quality and aquatic life; the likelihood of any changes in the velocity, volume, or course of water flow, or in the water table, and any consequences such changes may have for the capacity of the wetland or watercourse to help control flooding and to purify and supply water; and the existing and desired quality and use of the water in and near the affected area.

Comment: The evaluation criteria do not contain specific stormwater management standards and do not reference available design guidance such as the Connecticut Stormwater Quality Manual or local design guidance. The regulations also do not require or recommend the use of LID practices to meet stormwater management objectives.

<u>Watercourse Buffers</u>: Section 4.5.2.12 states that the Commission may require the provision of a buffer along a watercourse if proposed activities and/or development may create negative impacts on a watercourse that could be prevented or mitigated by provision of a buffer, as described in "Appendix B. Design Standards Recommended for a Watercourse Protection Buffer." The watercourse buffer design standards state that in areas where vegetated buffers do not exist, or are of limited width, consideration should be given to the creation of a buffer area. Newly created buffers should include canopy or shade trees, shrubs, and herbaceous plant species suited to the local habitat in three (3) zones of plantings. The recommended minimum width of a watercourse buffer is one hundred (100) feet measured horizontally from the banks of the watercourse and fifty (50) feet measured horizontally related to intermittent watercourses.

The recommended watercourse protection area with landscape buffer may be reduced when (1) an engineered stormwater management and pollution control system employing technical best management practices (BMP) in compliance with the Connecticut Department of Environmental Protection (DEP) "Stormwater Quality Manual: is provided to treat run-off from a development site; (2) the site is served by a public sewer system; and (3) a reduction of the river protection buffer depth would not result in a significant potential adverse impact to the watercourse.



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## 2.4 Plan of Conservation and Development

The Vernon Plan of Conservation and Development (June 2001) presents a detailed strategy for open space conservation and preservation, including increasing the amount of preserved open space as well as creating linkages between open space areas. The Plan identifies priority open space preservation areas along the Hockanum and Tankerhoosen River corridors.

A series of neighborhood meetings were held as an initial phase of the POCD. Several common themes emerged at public meetings. The themes associated with the protection of open space and watercourses included:

- Need to preserve open space for perpetuity in a positive, planned manner with adequate financial resources devoted to this program. A goal of 20% open space might be considered
- Retail development should be limited to prevent Vernon from becoming another Manchester in the Route 84 corridor or like the Berlin Turnpike along other major corridors in Town.
- The water quality of the Town's lakes and rivers as well as groundwater should be protected.

In addition to the currently-implemented Zoning Regulations, Subdivision Regulations, and Inland Wetlands and Watercourses Regulations, the Open Space section of the POCD also recommends adoption of a Hockanum River and Tankerhoosen River Protection Overlay District. Such a district would establish a contiguous and parallel buffer strip on either side of these rivers and would supplement the inland wetland and underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

## 3.0 OBSERVATIONS & PRELIMINARY RECOMMENDATIONS

Based on our review of the Town's existing land use regulations and planning documents that pertain to stormwater management and natural resource protection, we offer the following observations and preliminary recommendations for discussion during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

## 3.1 Observations

The Town has a number of land use regulations that regulate construction and postconstruction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or



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new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

## 1. Stormwater Management Standards and Design Manual

The Town land use regulations do not contain specific stormwater management standards. The Zoning Regulations reference the recommendations and design guidance contained in the Connecticut Stormwater Quality Manual, while the Subdivision Regulations indicate that stormwater systems shall be designed by methods approved by the Town Engineer. The Inland Wetlands and Watercourses Regulations do not contain specific stormwater management standards and do not reference design guidance such as the DEP Stormwater Quality Manual or local design standards, except for instances when the applicant requests reduction in the watercourse buffer width requirements.

While the Connecticut Stormwater Quality Manual contains hydrologic sizing criteria (for water quality, quantity, groundwater recharge, etc.) and detailed design guidance for specific stormwater treatment practices, it does not prescribe a set of stormwater standards due to the lack of state-wide stormwater regulations. The Connecticut Stormwater Quality Manual does contain many LID principles in addition to more traditional end-of-pipe stormwater controls. However, it does not contain more recently developed guidance on LID design methods and clear incentives for developers to use LID over traditional stormwater management methods, such as LID credit systems which have been adopted by communities in recent years. Another drawback of relying solely on the DEP manual is that the information in the manual may eventually become outdated and lacking in areas of new or emerging stormwater management issues, as DEP does not plan to revise the manual in the foreseeable future.

Although the Vernon land use commissions are encouraged to use the Connecticut Stormwater Quality Manual to review applications, an alternative approach is to develop a local stormwater and LID manual to complement the DEP stormwater manual. A local manual could reference applicable sections of the DEP manual and take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations could also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the Town land use regulations. Several other Connecticut communities have chosen this approach, including Tolland, which has developed a LID and Stormwater Management Design Manual, in addition to amendments to the Tolland Subdivision and Zoning Regulations. The Town of Greenwich is also in the process of revising its outdated drainage manual to incorporate stormwater quality elements and LID principles. Greenwich is also considering adopting a stand-alone ordinance or modifying its local land use regulations to implement the provisions of the new manual.

## 2. Local Regulatory Mechanism

As indicated in the introduction section, an opportunity exists for the Town of Vernon to develop and implement new or revised regulations to satisfy Phase II stormwater regulatory F:\P2005\0257\A20\Town Regulations and Data\Vernon\_Regulatory\_Review\_Memo\_20080605.doc Corres. (MA)



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requirements, while at the same time incorporating LID principles and addressing natural resource protection issues. The Town's existing land use regulations address some of the elements of the post-construction stormwater management "regulatory mechanism" required by the DEP Phase II Stormwater program. However, none of the existing regulations, either individually or collectively, addresses post-construction stormwater management in a comprehensive manner as required by the Phase II program. Additionally, the Town may want to consider regulating stormwater runoff from projects that may not currently be subject to Town land use regulations but which are known to be a source of stormwater quality and drainage issues (such as single family residential redevelopment outside of the Upland Review Area).

Two general approaches exist for implementing a comprehensive stormwater regulatory mechanism to meet Phase II stormwater program requirements and to incorporate LID principles and other specific community objectives. One approach involves developing a new stand-alone stormwater ordinance that could be incorporated into the Vernon Town Code and implemented by a single department or commission such as the Engineering Department. This approach has been used by Stratford and other communities throughout southern New England. An alternate approach would be to implement more comprehensive stormwater management/LID requirements in a new section of the Zoning Regulations and maintain the responsibility for administering the stormwater/LID provisions with the Planning and Zoning Commission. Such an approach has been used by Tolland and Guilford, Connecticut. Elements of both approaches are summarized as follows:

- a. Stand-Alone Stormwater Ordinance
  - Adopt a new stormwater ordinance as part of the Vernon Town Code. The ordinance could be similar to the draft ordinance which is provided in Attachment A of this memorandum and is based upon a model ordinance endorsed by the DEP. Typically, a new stormwater ordinance is a more efficient and effective way to address the Phase II Stormwater program regulatory mechanism requirement than separate revisions to the individual municipal land use regulations that are currently in place. The stormwater ordinance would apply to post-construction stormwater runoff from new development and redevelopment projects that disturb greater than a threshold value that could be selected by the Town. The Phase II General Permit requires that the ordinance apply to projects that would disturb one or more acres. Vernon could consider an alternative applicability threshold to ensure that the requirements would apply to in-fill development projects and other smaller land disturbance activities with the potential for drainage or water guality impacts. The sample draft ordinance provided in Attachment A would apply to all projects that disturb 5,000 square feet or more. Other applicability thresholds could be considered as well. The ordinance should incorporate by reference the technical standards and design guidance contained in a local stormwater manual and/or the Connecticut Stormwater Quality Manual, as amended.



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- The stand-alone stormwater ordinance could be administered by the Engineering Department, which would initially receive stormwater management permit applications for land disturbance activities subject to the ordinance. Stormwater Management Plans would then be reviewed by one or more of the applicable land use commissions (Planning and Zoning Commission or Inland Wetlands Regulatory Commission) with jurisdiction or expertise over the proposed project. Projects that do not fall under the jurisdiction of the Planning and Zoning Commission or the Inland Wetlands Regulatory Commission or the Inland Wetlands Regulatory Commission would be reviewed solely by the Engineering Department for compliance with the ordinance. This administrative structure places responsibility for stormwater management plan review on those agencies that already perform regulatory reviews (P&Z and IW), but consolidates authority for the stormwater ordinance under a single department (Engineering). A drawback to this approach is that the Engineering Department would bear the responsibility for administering the permit program and would likely require additional staff resources.
- The Town could consider creating a dedicated "stormwater inspector" position within the Engineering Department. The stormwater inspector would be responsible for conducting stormwater inspections during and after construction of stormwater facilities in support of the new ordinance, as well as augment the related inspection capabilities of Building Inspector and Zoning Enforcement Officer.
- Short-term funding for administration of the post-construction stormwater ordinance and other elements of the Town's Phase II program would most likely come from taxes and application fees. The Town could investigate implementation of a service charge-based system, such as user fees or a stormwater utility. However, these funding sources are often difficult to implement due to public resistance. Stormwater utilities have been established in Chicopee, Massachusetts, Burlington, Vermont, and elsewhere throughout the U.S. Stonington, Connecticut has investigated the feasibility of a stormwater utility. Several other Connecticut coastal communities are undertaking DEPfunded demonstration projects to explore the feasibility of developing and implementing a stormwater utility. Vernon may also explore the feasibility of a stormwater utility or similar stormwater service charge, although this would likely be a long-term potential funding source.
- b. Incorporation of Stormwater Management/LID Requirements in Zoning Regulations
  - Incorporate a new post-construction stormwater management and LID section into the existing Zoning Regulations. The new section could be similar to the stand-alone example ordinance in terms of applicability thresholds, exemptions, and general stormwater management standards and LID principles. Specific stormwater management standards and design guidance should not be included in the regulations, but rather in a local stormwater manual to avoid the need for



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significant future amendments to the regulations when the standards or design guidance are revised. A copy of the recent amendment to the Town of Tolland Zoning Regulations, which added a new LID section, is included as <u>Attachment B</u> of this memorandum.

• In addition, the Zoning Regulations could be modified to potentially require a Stormwater Management Plan for a proposed activity that only requires a Building Permit, such as a single-family dwelling, if it results in the disturbance of one or more acres (the Phase II permit minimum requirement) or a lower threshold selected by the Town. The following sample language is an excerpt from the Guilford Zoning Regulations:

Stormwater Management Plans shall be prepared for any Site Plan, Coastal Site Plan (CAM) or Special Permit Application in accordance with 273-75.F(3) of this Code. Futhermore, for an Application for Certificate of Zoning Compliance (Building Permit) for any new single family dwelling, the Town Engineer, or the Environmental Planner may require that a Stormwater Management Plan be prepared, all or in part, as required by 273-75.F.(3) when he/she has determined that the development if the single family dwelling may have an adverse impact on stormwater quality.

This approach consolidates stormwater management review within the Planning and Zoning Commission through the existing site plan and special permit application review process. The Subdivision and Inland Wetlands and Watercourses Regulations would also need to be modified to require a Stormwater Management Plan consistent with the Zoning Regulations.

## 3. LID Incentives and Obstacles

Although recent studies demonstrate that LID practices can reduce project costs and improve environmental performance, the perception still exists that site development using LID is more expensive than traditional approaches to stormwater management. Initial project costs may be higher in some cases than those for conventional design. However, significant savings are typically realized due to reduced costs for site grading and preparation, stormwater infrastructure, site paving, and landscaping (USEPA, Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA publication number 841-F-07-006, December 2007).

Many states and local communities have adopted LID credit systems as an added incentive for developers to use LID, and in particular non-structural measures, to ultimately reduce the size and cost of structural stormwater management systems.

LID Site Design Credits encourage environmentally sensitive site design and LID techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet certain stormwater standards by implementing LID site design techniques according to a prescribed set of standards. The Tolland LID Design F:\P2005\0257\A20\Town Regulations and Data\Vernon\_Regulatory\_Review\_Memo\_20080605.doc Corres. (MA)



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Manual includes such an LID credit system. <u>Attachment C</u> of this memorandum contains an example LID Site Design Credit System that is also being considered by the Town of Greenwich.

Local land use regulations often contain design standards that preclude or limit the use of certain LID practices, particularly the use of curbless roads and roadside vegetated swales. Traditional curb-and-gutter systems convey stormwater with virtually no treatment or attenuation. Open vegetated channels remove pollutants by allowing infiltration and filtering to occur, and encourage groundwater recharge, which can reduce the volume of stormwater generated from a site. Traditionally, the use of curbless roads and vegetated open channels has been discouraged and, in many instances, specifically prohibited in local land use regulations and drainage design manuals, due to concerns over maintenance problems, pavement stability, and potential nuisances such as mosquitoes. Many of these concerns can be addressed through careful design and integration of open channels along streets.

The Vernon Subdivision Regulations contain provisions that limit the use of curbless roads and roadside vegetated swales. The Subdivision Regulations require curbs on all new streets and do not permit drainage ditches where it is feasible to install underground pipe. The Town should evaluate the underlying reasons for these restrictions and determine if the Subdivision Regulations should be amended to encourage the use of curbless roads and roadside swales, consistent with LID principles.

## 4. Local Regulations and Impervious Cover

Impervious cover in a watershed is a strong indicator of the overall quality of streams and aquatic ecosystems. The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. As impervious cover increases, overall stream health declines.

A goal of LID, which is a form of alternative site design, is to reduce impervious cover, disconnect impervious surfaces from the storm drainage system, and preserve natural site features. Local land use regulations and design requirements were typically not developed with impervious cover in mind. Rather, they evolved from perceived consumer demand, safety concerns, and land availability, often resulting in more impervious cover than is necessary due to expansive parking lots, wide streets, and large-lot subdivisions with little conserved natural areas and open space.

Communities interested in adopting LID and alternative sit design principles need to re-evaluate local land use regulations to overcome these challenges. Based on our review of the Vernon Subdivision and Zoning Regulations, some of the key design parameters that strongly influence impervious cover are already at or near optimal levels (e.g., off-street parking stall dimensions and configuration), while others should be reviewed to determine if further refinement is warranted and feasible (e.g., cul-de-sac design, road width, sidewalks, parking ratios).



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## 3.2 Preliminary Recommendations

This section contains preliminary recommendations based on our review of the existing land use regulations and planning documents, as well as our observations discussed in the previous section. These recommendations are intended to facilitate a discussion with the Technical Advisory Committee and Vernon land use commissioners during the upcoming workshop meeting, and to serve as a starting point and basis for further refinement and implementation.

- 1. Town Design Manual
  - Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
  - Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
  - Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.
- 2. Stormwater Management Standards
  - Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in <u>Attachment D</u>.



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- 3. New or Modified Stormwater Regulations
  - Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified –1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
  - Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
    - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
    - Which projects and activities will the new ordinance apply to (i.e., applicability)?
    - How will applications be received and reviewed?
    - o Who will be responsible for inspections and enforcement?
    - Will additional staff be required to handle the increased workload to review and process applications?
- 4. Other Amendments to Existing Regulations

## Subdivision Regulations

- Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
- Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
- Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.



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- Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a stand-alone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
- Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.
- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

## Zoning Regulations

- Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
- Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
- Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



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Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

• Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

## Inland Wetlands and Watercourses Regulations

• Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.



# ATTACHMENT A

Draft Model Stormwater Ordinance

## DRAFT

## POST-CONSTRUCTION STORMWATER ORDINANCE (CITY NAME)

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- **1.0 PURPOSE AND AUTHORITY**
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- 5.0 STORMWATER MANAGEMENT PLANS
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- 7.0 CASH BOND
- 8.0 INSPECTION
- 9.0 MAINTENANCE
- 10.0 APPEALS
- **11.0 SEVERABILITY**
- 12.0 PENALTIES
- **13.0 EFFECTIVE DATE**

### 1.0 PURPOSE AND AUTHORITY

The purpose of this ordinance is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with post-construction stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land and wetlands, control stream channel erosion, reduce local flooding, improve water quality, and maintain after development, as nearly as possible, the pre-development runoff characteristics.

The provisions of this ordinance are pursuant to Connecticut State Statutes 7-148 (c) (8) (A)<sup>1</sup>, 8-2 (a)<sup>2</sup>, 8-25<sup>3</sup>, and 22a-36 to 22a-45 inclusive<sup>4</sup>, and 8-2(b)<sup>5</sup> and shall apply to all development occurring within the incorporated area of(City Name), Connecticut. The application of this ordinance and provisions expressed herein shall be the minimum stormwater management requirements and shall not be deemed a limitation or repeal of any other powers granted by State statute. The agencies defined in Section 2.0 as the

<sup>4</sup> The Inland Wetlands and Watercourses Act.

<sup>&</sup>lt;sup>1</sup> Municipal Powers: The municipality has the power to "Provide for the protection and improvement of the environment including, but not limited to, coastal areas, wetlands and areas adjacent to waterways in a manner not inconsistent with the general statutes.

<sup>&</sup>lt;sup>2</sup> Regulations: The zoning commission is authorized to adopt regulations "...to secure safety from ...flood and other dangers; to promote health and the general welfare..."

<sup>&</sup>lt;sup>3</sup> Subdivision of land: Authorizes the zoning commission to see "...that proper provision shall be made for... drainage..." and "that proper provision shall be made for protective flood control measures..."

<sup>&</sup>lt;sup>5</sup> "In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the zoning commission consider the environmental impact on Long Island sound of any proposal for development."

"Responsible Authority" shall be responsible for the coordination and enforcement of the provisions of this ordinance.

#### **1.1** Incorporation by Reference

For the purpose of this ordinance, the Connecticut Stormwater Quality Manual (as amended) is incorporated by reference by (City Name), Connecticut and shall serve as the official guide for stormwater principles, methods, and practices.

### 2.0 **DEFINITIONS**

- A. For the purpose of this ordinance, the following definitions describe the meaning of the terms used in this ordinance:
  - (1) "Adverse impact" means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation.
  - (2) "Agricultural land management practices" means those methods and procedures used in the cultivation of land in order to further crop and livestock production and conservation of related soil and water resources.
  - (3) "Applicant" means any person, firm, or governmental agency who executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.
  - (4) "Aquifer" means porous water bearing geologic formation generally restricted to materials capable of yielding an appreciable supply of water.
  - (5) "BMP (Best Management Practice)" means a structural device or nonstructural practice designed to temporarily store or treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities.
  - (6) "Clearing" means the removal of trees and brush from the land (i.e., removal of vegetative cover) but shall not include the ordinary mowing of grass
  - (7) "DEP" means the Connecticut Department of Environmental Protection.
  - (8) "Design Manual" means the most current edition of the Connecticut Stormwater Quality Manual that serves as the official guide for the stormwater management principles, methods, and practices.
  - (9) "Detention structure" means a permanent structure for the temporary storage of runoff, which is designed so as not to create a permanent pool of water.
  - (10) "Develop land" means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, municipal, or institutional construction or alteration.
  - (11) "Direct discharge" means the concentrated release of stormwater to tidal waters or vegetated tidal wetlands from new development or redevelopment projects in the Critical Area.
  - (12) "Disturb" or "Disturbance" means any activity consisting of the removal of vegetation, topsoil, or overburden, or the placement of topsoil, spoil, or other material, as defined in the Guidelines.

- (13) "Drainage area" means an area that contributes runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.
- (14) "Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.
- (15) "Exemption" means those land development activities that are not subject to the stormwater management requirements contained in this ordinance.
- (16) "Extended detention" means a stormwater design feature that provides gradual release of a volume of water in order to increase settling of pollutants and protect downstream channels from frequent storm events. Methods for designing extended detention BMPs are specified in the Design Manual.
- (17) "Extreme flood volume" means the storage volume required to control those infrequent but large storm events in which overbank flows reach or exceed the boundaries of the 100-year floodplain.
- (18) "Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.
- (19) "Grading" means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled or any combination thereof.
- (20) "Groundwater recharge volume (GRV)" means that portion of the water quality volume used to maintain groundwater recharge rates at development sites. Methods for calculating the groundwater recharge volume are specified in the Design Manual.
- (21) "Guidelines" means the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, or as may be amended, established pursuant to Section 22a-328 of the Connecticut General Statutes.
- (22) "Infiltration" means the passage or movement of water into the soil surface.
- (23) "Off-site stormwater management" means the design and construction of a facility necessary to control stormwater from more than one development.
- (24) "On-site stormwater management" means the design and construction of systems necessary to control stormwater within an immediate development.
- (25) "Peak runoff attenuation" means controlling by structural practices the volume to prevent an increase in the frequency of out of bank flooding generated by development.
- (26) "Primary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that is capable of providing high levels of water quality treatment as a stand-alone measure.
- (27) "Redevelopment" means any construction, alteration, or improvement exceeding five thousand (5,000) square feet of land disturbance performed on sites where existing land use is commercial, industrial, municipal, institutional or multifamily residential.
- (28) "Responsible Authority" means employees, members, or designees of (City Name) (Agency Name). Other responsible agencies under this ordinance include:
  - (a) The Inland Wetlands and Watercourses Commission for stormwater runoff impacting wetlands and watercourses. (For the purposes of only this paragraph, the definition of "wetlands" and "watercourse" is the definition used in the most current version of the Inland Wetland and Watercourses regulations of (City Name).

- (b) The Engineering Division of the Department of Public Works for stormwater runoff from public roads and sidewalks.
- (c) The Planning Commission and Zoning Commission for all other stormwater runoff.
- (29) "Responsible Official" means (City Name) Director of Public Works ("Director").
- (30) "Retention structure" means a permanent structure that provides for the storage of runoff by means of a permanent pool of water.
- (31) "Retrofitting" means the construction of a structural BMP in a previously developed area, the modification of an existing structural BMP, or the implementation of a nonstructural practice to improve water quality over current conditions.
- (32) "Secondary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that may not be suitable as stand-alone treatment because is not capable of meeting the water quality treatment performance criteria in the Design Manual or has not yet received the thorough evaluation needed to demonstrate the capabilities for meeting the performance criteria in the Design Manual.
- (33) "Sediment" means soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity as a product of erosion.
- (34) "Site" means:
  - (a) For "new development" any tract, lot or parcel of land or combination of tracts, lots, or parcels of land, which are in one ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.
  - (b) For "redevelopment" the area of new construction as shown on an approved site plan or the original parcel. Final determination of the applicable area shall be made by the Responsible Authority.
- (35) "Stabilization" means the prevention of soil movement by any of various vegetative and/or structural means.
- (36) "Stormwater management" means the selective use of various management measures to effectively address the adverse water quality and quantity impacts of urban stormwater runoff.
- (37) "Stormwater Management Plan" means a set of drawings or other documents that describe the potential water quality and quantity impacts associated with a development project after construction. A stormwater management plan also identifies selected source controls and treatment practices to address those potential impacts, the engineering design of the treatment practices, and maintenance requirements for proper performance of the selected practices.
- (38) "Stormwater Treatment Practice", as defined in the Design Manual, means a measure constructed for primary treatment or secondary treatment of stormwater runoff.
- (39) "Stream Channel Protection" means restricting peak flows from storm events that result in flow conditions where the stream is flowing to the full extent of its banks so the damaging effects to the channel of increased runoff from urbanization can be reduced. Methods for calculating stream channel protection are specified in the most current edition of the Design Manual.

- (40) "Variance" means the modification of the minimum stormwater management requirements for specific circumstances such that strict adherence to the requirements would result in necessary hardship and not fulfill the intent of this ordinance.
- (41) "Waiver" means the relinquishment from stormwater management requirements by the Responsible Authority for a specific development on a case-by-case review basis.
  - (a) "Quality stormwater management waiver" includes water quality volume and groundwater recharge volume design parameters.
  - (b) "Quantity stormwater management waiver" includes stream channel protection, peak runoff attenuation, and extreme flood volume design parameters.
- (38) "Watercourse" means any natural or artificial stream, river, brook, lake, pond, marsh, swamp, bog, ditch, channel, canal, conduit, culvert, drain, waterway, gully, ravine, wash, and all other bodies of water, natural or artificial, vernal or intermittent, public or private in and including any adjacent area that is subject to inundation from overflow or flood water.
- (39) "Watershed" means the total drainage area contributing runoff to a single point.
- (40) "Water quality volume" means the volume of runoff generated by one inch of rainfall on the site.

## 3.0 APPLICABILITY

### 3.1 Scope

No person shall develop land for residential, commercial, industrial, municipal, or institutional uses without having provided stormwater management measures that control or manage runoff from such development, except as provided within this section. The stormwater management measures must be designed consistent with the Design Manual and constructed according to an approved plan for new development or the policies stated in Section 3.4 for redevelopment.

## 3.2 Exemptions

The following development activities are exempt from the provisions of this ordinance and the requirements of providing stormwater management, except as noted:

- A. Development of single family residential property that results in the disturbance of less than one (1) acre of land, not including projects less than one (1) acre that are part of a larger common plan of development or sale that will ultimately disturb greater or equal to one (1) acre must conform to the requirements presented in Section 4.4.
- B. Agricultural land management practices;
- C. Any activity that will disturb an area less than five thousand (5,000) square feet over the total project;
- D. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;
- E. Repair or replacement of an existing roof of a single family dwelling;
- F. Construction of utilities (gas, water, electric, telephone, sanitary sewer, etc.) other than drainage, which will not alter terrain, ground cover, or drainage patterns;

G. Emergency repairs to any stormwater management facility or practice that poses a threat to public health or safety, or as deemed necessary by the Responsible Authority.

## 3.3 Waivers / Watershed Management Plans

- A. Stormwater management quantity control waivers may be granted by the Responsible Authority to projects when the Responsible Authority determines that circumstances exist that prevent the reasonable implementation of quantity control practices.
- B. Stormwater management quality control waivers granted by the Responsible Authority apply to:
  - (1) In-fill development projects where implementation of stormwater management quality controls is not feasible;
  - (2) Redevelopment projects if the requirements of Section 3.4 of this ordinance are satisfied; or
  - (3) Sites where the Responsible Authority determines that circumstances exist that prevent or make unnecessary the reasonable implementation of quality control practices.
- C. Waivers must be requested in writing one week in advance of the regular meeting of the (Responsible Authority Agency Name) in a manner prescribed by the Director of Public Works.
- D. Waivers granted must:
  - (1) Be on a case-by-case basis;
  - (2) Consider the cumulative effects of the waiver policy; and
  - (3) Reasonably ensure the development will not adversely impact stream quality.

## 3.4 Redevelopment

- A. All redevelopment projects shall reduce existing site impervious area by 20%. Where site conditions prevent the reduction of impervious area, then stormwater management practices shall be implemented to provide quality control for at least 20% of the site's impervious area. The elements and principles of stormwater quality control are noted in the Design Manual.
- B. Where conditions prevent impervious area reduction or on-site stormwater management, the Responsible Authority may consider practical alternatives including:
  - (1) Watershed or stream restoration;
  - (2) Retrofitting; or
  - (3) Other practices approved by Responsible Authority.

## 3.5 Variance

The Responsible Authority may grant a written variance from any requirement of Section 4.0 (Stormwater Management Criteria), of this ordinance if there are exceptional circumstances applicable to the site such that strict adherence will result in unnecessary hardship and not fulfill the intent of this ordinance. A written request for variance shall be provided to the Responsible Authority and shall state the specific variances sought and reasons for their granting. The Responsible Authority shall not grant a variance unless and until the person developing land provides sufficient justification.

## 4.0 STORMWATER MANAGEMENT CRITERIA

## 4.1 Minimum Control Requirements

A. The minimum control criteria established in this section and the Design Manual are as follows:

- (1) Shall require that the groundwater recharge volume, water quality volume, and peak runoff attenuation for the 2-year frequency storm event be used to design BMPs according to the Design Manual. Control of the 10-year frequency storm event is required according to the Design Manual. Control of larger storm events may be required at the discretion of the Responsible Authority if a flooding problem exists and downstream floodplain development and conveyance system design cannot be controlled.
- (2) Shall require that the groundwater recharge volume, water quality volume, and stream channel protection sizing criteria be used to design BMPs according to the Design Manual.
- (3) The Responsible Authority may require more than the minimum control requirements specified in this ordinance if hydrologic or topographic conditions warrant or if flooding, stream channel erosion, or water quality problems exist downstream from a proposed project.
- B. Stormwater management and development plans where applicable, shall be consistent with adopted and approved watershed management plans or flood management plans as approved by the DEP.

#### 4.2 Stormwater Management Measures

The structural and nonstructural stormwater management measures established in this ordinance shall be used, either alone or in a combination, in developing a stormwater management plan.

- A. Nonstructural Stormwater Management Measures.
  - (1) The following nonstructural stormwater management practices shall be applied according to the Design Manual to minimize increases in new development runoff:
    - (a) Natural area conservation;
    - (b) Disconnection of rooftop runoff;
    - (c) Disconnection of non-rooftop runoff;
    - (d) Sheet flow to buffers;
    - (e) Grass channels; and
    - (f) Environmentally sensitive development and Low Impact Development (LID) practices;
  - (2) The use of nonstructural stormwater management practices shall be encouraged to minimize the reliance on structural BMPs.
  - (3) The minimum control requirements listed in Section 4.1 of this ordinance may be reduced when nonstructural stormwater management practices are incorporated into site designs according to the Design Manual.
  - (4) The use of nonstructural stormwater management practices may not conflict with existing State or local laws, ordinances, or policies.
  - (5) Nonstructural stormwater management practices used to reduce the minimum control requirements must be recorded and remain unaltered by subsequent property owners. Prior approval from the Responsible Authority shall be obtained before nonstructural stormwater practices are altered.
- B. Structural Stormwater Management Measures.

- (1) The following structural stormwater management practices or "Stormwater Treatment Practices" shall be designed according to the Design Manual to satisfy the applicable minimum control requirements established in Section 4.1 of this ordinance.
  - (a) Primary Treatment Practices, including stormwater ponds, stormwater wetlands, stormwater infiltration practices, stormwater filtering practices, and water quality swales.
  - (b) Combination of primary treatment practices and secondary treatment practices.
  - (c) Multiple secondary treatment practices, at the discretion of the Responsible Authority.
- (2) The performance criteria specified in the Design Manual with regard to general feasibility, conveyance, pretreatment, treatment and geometry, environment and landscaping, and maintenance shall be considered when selecting structural stormwater management practices.
- (3) Structural stormwater management practices shall be selected to accommodate the unique hydrologic or geologic regions of the state.
- C. Alternative structural and nonstructural stormwater management practices may be used for new development water quality control if they meet the performance criteria established in the Design Manual. Practices used for redevelopment projects shall be approved by the Responsible Authority.
- D. For the purposes of modifying the minimum control requirements or design criteria, the owner/developer shall submit at the request of the Responsible Authority an analysis of the impacts of stormwater flows downstream in the watershed. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed development upon a dam, highway, structure, or natural point of restricted stream flow. The point of investigation is to be established with the concurrence of the Responsible Authority.

## 4.3 Specific Design Criteria

The basic design criteria, methodologies, and construction specifications, subject to the approval of the Responsible Authority, shall be those of the Design Manual.

## 4.4 Single Family Residence Lot Level Controls

Construction of single family residences that results in the disturbance of less than 1 acre of land must minimize or disconnect impervious area runoff from the public storm drainage system by implementing stormwater management measures designed in accordance with the Design Manual. The applicant shall submit evidence on a form prescribed by the Responsible Official that the requirements of Section 4.4 have been met prior to issuance of a building permit.

### 5.0 STORMWATER MANAGEMENT PLANS

#### 5.1 Review and Approval of Stormwater Management Plans

A. For any proposed development, the developer shall submit a stormwater management plan or waiver application to the Responsible Authority for review and approval, unless otherwise exempted. The stormwater management plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire development. The Responsible Authority shall

review the plan to determine compliance with the requirements of this ordinance prior to approval. The plan shall serve as the basis for all subsequent construction.

B. Notification of approval or reasons for disapproval or modification shall be given to the applicant within [time frame] after submission of the completed stormwater plan. If a decision is not made within [time frame] the applicant shall be informed of the status of the review process and the anticipated completion date. The stormwater management plan shall not be considered approved without the inclusion of the signature and date of signature of the responsible official on the plan.

#### 5.2 Contents of the Stormwater Management Plan

A. The developer is responsible for submitting a stormwater management plan that meets the design requirements of this ordinance. The plan shall be accompanied by a report that includes sufficient information to evaluate the environmental characteristics of affected areas, the potential impacts of the proposed development on water resources, and the effectiveness and acceptability of measures proposed for managing stormwater runoff. An engineer licensed in Connecticut shall certify on the drawings that all clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the plan. If a stormwater management plan involves direction of some or all runoff off the site, it is the responsibility of the developer to obtain from adjacent property owners any easements or necessary property interests concerning flowage of water. Approval of a stormwater management plan does not create or affect any right to direct runoff onto adjacent property without that property owner's permission.

The minimum information submitted for support of a stormwater management plan or application for a waiver shall be as follows:

- B. Reports submitted for stormwater management plan approval shall include:
  - (1) A brief narrative description of the project;
  - (2) Geotechnicial investigations including soil maps, borings, site-specific recommendations, and any additional information necessary for the proposed stormwater management design;
  - (3) Descriptions of all watercourses, impoundments, and wetlands on or adjacent to the site or into which stormwater directly flows;
  - (4) Hydrologic computations, including drainage area maps depicting pre development and post development runoff flow path segmentation and land use that demonstrate compliance with Section 4.0 of this ordinance;
  - (5) Hydraulic computations;
  - (6) Structural computations;
  - (7) Hydrologic sizing criteria computations according to the Design Manual; and
  - (8) Any other information required by the Responsible Authority.
- C. Construction drawings submitted for stormwater management plan approval shall include the following:
  - (1) A vicinity map;
  - (2) Topography survey showing existing and proposed contours, including the area necessary to determine downstream analysis for proposed stormwater management facilities;
  - (3) Any proposed improvements including location of buildings or other structures, impervious surfaces, storm drainage facilities, and all grading;

- (4) The location of existing and proposed structures and utilities;
- (5) Any easements and rights-of-way;
- (6) The delineation, if applicable, of the 100-year floodplain and any on-site wetlands;
- (7) Structural and construction details for all components of the proposed drainage system or systems, and stormwater management facilities.
- (8) All necessary construction specifications;
- (9) A sequence of construction;
- (10) Data for total site area, disturbed area, new impervious area, and total impervious area;
- (11) A table showing the hydrologic sizing criteria volumes described in the Design Manual;
- (12) A table of materials to be used for stormwater management facility planting;
- (13) All soil boring logs and locations;
- (14) A maintenance schedule;
- (15) Certification by a Connecticut certified engineer that all stormwater management construction will be done according to this plan;
- (16) An as-built certification signature block to be executed after project completion; and
- (17) Any other information required by the Responsible Authority.

#### 5.3 Preparation of the Stormwater Management Plan

- A. A professional engineer licensed in the State shall design and prepare a stormwater management plan as necessary to protect the public and the environment.
- B. If a stormwater treatment practice requires either a dam safety permit from DEP or approval from the Inland Wetlands and Watercourses Agency, the Responsible Authority shall require that a professional engineer licensed in the State prepare the design.

#### 6.0 **PERMITS**

#### 6.1 Permit Requirement

A building permit may not be issued for any parcel or lot unless a stormwater management plan has been approved or waived by the Responsible Authority as meeting all the requirements of this ordinance. Where appropriate, a building permit may not be issued without:

- A. Recorded easements for the stormwater management facility and easements to provide adequate access for inspection and maintenance from a public right-of-way;
- B. A recorded stormwater management maintenance agreement;
- C. A cash bond; and
- D. Permission from adjacent property owners as necessary.

#### 6.2 Permit Fee

A non-refundable permit fee will be collected at the time the stormwater management plan or application for waiver is submitted. The permit fee will provide for the cost of plan review, administration, and management of the permitting process, and inspections by the Responsible Authority of all projects subject to this ordinance. A permit fee schedule shall be established by the Responsible Authority based upon the relative complexity of the project and may be amended from time to time.

### 6.3 Permit Suspension and Revocation

Any building permit issued by the Responsible Authority may be suspended or revoked after written notice is given to the permittee for any of the following reasons:

- A. Any violation(s) of the conditions of the stormwater management plan approval.
- B. Changes in site runoff characteristics upon which an approval or waiver was granted.
- C. Construction is not in accordance with the approved plan.
- D. Noncompliance with correction notice(s) or stop work order(s) issued for the construction of the stormwater management facility.
- E. An immediate danger exists in a downstream area in the opinion of the Responsible Authority.

#### 6.4 **Permit Conditions**

In granting the plan approval, the Responsible Authority may impose such conditions that may be deemed necessary to ensure compliance with the provisions of this ordinance and the preservation of the public health and safety.

### 7.0 CASH BOND

The Responsible Authority shall require from the developer a cash bond prior to the issuance of any building permit for the construction of a development requiring a stormwater management facility. The amount of the security shall not be less than the total estimated construction cost of the stormwater management facility. The bond required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this ordinance, and other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the Responsible Authority, submission of "as-built" plans, and certification of completion by the Responsible Authority that the stormwater management facilities comply with the approved plan and the provisions of this ordinance. A procedure may be used to release parts of the bond held by the Responsible Authority after various stages of construction have been completed and accepted by the Responsible Authority. The procedures used for partially releasing performance bonds must be specified by the Responsible Authority in writing prior to stormwater management plan approval.

[1) a cash bond posted within the Town treasury or 2) a surety bond that the town could investigate/ approve. Language should be consistent with language currently under review/development by Town Counsel.]

The bond requirement under this ordinance may be waived by the Responsible Authority provided that a bond is required by another agency in the amount equal to or greater than the total estimated construction cost of the stormwater management facilities for the project.

#### 8.0 INSPECTION

#### 8.1 Inspection Schedule and Reports

- A. The developer shall notify the Responsible Official at least 48 hours before commencing any work in conjunction with the stormwater management plan and upon completion of the project when a final inspection will be conducted.
- B. The developer shall retain a professional engineer licensed in the State to conduct inspections. Written inspection reports shall be made of the periodic inspections necessary during construction of stormwater management systems to ensure compliance with the approved plans.
- C. Written inspection reports shall be provided by the developer's engineer to the Responsible Authority on a standard form provided by the Town.
- D. The owner/developer and on-site personnel shall be notified in writing when violations are observed. Written notification shall describe the nature of the violation and the required corrective action.
- E. No work shall proceed until the Responsible Authority approves the work previously completed. The inspector shall provide the developer and Responsible Authority with the results of the inspection reports as soon as possible after completion of each required inspection.

## 8.2 Inspection Requirements During Construction

- A. At a minimum, inspections shall be made and documented at the following specified stages of construction:
  - (1) For stormwater ponds:
    - (a) Upon completion of excavation to sub-foundation and when required, installation of structural supports or reinforcement for structures, including but not limited to:

- (i) Core trenches for structural embankments
- (ii) Inlet and outlet structures, anti-seep collars or diaphragms, and watertight connectors on pipes; and
- (iii) Trenches for enclosed storm drainage facilities;
- (b) During placement of structural fill, concrete, and installation of piping and catch basins;
- (c) During backfill of foundations and trenches;
- (d) During embankment construction; and
- (e) Upon completion of final grading and establishment of permanent stabilization.
- (2) For stormwater wetlands at the stages specified for pond construction in 8.2 A (1) of this section, during and after wetland reservoir area planting, and during the second growing season to verify a vegetation survival rate of at least 50 percent.
- (3) For infiltration trenches:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems and observation wells;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization;
- (4) For infiltration basins at the stages specified for pond construction in 8.2 A (1) of this section and during placement and backfill of underdrain systems.
- (5) For filtering systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as flow diversion structures, pre-filters and filters, inlets, outlets, orifices, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization.
- (6) For open channel systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems for dry swales;
  - (c) During installation of diaphragms, check dams, or weirs; and
  - (d) Upon completion of final grading and establishment of permanent stabilization.
- (7) For nonstructural practices upon completion of final grading, the establishment of permanent stabilization, and before issuance of use and occupancy approval.
- (8) For secondary treatment practices, including subsurface manufactured devices:

- (a) During excavation to subgrade;
- (b) During placement and backfill of treatment unit;
- (c) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
- (e) Upon completion of final grading and establishment of permanent stabilization;
- B. The Responsible Authority may, for enforcement purposes, use any one or a combination of the following actions:
  - (1) A notice of violation shall be issued specifying the need for a violation to be corrected if the stormwater management plan noncompliance is identified;
  - (2) A stop work order shall be issued for the site by the Responsible Authority if a violation persists;
  - (3) Bonds or securities may be withheld or the case may be referred for legal action if reasonable efforts to correct the violation have not been undertaken; or
  - (4) In addition to any other sanctions, a civil action or criminal prosecution may be brought against any person in violation of the Stormwater Management subtitle or this ordinance.
- C. Any step in the enforcement process may be taken at any time, depending on the severity of the violation.
- D. Once construction is complete, as-built plan certification shall be submitted by a professional engineer licensed in the State to ensure that constructed stormwater management practices and conveyance systems comply with the specifications contained in the approved plans. At a minimum, as-built certification shall include a set of drawings comparing the approved stormwater management plan with what was constructed the Responsible Authority may require additional information.

#### 9.0 MAINTENANCE

#### 9.1 Maintenance Inspection

- A. The owner (or the developer during construction) shall ensure that all stormwater management systems are inspected for performance of preventative maintenance. Inspection shall occur during the first year of operation and at least once every 3 years thereafter. In addition, a maintenance agreement between the owner and the Responsible Authority shall be executed for privately owned stormwater management systems as described in 9.2 of this section.
- B. The owner (or the developer during construction) shall maintain inspection reports for all stormwater management systems.
- C. Inspection reports for stormwater management systems shall include the following:
  - (1) The date of inspection;
  - (2) Name of inspector;
  - (3) The condition of:
    - (a) Vegetation or filter media;
    - (b) Fences or other safety devices;

- (c) Spillways, valves, or other control structures;
- (d) Embankments, slopes, and safety benches;
- (e) Reservoir or treatment areas;
- (f) Inlet and outlet channels or structures;
- (g) Underground drainage;
- (h) Sediment and debris accumulation in storage and forebay areas;
- (i) Any nonstructural practices to the extent practicable; and
- (j) Any other item that could affect the proper function of the stormwater management system.
- (4) Description of needed maintenance.
- D. After notification is provided to the owner of any deficiencies discovered from an inspection of a stormwater management system, the owner shall have 30 days or other time frame mutually agreed to between the Responsible Authority and the owner to correct the deficiencies. The Responsible Authority shall then conduct a subsequent inspection to ensure completion of the repairs.
- E. If repairs are not undertaken or are not done properly, then enforcement procedures following 9.2 C of this section shall be followed by the Responsible Authority
- F. If, after an inspection by the Responsible Authority, the condition of a stormwater management facility presents an immediate danger to the public health or safety, because of an unsafe condition or improper maintenance, the Responsible Authority shall take such action as may be necessary to protect the public and make the facility safe. Any cost incurred by (City Name) shall be assessed against the owner(s), as provided in Section 9.2 C.

### 9.2 Maintenance Agreement

- A. Prior to the issuance of any building permit for which stormwater management is required, the Responsible Authority shall require the applicant or owner to execute an inspection and maintenance agreement binding on all subsequent owners of land served by a private stormwater management facility. Such agreement shall provide for access to the facility at reasonable times for regular inspections by the Responsible Authority or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards.
- B. The applicant and/or owner shall record the agreement in the land records of (City Name).
- C. The agreement shall also provide that, if after notice by the Responsible Authority to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within a reasonable period of time (30 days maximum), the Responsible Authority may perform all necessary work to place the facility in proper working condition. The owner(s) of the facility shall be assessed the cost of the work and any penalties. This may be accomplished by placing a lien on the property, which may be placed on the tax bill and collected as ordinary taxes by the County/Municipality.

#### 9.3 Maintenance Responsibility

A. The owner of the property on which work has been done pursuant to this ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B. A maintenance schedule shall be developed for the life of any stormwater management facility and shall state the maintenance to be completed, the time period for completion, and who shall perform the maintenance. This maintenance schedule shall be printed on the approved stormwater management plan.

### 10.0 APPEALS

Any person aggrieved by the action of any official charged with the enforcement of this ordinance, as the result of the disapproval of a properly filed application for a permit, issuance of a written notice of violation, or an alleged failure to properly enforce this ordinance in regard to a specific application, shall have the right to appeal in a manner prescribed in the regulations and procedures of the Responsible Authority and the State of Connecticut.

### **11.0 SEVERABILITY**

If a court of competent jurisdiction holds any portion of this ordinance invalid or unconstitutional, such portion shall not affect the validity of the remaining portions of this ordinance. It is the intent of (City Name) that this ordinance shall stand, even if a section, subsection, sentence, clause, phrase, or portion may be found invalid.

### 12.0 PENALTIES

Any person convicted of violating the provisions of this ordinance shall be guilty of a misdemeanor, and upon conviction thereof, shall be subject to a fine of not more than Five Thousand Dollars (\$5,000.00) or imprisonment not exceeding 1 year or both for each violation with costs imposed in the discretion of the court. Each day that a violation continues shall be a separate offense. In addition, the Responsible Authority may institute or cause to be instituted injunctive, mandamus or other appropriate action or proceedings of law to correct violations of this ordinance. Any court of competent jurisdiction shall have the right to issue temporary or permanent restraining orders, injunctions or mandamus, or other appropriate forms of relief.

## **13.0 EFFECTIVE DATE**

And be it further enacted, that this ordinance shall take effect [number] days from the date it becomes adopted.



# ATTACHMENT B

Tolland Zoning Regulation Amendments Low Impact Development

## ARTICLE XXIV LOW IMPACT DEVELOPMENT

The Town of Tolland requires that Low Impact Development techniques be implemented on all development projects within the boundaries of the Town to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and non-point sources of storm water due to land development projects.

The concept of Low Impact Development (LID) utilizes many tools to reduce the impact of development on the environment. A primary benefit of LID is a better balance between Conservation of Natural Resources, growth, ecosystem protection and the public health.

## A. Goals of Low Impact Development

- Preserve Open Space within developments by using Cluster and Open Space subdivision standards as found in Section 170-38 of these regulations.
- Incorporate natural site elements (ridge lines, significant trees, open meadows, suitable soils for infiltration, wetlands and streams) into the design as features.
- Minimize land clearing and disturbance and increase natural landscape buffers at the limit of development to improve storm water management.
- Incorporate decentralized storm water management systems in to the site design, treat storm water runoff at its source, disconnect impervious areas.
- Maintain pre-development Times of Concentrations for post-development runoff Maintain sheet flow to the maximum extent possible, avoid concentrating runoff, reduce runoff volumes by infiltration.
- Provide water quality treatment to remove pollutants from storm water, pollution, modify human activities to reduce the introduction of pollutants into the environment.
- Encourage public education and participation in environmental protection within the community

## B. Benefits of Low Impact Development

There are many benefits associated with the use of Low Impact Development for all of the stakeholders in the development field. The three stakeholders in the development field are the environment, the municipality, and the developer. The benefits of LID for each stakeholder are stated below.

- 1. Environmental Benefits:
  - Preserve the biological and ecological integrity of natural systems through the preservation of trees and natural vegetation,
  - Protect the water quality by reducing sediment, nutrient and toxic loads to wetland/watercourse aquatic environments and also terrestrial plants and animals.

- 2. Municipality Benefits:
  - Increase collaborative public/private partnerships on environmental protection by the protection of regional flora and fauna.
  - Balance Growth needs with environmental protections.
  - Reduce municipal infrastructure and utility maintenance costs (roads, and storm water drainage systems)
- 3. Developer Benefits:
  - Reduce land clearing and earth disturbance costs, reduce infrastructure costs (roads, storm water conveyance and treatment systems)
  - Reduce storm water management costs by the reduction of structural components of a drainage system.
  - Increase quality of building lots and community marketability.

## C. Low Impact Development Strategies

- 1. Vegetation and Soils:
  - Retain native forest cover on undeveloped sites, restore vegetated area on previously cleared sites when possible as vegetation captures rainfall, thus increasing evapotranspiration and infiltration.
- 2. Site Design:
  - Define and locate Critical Resource areas, such as wetlands/watercourses, unusual forest features, and soils with moderate to high infiltrative capacities, locate roads, driveways, parking areas, home sites and other buildings away from critical resource areas
  - Minimize impervious surfaces such as roads, driveways, parking areas, and roof tops. Eliminate direct discharges of runoff from impervious areas to wetlands and watercourses
- 3. Storm Water Management:
  - Reduce reliance on the use of traditional storm water collection and conveyance systems (catch basins, pipes, and detention basins) and use small scale storm water management systems, such as bioretention, and rain gardens. Integrate source storm water controls during the design process.
  - Create a site design that slows runoff from rainfall events and increases the amount of time that runoff stays on the site. Incorporate multiple Low Impact Development treatment systems in a treatment train to increase the redundancy of the system to reduce the possibility of system failure
- 4. Education and Maintenance
  - Develop reliable long-term maintenance protocols for LID systems with built in enforcement provisions.
• Educate homeowners, building owners and landscape contractors on the appropriate maintenance requirements for LID systems

### D. Types of LID Storm Water Systems:

- 1. Vegetated Systems:
  - Vegetated Buffers, Rain Gardens, Bioretention Systems, Water Quality Swales (wet and dry), Grass Filter Strips, Vegetated Level Spreaders, and Vegetated Roofs

### 2. Infiltration Systems:

- Soil Amendments, Surface Sand Filters, Underground Sand Filters, Gravel Infiltration Trenches, Underground Infiltration Systems, (large diameter perforated PVC pipes and galleries), and Tree Wells
- 3. Surface Treatment Systems:
  - Permeable Pavement, Permeable Concrete, Concrete or PVC Pavers with gravel or grass surface
- 4. Storm Water Ponds and Wetland Systems:
  - Wet Ponds, Multiple Ponds in series, Gravel Wetland Systems, Micropool extended detention pond, Shallow Wetlands, Pond/wetland system, and Extended detention ponds

Refer to Town of Tolland Design Manual for more information on individual systems.

References:

1. Low-Impact Development Design Strategies – An Integrated Design Approach Prepared by: Prince George's County, Maryland; Department of Environmental

Resources, Programs and Planning Division; June 1999 2. Low-Impact Development Hydrologic Analysis

Prepared by: Prince George's County, Maryland; Department of Environmental Resources, Programs and Planning Division; July 1999

3. LOW IMPACT DEVELOPMENT – Technical Guidance Manual for Puget Sound; January 2005

Prepared by Puget Sound Action Team \* Washington State University Pierce County Extension

4. 2004 Connecticut Stormwater Quality Manual by the Connecticut Department of Environmental Protection

5. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control by The Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection



# ATTACHMENT C

# Example LID Site Design Credit System

## LOW IMPACT DEVELOPMENT (LID) SITE DESIGN CREDIT SYSTEM

# DRAFT

The Low Impact Development (LID) Site Design Credits encourage environmentally sensitive site design and Low Impact Development techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet Standards 3 and 4 by directing stormwater runoff to qualifying pervious surfaces that provide recharge and treatment.

# Available LID Site Design Credits

There are five types of LID credits that can be obtained:

- Credit 1 Natural Area Conservation,
- Credit 2 Environmentally Sensitive Development,
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area,
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area,
- Credit 5 Sheet Flow to Buffer.

The credits may be used to reduce the required Groundwater Recharge Volume (GRV) and the required Water Quality Volume (WQV) provided that any pervious surfaces used to treat and infiltrate stormwater runoff meet the requirements set forth herein. A proponent of a project that is eligible for the site design credit is required to comply with all other applicable stormwater management standards. The application of these credits does not relieve the design engineer or reviewer from the standard of engineering practice associated with safe conveyance of stormwater runoff and good drainage design.

# Not Eligible for Credits

The LID Site Design Credits may <u>not</u> be applied to reduce the required Groundwater Recharge Volume and the required Water Quality Volume:

- At sites where stormwater runoff is directed to non-permeable soils, such as bedrock and soils classified as Hydrologic Soil Group D; and
- At sites with urban fill, soils classified as contaminated pursuant to the Connecticut Remediation Standards Regulations, and soils with seasonal high groundwater groundwater elevation within 2 feet of the land surface.

Sites with land uses with higher potential pollutant loads are not eligible for Credit No. 2.

Sites with land uses with higher potential pollutant loads are eligible for Credits 3 and 4, provided that no runoff from the areas or activities that may generate runoff with higher potential pollutant loads is directed to the pervious surfaces used to satisfy the credit, and provided further that the proposal satisfies all the other requirements set forth herein.

Runoff from metal roofs is only eligible for Credit 3 when the metal roof is located outside a recharge areas for public water supplies (groundwater and surface water supplies) and the building is not used for industrial purposes.

Runoff from green roofs is not eligible for Credit 3.

1. Natural Area Conservation Credit

A credit is given when natural areas are conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. A simple WQV credit is granted for all conservation areas permanently protected under conservation easements. Under this credit, the design engineer can substract the conservation areas from the total site area when computing the water quality volume. The volumetric runoff coefficient, R, is still based upon the percent impervious cover for the entire site. As an additional incentive, the post-development curve number (CN) for all natural areas permanently protected can be assumed to be woods in good condition when calculating the total site CN.

Minimum Criteria for Credit:

- The area shall not be disturbed during the construction process.
- The area shall be protected from having the limits of disturbance clearly shown on all construction and mitigation plans and shall be delineated in the field.
- The area shall be located within an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- The area shall be located on the development project site.
- 2. Environmentally Sensitive Development Credit

This credit is given for environmentally sensitive site design techniques that "cluster development" or reduce development scale, to leave a significant amount of the site undisturbed in its natural state. If a site is designed, constructed, operated and maintained in accordance with the requirements of this credit, the credit eliminates the need for structural practices to treat the WQV (Standard 4) and GRV (Standard 5) for low density or cluster residential developments.

# Minimum Criteria for Credit:

# Single Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.

# Multiple Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre if clustering techniques are not used.

- If clustering techniques are used, the average lot shall not be less than \_\_\_\_\_ square feet, which is the minimum residential lot size as identified in the Town of \_\_\_\_\_ Building Zone Regulations.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.
- A minimum of 25% of the site is placed in a natural conservation area maintained by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- 3. Rooftop Runoff Directed to Qualifying Pervious Area Credit

This credit is available when rooftop runoff is directed to a qualifying pervious area where it can either infiltrate into the soil or flow over it with sufficient time and reduced velocity to allow for filtering. Qualifying pervious areas are relatively flat locations, where the discharge is directed via sheet flow and not as a point source discharge. The credit may be obtained by grading the site to induce sheet flow over specially designed flat vegetated areas or bioretention areas that can treat and infiltrate rooftop runoff. If rooftop runoff is adequately directed to a qualifying pervious area, the rooftop area can be deducted from total impervious area, therefore reducing the required WQV and the size of the structural treatment practices.

Minimum Criteria for Credit:

- To take credit for rooftop disconnection associated with a land use with higher potential pollutant loads, the rooftop runoff must not commingle with runoff from any paved surfaces or activities or areas on the site that may generate higher pollutant loads.
- Disconnection shall cause no basement seepage.
- The contributing area of the rooftop to each disconnected discharge point (gutter pipe) shall not exceed 1,000 square feet.
- The length of the qualifying pervious area shall be 75 feet or greater.
- The width of the qualifying pervious area (in feet) shall be equal to or greater than the roof length. For example, if a roof section is 20 feet wide by 50 feet long (1,000 ft2 roof), the width of the qualifying pervious area shall be at least 50 feet.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the disconnection length is less than 75 feet.
- Although they may abut, there shall be no overlap between qualifying pervious areas. For example, the runoff from two 1,000 square foot sections of roof must be directed to separate qualifying pervious areas. They may not be directed to the same area.
- The lot must be greater than \_\_\_\_\_ square feet.
- The slope of the qualifying pervious area shall be less than or equal to 5%.
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage reconnection to the stormwater management system.
- Where a gutter/downspout system is not used, the rooftop runoff must be designed to sheet flow at low velocity away from the structure housing the roof.
- Qualifying pervious areas should be located on relatively permeable soils (HSG "A" and "B"). A soil evaluation by a Registered Professional Engineer or soil scientist is required to confirm the soil type. The soil evaluation shall also confirm that the depth to groundwater is 2 feet or more and that the long-term saturated hydraulic conductivity of

the soil is at least 0.17 inches/hour. The soil evaluation must identify the soil texture, Hydrologic Soil Group and depth to groundwater. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG "C"), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction of the soil in the qualifying pervious area, construction vehicles must not be allowed to drive over the area. If it becomes compacted, the soil must be amended, tilled and revegetated to restore its infiltrative capacity once construction is complete.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area Credit

Credit is given for practices that direct runoff from impervious roads, driveways, and parking lots to pervious areas where plants provide filtration (through sheet flow) and infiltration into the soil can occur. This credit can be obtained by grading the site to promote overland vegetative filtering and infiltration. This credit is available for paved driveways, roads, and parking lots associated with all land uses, except for high-intensity parking lots that generate 1,000 or more vehicle trips per day or runoff not segregated from land uses with higher potential pollutant loads.

Disconnected impervious areas can be subtracted from the site impervious area when computing the WQV. In addition, disconnected impervious surfaces can be used to reduce the GRV.

Minimum Criteria for Credit:

- The maximum contributing impervious flow path length shall be 75 feet.
- The length of the qualifying pervious area must be equal to or greater than the length of the contributing impervious area.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the site cannot meet the required length of the qualifying pervious area.
- The width of the qualifying pervious area shall be no less than the width of the contributing impervious surface. For example, if a driveway is 15 feet wide, the qualifying pervious area width shall be no less than 15 feet.
- The entire qualifying pervious area shall be on a slope less than or equal to 5%.
- The impervious area draining to any one discharge location cannot exceed 1,000 square feet.
- Qualifying pervious areas should be located on relatively permeable soils (HSGs A and B). A soil evaluation is required to confirm the soil type. The soil evaluation shall also

confirm that the depth to groundwater is 2 feet or more, and that the long term saturated hydraulic conductivity of the soil is at least 0.17 inches/hour. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG C), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction, construction vehicles must not be allowed to drive over the qualifying pervious area. If compacted, the soil must be amended, tilled, and revegetated once construction is complete to restore its infiltrative capacity.
- Runoff from driveways, roadways and parking lots may be directed over soft shoulders, through curb cuts, or level spreaders to qualifying pervious areas. Measures must be employed at the discharge point to the qualifying pervious area to prevent erosion and promote sheet flow.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- 5. Sheet Flow to Buffer Credit

This credit is given when stormwater is effectively treated by a natural buffer to a stream or forested area. Effective treatment is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site. This credit includes subtracting the area draining by sheet flow to a buffer from the total area in the WQV calculation and the area draining to the buffer contributes to the GRV requirement.

Minimum Criteria for Credit:

- The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the bank elevation of a stream or the boundary of a wetland.
- The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.
- The average contributing overland slope to and across the stream buffer shall be less than or equal to 5%.
- Runoff shall enter the stream buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained.
- The credit is not applicable if rooftop or non-rooftop disconnection is already provided (i.e., no double counting).
- Stream buffers shall remain unmanaged other than routine debris removal.
- Buffers shall be protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.



# ATTACHMENT D

# Example Stormwater Management Standards

# STORMWATER MANAGEMENT STANDARDS

# DRAFT

The following stormwater standards establish minimum stormwater management criteria for all development and redevelopment activities in the Town of \_\_\_\_\_\_ and reflect the unique natural resources and development characteristics of the Town of \_\_\_\_\_\_. These standards encourage groundwater recharge and reduce the potential for stormwater discharges to cause or contribute to pollution of surface water and groundwater. The standards also promote low impact development (LID) techniques, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater BMPs. The standards are also consistent with the recommended stormwater management approaches and design guidance contained in the Connecticut Department of Environmental Protection *Connecticut Stormwater Quality Manual.* 

Standard 1: Stormwater Management Practices

Stormwater Management Practices shall be used to meet the conditions below for control of peak flow and total volume of runoff, water quality protection, and maintenance of on-site groundwater recharge.

- A. Stormwater management practices shall be selected to accommodate the unique hydrologic and geologic conditions of the site.
- B. Proponents shall demonstrate how the proposed control(s) will comply with these standards, including the control of peak flow and total volume of runoff, protection of water quality, and recharge of stormwater to groundwater. The proponent must provide design calculations and other back-up materials necessary.
- C. At the discretion of the Stormwater Authority, stormwater management systems shall incorporate designs that allow for shutdown and containment in the event of an emergency spill or other unexpected contamination event.
- D. Pumping of stormwater is prohibited as part of a proposed stormwater management system design because of the significant runoff volumes, maintenance requirements, standby power requirements, and overflows associated with large storms. All other feasible approaches must be investigated to avoid the use of pumps for stormwater management. If the event the Stormwater Authority determines that pumps are necessary, the proponent must submit required backup information as described in the \_\_\_\_\_\_ Stormwater Drainage Manual.

Standard 2: Low Impact Development

A. Project proponents must consider the use of environmentally-sensitive site design and Low Impact Development (LID) techniques to reduce runoff rates, volumes, and pollutant loads. The proponent shall demonstrate why the use of environmentallysensitive site design and LID techniques is not possible before proposing to use traditional, structural stormwater management measures. Such environmentally-sensitive site design and LID techniques include, but are not limited to:

- Identify, map, and preserve the site's natural features and environmentally sensitive areas such as wetlands, native vegetation, mature trees, slopes, drainageways, permeable soils, flood plains, woodlands and soils to the greatest extent possible;
- b. Minimize grading and clearing;
- c. Delineate potential building envelopes, avoiding environmental resource areas and appropriate buffers by clustering buildings and reducing building footprints;
- d. Develop methods to minimize impervious surfaces, and protect and preserve open space. Reduce impervious surfaces wherever possible through alternative street design, such as omission of curbs and use of narrower streets, shared driveways and through the use of shared parking areas;
- e. Lengthen flow paths and maximize sheet flow;
- f. Use nonstructural, low-tech methods including open drainage systems, disconnection of roof runoff, and street sweeping where possible;
- g. Use native plant vegetation in buffer strips and in rain gardens (small planted depressions that can trap and filter runoff);
- h. Use drought-resistant vegetation;
- i. Manage runoff using smaller, decentralized, low-tech stormwater management techniques to treat and recharge stormwater close to the source in place of a centralized system comprised of closed pipes that direct all the drainage from the entire site into one large detention basin.
- j. Integrate management techniques into the site design to create a hydrologically functional lot or development site, including but not limited to grass swales along roads, rain gardens, buffer strips, green roofs, tree box filters, use of amended soils that will store, filter and infiltrate runoff, bioretention areas (rain gardens), rain barrels and cisterns, and permeable pavement.

[NOTE: An "LID Site Design Credit" is available to encourage proponents to incorporate LID techniques in their projects. In exchange for directing runoff from roads and driveways to vegetated open areas, preserving natural areas on development sites, or directing runoff to landscaped or undisturbed areas, the LID credit system allows developers to reduce in size or eliminate the traditional BMPs used to treat and infiltrate stormwater. By using this credit, proponents can reduce the volume of stormwater subject to the Water Quality and Groundwater Recharge Standards. The proposed LID Site Design Credits include:

- Credit 1 Natural Area Conservation
- Credit 2 Environmentally Sensitive Development
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area]



# Standard 3: Protection of Natural Hydrology

[NOTE: These standards are further reinforced through the LID Credit System.]

- A. Site disturbance shall be minimized. The area outside the project disturbance area shall be maintained at natural grade and retaining existing, mature vegetated cover. The project disturbance area shall be depicted on the design, construction, and mitigation plans and shall be delineated in the field prior to commencing land disturbance activities. The project disturbance area shall include only the area necessary to reasonably accommodate construction activities.
- B. Soil compaction on site shall be minimized by using the smallest (lightest) equipment possible and minimizing travel over areas that will be revegetated (e.g., lawn areas) or used to infiltrate stormwater (e.g., bioretention areas). In no case shall excavation equipment be placed in the bottom of an infiltration area during construction.
- C. Development shall follow the natural contours of the landscape. A grading plan shall be submitted as part of the site plan review process showing both existing and finished grades for the proposed development. The original, natural grade of a lot shall not be raised or lowered more than 10 feet at any point for the construction of any structure or improvements. Retaining walls must comply with the requirements of the Building Zone Regulations. Basements that reach grade should be constructed as walk-outs.
- D. No ground disturbed as a result of site construction and development shall be left as exposed bare soil at project completion. All areas exposed by construction, with the exception of finished building, structure, and pavement footprints, shall be decompacted (aerated) and covered with a minimum thickness of six inches of non-compacted topsoil, and shall be subsequently planted with a combination of living vegetation such as grass, groundcovers, trees, and shrubs, and other landscaping materials (mulch, loose rock, gravel, stone).
- E. Priority shall be given to maintaining existing surface waters and systems, including, but not limited to, perennial and intermittent streams, wetlands, vernal pools, and natural swales.
- F. Where roadway or driveway crossings of surface waters cannot be eliminated, disturbance to the surface water shall be minimized, hydrologic flows shall be maintained, there shall be no direct discharge of runoff from the roadway to the surface water, and the area shall be revegetated post-construction.
- G. Roadway and driveway crossings over streams shall comply with the Connecticut Department of Environmental Protection *Stream Crossing Guidelines* (as amended) to accommodate high flows, minimize erosion, and support aquatic habitat and wildlife passage.

# Standard 4: Post-Development Peak Discharge

A. Stream Channel Protection – The two-year, 24-hour post-development peak flow rate shall be (a) less than or equal to 50 percent of two-year, 24-hour storm pre-development

peak flow rate and (b) less than or equal to the one-year, 24-hour storm predevelopment peak flow rate. This Standard may be waived under certain conditions, as described in the *Connecticut Stormwater Quality Manual*.

- B. Conveyance Protection The 10-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows within internal and external conveyance systems associated with stormwater treatment practices.
- C. Peak Runoff Attenuation The 10-year and 25-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows off-site. This Standard may be waived for sites that discharge to a large river, lake, estuary, tidal waters, or land subject to coastal storm flows, as described in the *Connecticut Stormwater Quality Manual*.
- D. Emergency Outlet Sizing size the emergency outlet to safely pass the postdevelopment peak runoff from the 100-year storm in a controlled manner without eroding the outlet works and downstream drainages and property.
- E. Measurement of peak discharge rates shall be calculated using point of discharge or the downgradient property boundary. The topography of the site may require evaluation at more than one location if flow leaves the property in more than one direction. Calculations shall include runoff from adjacent upgradient properties. A proponent may demonstrate that a feature beyond the property boundary is more appropriate as a design point.
- F. A downstream hydrologic analysis must be performed to determine whether peak flows, velocities, and hydraulic effects are attenuated by controlling the 2-year, 10-year, 25-year and 100-year, 24-hour storms. This analysis must be performed at the outlet(s) of the site and at critical downstream locations (stream confluences, culverts, other channel constrictions, and flood-prone areas) to a confluence point where the site drainage area represents 10% of the total drainage area above that point.
- G. The proponent shall provide pre- and post-development total runoff volumes. The post-development total runoff volume shall be equal to 90 to 110 percent of the predevelopment total runoff volume (based on a 2-year, 10-year, 25-year, and 50-year, 24-hour storms). Calculations shall include runoff onto the project site from adjacent upgradient properties.

## Standard 5: Water Quality

- A. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspend Solids (TSS). This standard is met when:
  - a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
  - b. Stormwater management practices are sized to treat the Water Quality Volume or Water Quality Flow;
  - c. Appropriate pretreatment is provided in accordance with the \_\_\_\_\_\_ Stormwater Drainage Manual; and
  - d. Stormwater treatment practices are maintained as designed.
- B. Compliance with the groundwater recharge requirements under Standard 6 shall be considered adequate to meet the treatment standards specified in 5.A above for the Groundwater Recharge Volume.

Standard 6: Groundwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized to the maximum extent practicable through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater management practices, and good operation and maintenance. At a minimum the annual recharge from the post-development site shall approximate the annual recharge from the pre-development or existing site conditions. Infiltration of stormwater runoff from land uses with higher potential pollutant loads near or to a critical area is prohibited. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to a critical area, taking into account site-specific factors.

A. For all areas covered by impervious surfaces, the total volume of recharge that must be maintained shall be calculated as follows:

[NOTE: The NRCS classifies soils into four hydrologic groups A thru D indicative of the minimum infiltration obtained for a soil after prolonged wetting. Group A soils have the lowest runoff potential and the highest infiltration rates, while Group D soils have the highest runoff potential and the lowest infiltration rates. The prescribed stormwater volume that is required to be infiltrated must be determined using existing site conditions and the infiltration rates are set forth below.

# Hydrologic Group Volume to Recharge (x Total Impervious Area)

A gravels, sand, loamy sand or sandy loam 0.6 inches of runo	ff
B silty loam 0.35 inches of runo	<mark>ff</mark>
C sandy clay loam 0.25 inches of runo	<mark>ff</mark>
D clay, silty clay loam, sandy clay, silty clay 0.10 inches of runo	<mark>ff</mark>

For each NRCS Hydrologic Group on the site, the volume that must be recharged equals the recharge volume above multiplied by the total area within that NRCS Hydrologic Group

that is impervious. Infiltration of these volumes must be accomplished using appropriate BMPs. These BMPs include bioretention areas, rain gardens, dry wells, infiltration basins, infiltration chambers and galleys, infiltration trenches, leaching catch basins, and vegetated filter strips. Roof runoff may be infiltrated without any treatment, and that infiltrated volume may be used to satisfy the total recharge volume and reduce the water quality volume.

To size infiltration BMPs, proponents may use either the static method or the dynamic infiltration method. The static method assumes that the entire volume is discharged to storage instantaneously, is easy to calculate and generally results in a larger recharge volume than the dynamic method. The dynamic method assumes that that the recharge BMP is infiltrating as it fills and requires certain technical calculations that take this recharge into account when sizing the infiltration BMP.]

- B. When designing infiltration BMPs, adequate subsurface information needs to be obtained. Infiltration systems must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). Surface infiltration structures must be able to drain fully within 72 hours. In addition, there must be at least a three-foot separation from the bottom of the infiltration structure and the seasonal high ground water table or bedrock/ledge. Soils under BMPs shall be scarified or tilled to improve infiltration.
- C. Pre-Treatment Requirements All runoff must be pretreated prior to its entrance into the groundwater recharge device to remove materials that would clog the soils receiving the recharge water. Pretreatment devices shall be provided for each BMP, shall be designed to accommodate a minimum of one-year's worth of sediment, shall be designed to capture anticipated pollutants, and be designed and located to be easily accessible to facilitate inspection and maintenance.
- D. Infiltration of stormwater may be prohibited or subject to additional pre-treatment requirements, at the discretion of the Stormwater Authority, for 1) land uses with higher potential pollutant loads (see Standard 7), 2) areas with soil or groundwater contamination such as brownfield sites, and 3) public drinking water aquifer recharge areas, wellhead protection areas, or water supply intake protection areas.

Standard 7: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads require the use of specific source control and pollution prevention measures and specific stormwater management practices, approved by the Stormwater Authority for such use.

- A. The following uses or activities are considered "high-load areas," with the potential to contribute higher pollutant loads to stormwater, and must comply with the requirements set forth in this section.
  - a. Areas within an industrial site that are the location of activities subject to the DEP Industrial Stormwater General Permit (except where a No Exposure Certification for Exclusion from the General Permit has been executed)
  - b. Vehicle salvage yards and recycling facilities
  - c. Auto fueling facilities (gas stations and other facilities with on-site vehicle fueling)

- d. Exterior fleet storage areas (cars, buses, trucks, public works equipment)
- e. Exterior vehicle service, maintenance and equipment cleaning areas
- f. Commercial parking lots with high intensity use (1,000 vehicle trips per day or more). Such areas typically include fast food restaurants, convenience stores, high turnover (chain) restaurants, shopping centers and supermarkets.
- g. Road salt storage facilities (if exposed to rainfall)
- h. Commercial nurseries
- i. Non-residential facilities having uncoated metal roofs with a slope flatter than 20 percent.
- j. Outdoor storage and loading/unloading of hazardous substances or materials
- k. Facilities subject to chemical inventory reporting under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), if materials or containers are exposed to rainfall)
- I. Marinas (service, painting and hull maintenance areas).
- m. Confined disposal facilities, disposal sites, landfills or wastewater residuals landfills if stormwater that may come into contact with the confined disposal area, disposal site, landfill or wastewater residuals landfill may cause or contribute to the discharge of pollutants to wetlands, surface waters or ground water or otherwise result in a release or threat of release
- n. Other land uses and activities as designated by the Stormwater Authority
- B. In addition to implementation of BMPs for designing site-specific stormwater management controls, high-load areas shall provide a stormwater pollution prevention plan (SWPPP) describing methods for source reduction and methods for pretreatment.
- C. If a high-load area demonstrates, through a SWPPP, the use of BMPs that result in no exposure of regulated substances to precipitation or runoff or release of regulated substances, it shall no longer be considered a high-load area.
- D. Infiltration of stormwater from high-load areas are prohibited within critical areas (see Standard 8). Infiltration of stormwater from high-load areas outside of critical areas (see Standard 8) is allowed. For such discharges, proponents should use one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- E. For high-load areas, the following stormwater management practices may be used for treatment only if lined or sealed: Sand Filters/Organic Filters (may also be used for pretreatment), Wet Retention Basins, Detention Basins, Constructed Wetlands, Bioretention Areas, including rain gardens (underdrain required).

Standard 8: Critical Areas

- A. Critical Areas are defined as:
  - a. Shellfish growing areas,
  - b. Bathing beaches,
  - c. Recharge areas for public water supplies (groundwater and surface water supplies),
  - d. Any listed water bodies and wetlands as designated by the Town of \_\_\_\_\_\_.

- B. The stormwater BMPs approved for discharges to or near critical areas shall be designed to treat the Water Quality Volume (WQV) for the post-development site. These practices are included in the *Connecticut Stormwater Quality Manual* and the \_\_\_\_\_\_ Stormwater Drainage Manual. These stormwater discharges require the use of a treatment train that provides 80% TSS removal prior to discharge. This treatment train shall include at least one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- C. Infiltration of stormwater from high-load areas are prohibited within critical areas.

### Standard 9: Parking

- A. Snow may not be plowed to, dumped in, or otherwise stored within 15 feet of a wetland or waterbody, except for snow that naturally falls into this area. Snow storage areas shall be shown on the site plan to comply with these requirements.
- B. At the discretion of the Stormwater Authority, parking spaces may be required to be constructed of a pervious surface (i.e. grass, pervious asphalt, pervious pavers).
- C. Infrequently used emergency access points or routes shall be constructed with pervious surfaces (i.e. grass, pervious asphalt, pervious pavers).

### Standard 10: Redevelopment

- A. Redevelopment projects are defined to include the following:
  - a. Maintenance and improvement of existing roadways including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving;
  - b. Development, rehabilitation, expansion and phased projects on previously developed sites; and
  - c. Remedial projects specifically designed to provide improved stormwater management.
- B. Redevelopment of previously developed sites must meet Standards 3, 4, 5, and 6 to the maximum extent practicable as determined by the Stormwater Authority. To make this determination the Stormwater Authority shall consider the benefits of redevelopment as compared to development of raw land with respect to stormwater. All projects involving redevelopment or reuse activities shall also improve existing conditions.
- C. For all redevelopment projects, new stormwater controls (retrofitted or expanded) must be incorporated into the design and result in a reduction in annual stormwater pollutant loads from the site. Proponents of redevelopment projects shall make full use of all opportunities for controlling the sources of pollution and to incorporate environmentally sensitive site design and low impact development techniques. This is particularly important for constrained redevelopment sites where it is not possible to install BMPs that treat the entire water quality volume. All redevelopment projects shall also incorporate measures that will address water quantity issues by reducing the peak and total runoff from the site and by increasing groundwater recharge. Actions to improve existing conditions should address known water quality and water quantity

problems such as documented failures to meet the Surface Water Quality Standards, low stream flow, or repeated flood events.

- D. Redevelopment activities shall not infiltrate stormwater through materials or soils containing regulated or hazardous substances or areas with soil or groundwater contamination.
- E. The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 10. Any development on previously undeveloped portions of a property must comply fully with all of the other Stormwater Management Standards.

Standard 11: Construction Erosion and Sediment Control

- A. A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) must be developed and implemented in accordance with the *Connecticut Guidelines for Soil Erosion and Sediment Control* (as amended).
- B. All development, regardless of the area of disturbance, must implement erosion and sedimentation controls prior to and during construction.

Standard 12: Easements

- A. Where a site is traversed by or requires construction of a watercourse or drainageway, an easement of adequate width may be required for such purpose.
- B. There shall be at least a 10-foot wide permanent maintenance easement corridor on each side of any stormwater management system element, as well as at least a 10-foot wide temporary construction easement corridor contiguous with the boundaries of the permanent easement. For systems using underground pipes, the maintenance easement may need to be wider, depending on the depth of the pipe.

Standard 13: Operation and Maintenance

A. A long-term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed. This plan shall be reviewed and approved as part of the review of the proposed permanent (post-construction) stormwater management system and incorporated in the Stormwater Management Plan. Execution of the O&M Plan shall be considered a condition of approval of a stormwater management permit application. If the stormwater management system is not dedicated to the town pursuant to a perpetual offer of dedication, the Stormwater Authority may require a project proponent to establish a homeowners association or similar entity to maintain the stormwater management system. For high-load areas or activities under Standard 7, the O&M Plan shall include implementation of a SWPPP.

- B. The O&M Plan shall at a minimum identify:
  - a. Stormwater management system(s) owners;
  - b. The party or parties responsible for operation and maintenance including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
  - c. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
  - d. Plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
  - e. Description and delineation of public safety features; and
  - f. Estimated operations and maintenance budget.
- C. The stormwater management system owner is generally considered to be the landowner of the property, unless other legally binding agreements are established.
- D. The proponent shall include with the stormwater management permit application a mechanism for implementing and enforcing the O&M Plan. The proponent shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The proponent shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs. In the event that the stormwater BMPs will be operated and maintained by an entity, municipality, state agency or person other than the sole owner of the lot upon which the stormwater management facilities are placed, the proponent shall provide a plan and easement deed that provides a right of access for the legal entity to be able to perform said operation and maintenance functions, including inspections.

[NOTE: It is recommended that the stormwater management permit include a condition requiring that the responsible party provide a copy of the permit approval and the legal instrument to each unit or lot owner at or before the purchase of each unit or lot to be serviced by the stormwater BMPs.]

- E. The owner shall keep the O&M Plan current, including making modifications to the O&M Plan as necessary to ensure that BMPs continue to operate as designed and approved. Proposed modifications of O&M Plans including, but not limited to, changes in inspection frequency, maintenance schedule, or maintenance activity along with appropriate documentation, shall be submitted to the Stormwater Authority for review and approval within thirty days of change.
- F. Parties responsible for the operation and maintenance of a stormwater management system shall keep records of the installation, maintenance and repairs to the system, and shall retain records for at least five years.
- G. Parties responsible for the operation and maintenance of a stormwater management system shall provide records of all maintenance and repairs during inspections and/or upon request.
- H. When the responsible party fails to implement the O&M Plan, including, where applicable, the SWPPP, the municipality is authorized to assume responsibility for their

implementation and to secure reimbursement for associated expenses from the responsible party, including, if necessary, placing a lien on the subject property.

Standard 14: Stormwater Management Plan

A. All stormwater management permit applications must include a Stormwater Management Plan. This plan shall document how the proposed project complies with the stormwater standards and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the State of Connecticut.

### Standard 15: Illicit Discharges

A. All illicit discharges to the stormwater management system are prohibited.

[NOTE: The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities:

- Landscape irrigation,
- Uncontaminated groundwater discharges such as pumped groundwater, foundation drains, water from crawl space pumps, and footing drains,
- Irrigation water,
- Lawn watering runoff,
- Residual street wash water,
- Discharges of uncontaminated air conditioner condensate,
- Discharges of flows from fire fighting activities,
- Discharges containing no chemical additives (including chlorine) from the flushing of fire protection systems, and
- Naturally occurring discharges such as rising groundwater, uncontaminated groundwater infiltration, springs, and flows from riparian habitats and wetlands.]



# Appendix B

Vernon Regulatory Review Memorandum

# MEMORANDUM

- TO: Technical Advisory Committee, Tankerhoosen River Watershed Management Plan and Town of Vernon Land Use Commissioners
- FROM: Erik Mas, P.E., Fuss & O'Neill, Inc.

DATE: June 9, 2008

RE: Stormwater and Low Impact Development (LID) Regulations in the Tankerhoosen River Watershed – Vernon Regulatory Review

# 1.0 INTRODUCTION

Fuss & O'Neill is working with the Friends of the Hockanum River Linear Park, Inc., in collaboration with its project partners (Town of Vernon Planning Department, Town of Vernon Conservation Commission, North Central Conservation District, Hockanum River Watershed Association, Rivers Alliance of Connecticut, Inc, and the Belding Wildlife Trust) to prepare a Watershed Management Plan for the Tankerhoosen River watershed. The watershed plan will identify action items that can be implemented by the watershed municipalities and private groups to protect and improve the health of the Tankerhoosen River watershed, which is a particularly valuable natural resource, demonstrated by the Class A water quality in the upper regions of the watershed that harbor the Belding Wild Trout Management Area, one of only two such Class I areas east of the Connecticut River.

A key element of the Watershed Management Plan is to identify potential land use regulatory mechanisms (i.e., new or modified land use regulations) that can be implemented by the watershed towns to better manage stormwater runoff associated with land development within the watershed. Many Connecticut communities are in the process of developing new or modified land use regulations that incorporate Low Impact Development (LID) and related stormwater management approaches to address stormwater quantity and quality objectives. Communities, including Vernon, are faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl. An opportunity exists for the Town of Vernon to develop and implement an ordinance or other regulatory mechanism to satisfy Phase II stormwater regulatory requirements, while also strengthening the existing land use controls to protect natural resources within the Tankerhoosen River watershed.

This memorandum summarizes our review of Vernon's existing land use regulations and related planning documents that pertain to stormwater management and natural resource protection issues, as well as potential approaches for developing regulatory mechanisms to incorporate improved stormwater management, including LID concepts and opportunities to reduce impervious cover, into the Town's land use regulations. The information presented in this



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technical memorandum is intended to facilitate a discussion of these issues during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

# 2.0 EXISTING REGULATORY MECHANISMS

Fuss & O'Neill reviewed the following documents and information provided by the Town, which are the primary regulatory mechanisms and related planning documents that address stormwater management and related natural resource protection issues in the Town of Vernon:

- Subdivision Regulations,
- Zoning Regulations,
- Inland Wetland and Watercourses Regulations,
- Plan of Conservation and Development.

# 2.1 <u>Subdivision Regulations</u>

The Town's subdivision regulations (effective date: May 8, 2007) regulate the division of a tract or parcel of land with the purpose of sale or building development. The subdivision regulations address street and lot layout, water supplies, sanitary sewage facilities, stormwater drainage, utilities, open space, street widths, grades and construction, and other necessary improvements. The following is a summary of specific sections of the subdivision regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 5 Standards for Maps and Plans</u>: This section specifies requirements for maps and plans submitted with subdivision applications, including Site Development Plans, Construction Plans, and Grading Plans. Existing and proposed watercourses and stormwater management systems are required to be shown on the Site Development Plan. Grading Plans are required to include notations and details on erosion and sedimentation control methods.
- <u>Section 6.1.3 General Improvements, Open Space to be Dedicated</u>: The Planning and Zoning Commission may require the set aside of Open Space as part of a subdivision where the Commission finds the existing land applicable to one or more of the following:
  - o The policies and objectives of the Plan of Conservation and Development
  - Areas sensitive to development
  - Prime and important farmland soils
  - Natural Diversity Database Areas as updated by the Connecticut Department of Environmental Protection
  - o Unconsolidated Aquifers and Aquifer Protection Areas
  - Areas indicated for future community facility needs
  - Existing open areas and significant cultural and natural resources
  - o Potential open space system



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- o Land Use Plan and Strategy
- Significant natural and cultural resources inventory
- Viable vernal pools verified by the Town of Vernon Vernal Pool Study or by a qualified licensed professional
- <u>Section 6.1.3.2 General Improvements, Location of Open Space</u>: The protection and preservation of the Hockanum River, Ogden Brook, Tankerhoosen River, Gage's Brook, Railroad Brook, Walker's Reservoir East, Walker's Reservoir West, Valley's Fall's Pond, or a Vernal Pool indentified by the Town, is considered a priority when the parcel being subdivided contains portions of the aforementioned watercourses.

When the parcel being subdivided contains portions of land that would allow for the connection of the Shenipsit Trail, Hockanum River Trail, Risley Pond Trail, Land Trust Trail, Belding Path, Hockanum River Linear Park, Box Mountain Greenway, Talcottville & Tankerhoosen Trail/open space system, Ellington Trail System, Tolland Trail System, Bolton Greenways, Manchester Greenways, other potential greenway, linear park, or trail identified in the POCD or by the Department of Parks and Recreation, the provision and connection of these amenities shall be a priority in the design and or location of Open Space.

- <u>Section 6.1.3.3 General Improvements, Size of Open Space</u>: When Open Space is required, the minimum recommended amount of Open Space to be provided is 12% of the total area of land to be subdivided, 15% of the total area of land if the location of the subdivision is identified in the Land Use Plan and Strategy of the POCD, and 20% of the total land area if the location of the subdivision is identified as a Priority Area for Open Space Protection of the POCD.
- <u>Section 6.1.3.4.3 General Improvements, Open Space Standards</u>: Any land to be dedicated as Open Space shall be left in its natural state by the subdivider and shall not be graded, cleared, disturbed, or used as a temporary or permanent repository for stumps, brush, earth, building materials, debris, detention ponds, or basins.
- <u>Section 6.4 Lot Grading and Drainage</u>: Grading plans shall be submitted where substantial grading is required in order to provide a buildable site and shall employ standards and methods equal to or exceeding those set forth in the Erosion and Sediment Control Handbook (USDA, SCS, Storrs, Conn., 1976). Lot drainage should be coordinated with the general storm drainage patterns for the area, and drainage should be designed to avoid concentrated stormwater to adjacent lots.

Comment: Contains an outdated reference to a previous version of the State Erosion and Sedimentation Control Handbook. Revise the language to reference the current CT Erosion and Sedimentation Control Guidelines, as amended



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• <u>Section 6.5.1.1 - Street Grading and Improvement</u>: Roads shall be related appropriately to the topography, and streets shall be arranged so as to obtain as many as possible of the building sites at, or above, the grades of the streets.

Comments: consistent with fitting the development to the topography. Building sites above the grade of the streets provides opportunity for use of roadside swales. Consider adding a provision to allow elimination of curbing for roads for grades less than 5% to encourage the use of vegetated swales and similar LID stormwater management systems.

• <u>Section 6.6.6 - Cul-de-sac or Dead-End</u>: Cul-de-sac pavement shall be a uniform 45 foot radius except when an island is used, in which case the outside radius shall be 50 feet with an island radius of 20 feet.

Comment: The radius of cul-de sacs should be the minimum required to accommodate emergency and maintenance vehicles. Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.

• <u>Section 6.7.1 - Design Standards, Road Width</u>: Table 1 contains minimum pavement width for collector (32 ft), local (28 ft), and limited local roads (28 ft).

Comment: Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access. Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.

• <u>Section 6.7.2</u> - <u>Design Standards, Curbs</u>: Curbs shall be required on all new streets and shall conform to construction and design standards in the Appendix of the regulations.

Comment: The requirement for curbs on all new roads appears to preclude the use of curbless roads and open vegetated channels for stormwater management.

- <u>Section 6.9.1 Drainage and Storm Sewers, General Requirements</u>: The developer shall be fully responsible for constructing adequate facilities for the control, collection, conveyance and acceptable disposal of storm water, other surface water and subsurface water, whether originating within the sub- division area or in a tributary drainage area.
- <u>Section 6.9.2.2</u> <u>Drainage and Storm Sewers, Location of Stormwater Facilities</u>: The applicant may be required to dedicate either in fee or by drainage or conservation easement, land on both sides of existing watercourses to a distance to be determined by the Commission.



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 Section 6.9.3 - Drainage and Storm Sewers, Drainage Discharge: The discharge of all storm water from a subdivision shall be into suitable streams or other acceptable and suitable storm water drainage facilities having adequate capacity to carry the additional water. Sufficient and adequate facilities shall be constructed on private lots wherever necessary to prevent the flow of surface drainage from the property on which it originates onto adjacent property in sufficient quantity, concentration or velocity to cause damage or create a nuisance on adjoining property.

Comment: The Subdivision Regulations do not include post-development peak flow, volume control, or stormwater quality requirements.

• <u>Section 6.9.3 - Drainage and Storm Sewers, Drainage Design</u>: Designs shall be based on the maximum ultimate development of the entire watershed as permitted by the Zoning Regulations. On watersheds one square mile or over, the design of culverts, bridges and through watercourses shall be based upon not less than a 100-year storm. On watersheds of less than one square mile, the design for the through drainage system shall be for no: less than a 50-year storm. The drainage system for roads, including catch basins, inlets, pipes, underdrains and gutters within or abutting the subdivision shall be designed for not less than a 10-year storm.

Drainage ditches will, in general, not be permitted where it is feasible to install underground pipe.

Comment: This requirements restricts the use curbless roads and roadside vegetated swales in lieu of traditional curb, gutter, and piped drainage.

• <u>Section 6.12.1 - Sidewalks</u>: Sidewalks shall be required in all subdivisions on at least one side of all new streets, unless waived by a three-quarters vote of all members of the Commission, and may be required on both sides at the discretion of the Commission.

Comment: Sidewalks required on two side of the street increase impervious cover. Where practical, consider locating sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.

• <u>Section 6.14 - Certified Erosion and Sediment Control Plan</u>: A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre. A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

Comment: Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.



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• <u>Section 6.14.3 - Erosion and Sediment Control Plan</u>: a soil erosion and sediment control plan shall contain proper provisions to adequately control accelerated erosion and sedimentation and reduce the danger from storm water runoff on the proposed site based on the best available technology. Such principles, methods and practices necessary for certification are found in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985) as amended.

Plans for soil erosion and sediment control shall be developed in accordance with these regulations using the principles as out-lined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

- <u>Section 6.14.6 Conditions Relating to Soil Erosion and Sediment Control</u>: A performance bond may be required for the estimated costs of measures required to control soil erosion and sedimentation, as specified in the certified plan.
- <u>Section 13 Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

Comment: This concept is consistent with LID principles to protect and preserve natural features of a site.

# 2.2 Zoning Regulations

Site development in the Town of Vernon must comply with the Vernon Zoning Regulations (effective date: May 8, 2007). The following is a summary of specific zoning regulations that relate to stormwater management and natural resource protection issues.

- <u>Section 3.4 General Provisions, Collection and Disposal of Storm Drainage</u>: Proper provision shall be made for collection and disposal of storm water from roofs and parking areas through a pipe system connected to existing storm drains or carried to a natural watercourse or to an on-site area approved by the Town Engineer in compliance with the recommendations of the latest edition of the "Stormwater Quality Manual" of the Connecticut Department of Environmental Protection (DEP).
- <u>Section 3.18 General Provisions, Building Above or Below Center Line of Road</u>: Any lot or parcel of land with the top of foundation more than five (5) feet above or below the center line grade of the road opposite the midpoint of the front foundation wall requires a detailed site plan showing the existing and proposed topography, driveways, storm drainage, and other information.



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- <u>Section 3.25 General Provisions, Sidewalks</u>: Sidewalks shall be installed for all new developments in all areas, unless waived by a three-quarters vote of all members of the Commission.
- <u>Sections 4.1 through 4.25 Use Districts, Setbacks and Lot Dimensions</u>: These sections specify minimum setbacks and lot dimensions for various use districts in the Town of Vernon.

Comment: Minimum setbacks and frontage distances can increase impervious cover. Front yard setbacks, which dictate how far houses must be from the street, can extend driveway length. Large side setbacks and frontage distances influence the road length needed to serve individual lots. Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.

- <u>Section 7 Cluster Development</u>: Developers may vary the lot size requirements in Residential 40 and Residential 27 zoning districts, leaving a substantial area free of building lots (i.e., "cluster" development). The land area not allocated to building lots and streets shall be permanently reserved in open space and be readily usable for recreation or conservation.
- <u>Section 12 Off-street Parking and Loading</u>: Section 12.1 specifies parking ratios, which are the number of parking spaces that must be provided for particular uses. The Planning & Zoning Commission may reduce the number of off-street parking spaces which must be installed provided that the required number of spaces is reduced by no more than 20%, the number of spaces will not result in an increase of on-street parking, and the developer pays a fee of \$500 for each space eliminated (fee-in-lieu of parking). Section 12.3 specifies the minimum stall dimensions for off-street parking and truck loading spaces, which already appear to be at or near recommended minimum values.

Comment: Parking ratios typically represent the minimum number of spaces needed to accommodate the highest hourly parking rate at the site. In many cases, parking ratios far exceed parking demand, which refers to the number of spaces actually used for a particular land use. Parking ratios often result in far more spaces than are actually required because ratios are typically set as minimums and not maximums. This results in excessive impervious cover for many land uses. Existing parking ratio should be reviewed to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



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Shared parking is another strategy that reduces the number of parking spaces needed by allowing adjacent land uses to share parking lots, particularly when parking demands occur at different times during the day or week. Section 12.3 appears to allow for shared parking for non-residential uses, although it is unclear if the Town actively promotes shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Also consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Connecticut Stormwater Quality Manual, local stormwater management design manual, other sections of the Zoning regulations, or new/modified local stormwater management and LID regulations.

Model zoning regulations for parking were developed in 2003 for communities in northwestern Connecticut through a study sponsored by the Northwestern Connecticut Council of Governments (NWCCOG), the Litchfield Hills Council of Elected Officials (LHCEO), and the Connecticut DEP. This document provides a good starting point for reviewing and modifying local zoning regulations for parking to address impervious cover and stormwater management issues.

<u>Section 18 — Activities Requiring a Certified Erosion and Sediment Control Plan</u>: A soil
erosion and sediment control plan shall be submitted with any application for
development when the disturbed area of such development is cumulatively more than
one-half acre, except for a single family dwelling that is not a part of subdivision of land,
which is exempt from these soil erosion and sediment control regulations.

Comment: The section of the Zoning Regulations is consistent with the Erosion and Sediment Control Plan requirements (Section 6.14) of the Subdivision Regulations. Construction of single family dwellings that disturb an acre or more of land are subject to state and federal NPDES Phase II Stormwater Program requirements. Consider amending the single family exemption to indicate that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land.

 <u>Section 19 – Rear Lots</u>: This section includes provisions for greater residential development flexibility, particularly where a site has an unusual lot line or natural resource configuration or where rear lot development would promote or enhance the protection of valuable natural resource features.

*Comment:* This section of the Zoning Regulations is consistent with Section 13 of the Subdivision Regulations.

# 2.3 Inland Wetlands & Watercourses Regulations

The Town of Vernon Inland Wetlands and Watercourses Regulations (effective date: October 2, 2006) regulate the removal or deposition of materials and the construction, obstruction, alteration, or pollution of wetlands and watercourses in the Town. The regulations make provisions for the protection, preservation, maintenance and use of inland wetlands and watercourses by minimizing their disturbance and pollution, maintaining and improving water



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quality in accordance with federal, state, and local authority, and preventing damage from erosion, turbidity, or siltation as well as preventing the loss of beneficial aquatic organisms.

 <u>Section 2 – Definitions, Regulated Activity</u>: Regulated activities include any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution, of such wetlands or watercourses. Any clearing, grubbing, filling, grading, paving, excavating, constructing, depositing, or removing of material and discharging of stormwater on the land within the following *upland review areas* is a regulated activity:

Resource	Upland Review Area
Wetland and Watercourse	100 ft.
Hockanum River, Ogden Brook, Tankerhoosen	200 ft.
River, Gage's Brook, Railroad Brook, Walker	
Reservoir West, Walker Reservoir East, and Valley	
Falls Pond	
Other	Agency Discretion*

\*The Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity. The Commission may rule that any other activity whether located within or outside the Regulated Area that is likely to have an affect on the wetlands or watercourses is a Regulated Activity.

Additionally, the Commission may rule that any activity that alters the existing rate or quality of any stormwater discharge conveyed to a Regulated Area or is likely to impact or affect wetlands or watercourses is a Regulated Activity.

- <u>Section 2 Definitions, Significant Activity</u>: A "significant activity" includes any activity involving a deposition or removal of material which will or may have a substantial adverse effect on the Regulated Area or on another part of the inland wetland or watercourse system or an activity which substantially changes the natural channel or may inhibit the natural dynamics of a watercourse system or substantially diminishes the natural capacity of an inland wetland or watercourse to support desirable biological life, prevent flooding, supply water, assimilate waste, facilitate drainage, and/or provide recreation and open space, or any activity which would results in degrading a watercourse or the surface and/or groundwater of an inland wetland, such degradation to be measured by the standards of the Water Compliance Division of the Connecticut Department of Environmental Protection.
- <u>Section 4.3.2 Fee Schedule</u>: A technical review may be required by a consultant for certain regulated activities, including those that are within 200 feet of a watercourse of concern (including the Tankerhoosen River and its major tributaries), regulated activities proposed in a use district where the proposed activity exceeds the impervious coverage thresholds established in such districts, as well as parking space, building square footage, disturbance, and other thresholds.



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- <u>Section 4.3.4 Application Procedure</u>: Any person wishing to undertake a Regulated Activity must submit an application to the Commission. The application must include a map showing the location of the site, the nature and extend of the proposed activity, the location of the Regulated Areas, existing and proposed structures, two-foot elevation contours, all drainage to be engineered, areas where material may be deposited or removed, all proposed construction within Regulated Area, areas of significant vegetation. The application must also include a detailed description of the activity, a map drawn by a licensed surveyor if the proposed activity exceeds ½ acre, the names and address of property owners within 500 feet of the proposed activity, and any reasonable measures which would mitigate the impacts of the Regulated Activity.
- <u>Section 4.5 Evaluation of Proposed Activities</u>: This section specifies the information and criteria upon which the Commission makes its decision on an application. Section 4.5.2 includes factors related to erosion, siltation, and leaching; adverse effects on water quality and aquatic life; the likelihood of any changes in the velocity, volume, or course of water flow, or in the water table, and any consequences such changes may have for the capacity of the wetland or watercourse to help control flooding and to purify and supply water; and the existing and desired quality and use of the water in and near the affected area.

Comment: The evaluation criteria do not contain specific stormwater management standards and do not reference available design guidance such as the Connecticut Stormwater Quality Manual or local design guidance. The regulations also do not require or recommend the use of LID practices to meet stormwater management objectives.

<u>Watercourse Buffers</u>: Section 4.5.2.12 states that the Commission may require the provision of a buffer along a watercourse if proposed activities and/or development may create negative impacts on a watercourse that could be prevented or mitigated by provision of a buffer, as described in "Appendix B. Design Standards Recommended for a Watercourse Protection Buffer." The watercourse buffer design standards state that in areas where vegetated buffers do not exist, or are of limited width, consideration should be given to the creation of a buffer area. Newly created buffers should include canopy or shade trees, shrubs, and herbaceous plant species suited to the local habitat in three (3) zones of plantings. The recommended minimum width of a watercourse buffer is one hundred (100) feet measured horizontally from the banks of the watercourse and fifty (50) feet measured horizontally related to intermittent watercourses.

The recommended watercourse protection area with landscape buffer may be reduced when (1) an engineered stormwater management and pollution control system employing technical best management practices (BMP) in compliance with the Connecticut Department of Environmental Protection (DEP) "Stormwater Quality Manual: is provided to treat run-off from a development site; (2) the site is served by a public sewer system; and (3) a reduction of the river protection buffer depth would not result in a significant potential adverse impact to the watercourse.



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## 2.4 Plan of Conservation and Development

The Vernon Plan of Conservation and Development (June 2001) presents a detailed strategy for open space conservation and preservation, including increasing the amount of preserved open space as well as creating linkages between open space areas. The Plan identifies priority open space preservation areas along the Hockanum and Tankerhoosen River corridors.

A series of neighborhood meetings were held as an initial phase of the POCD. Several common themes emerged at public meetings. The themes associated with the protection of open space and watercourses included:

- Need to preserve open space for perpetuity in a positive, planned manner with adequate financial resources devoted to this program. A goal of 20% open space might be considered
- Retail development should be limited to prevent Vernon from becoming another Manchester in the Route 84 corridor or like the Berlin Turnpike along other major corridors in Town.
- The water quality of the Town's lakes and rivers as well as groundwater should be protected.

In addition to the currently-implemented Zoning Regulations, Subdivision Regulations, and Inland Wetlands and Watercourses Regulations, the Open Space section of the POCD also recommends adoption of a Hockanum River and Tankerhoosen River Protection Overlay District. Such a district would establish a contiguous and parallel buffer strip on either side of these rivers and would supplement the inland wetland and underlying zoning regulations, with the added provision that the land within the buffer areas and the river itself would remain in a natural, undisturbed state.

# 3.0 OBSERVATIONS & PRELIMINARY RECOMMENDATIONS

Based on our review of the Town's existing land use regulations and planning documents that pertain to stormwater management and natural resource protection, we offer the following observations and preliminary recommendations for discussion during the upcoming workshop meeting with the Tankerhoosen River Management Plan Technical Advisory Committee and the Town of Vernon land use commissioners.

# 3.1 Observations

The Town has a number of land use regulations that regulate construction and postconstruction stormwater runoff from new development and redevelopment activities, and provide for protection of natural resources. The local regulations are particularly strong in terms of erosion and sediment control (as well as consistent between the various regulations), open space protection, and regulating activities that can potentially affect wetlands and watercourses, including requirements for watercourse buffers. However, there are several areas where the regulations and design standards and guidance could be strengthened through amendments or



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new regulations to clarify and strengthen stormwater management requirements and better promote the use of LID principles.

# 1. Stormwater Management Standards and Design Manual

The Town land use regulations do not contain specific stormwater management standards. The Zoning Regulations reference the recommendations and design guidance contained in the Connecticut Stormwater Quality Manual, while the Subdivision Regulations indicate that stormwater systems shall be designed by methods approved by the Town Engineer. The Inland Wetlands and Watercourses Regulations do not contain specific stormwater management standards and do not reference design guidance such as the DEP Stormwater Quality Manual or local design standards, except for instances when the applicant requests reduction in the watercourse buffer width requirements.

While the Connecticut Stormwater Quality Manual contains hydrologic sizing criteria (for water quality, quantity, groundwater recharge, etc.) and detailed design guidance for specific stormwater treatment practices, it does not prescribe a set of stormwater standards due to the lack of state-wide stormwater regulations. The Connecticut Stormwater Quality Manual does contain many LID principles in addition to more traditional end-of-pipe stormwater controls. However, it does not contain more recently developed guidance on LID design methods and clear incentives for developers to use LID over traditional stormwater management methods, such as LID credit systems which have been adopted by communities in recent years. Another drawback of relying solely on the DEP manual is that the information in the manual may eventually become outdated and lacking in areas of new or emerging stormwater management issues, as DEP does not plan to revise the manual in the foreseeable future.

Although the Vernon land use commissions are encouraged to use the Connecticut Stormwater Quality Manual to review applications, an alternative approach is to develop a local stormwater and LID manual to complement the DEP stormwater manual. A local manual could reference applicable sections of the DEP manual and take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town. The Town land use regulations could also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the Town land use regulations. Several other Connecticut communities have chosen this approach, including Tolland, which has developed a LID and Stormwater Management Design Manual, in addition to amendments to the Tolland Subdivision and Zoning Regulations. The Town of Greenwich is also in the process of revising its outdated drainage manual to incorporate stormwater quality elements and LID principles. Greenwich is also considering adopting a stand-alone ordinance or modifying its local land use regulations to implement the provisions of the new manual.

# 2. Local Regulatory Mechanism

As indicated in the introduction section, an opportunity exists for the Town of Vernon to develop and implement new or revised regulations to satisfy Phase II stormwater regulatory F:\P2005\0257\A20\Town Regulations and Data\Vernon\_Regulatory\_Review\_Memo\_20080605.doc Corres. (MA)



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requirements, while at the same time incorporating LID principles and addressing natural resource protection issues. The Town's existing land use regulations address some of the elements of the post-construction stormwater management "regulatory mechanism" required by the DEP Phase II Stormwater program. However, none of the existing regulations, either individually or collectively, addresses post-construction stormwater management in a comprehensive manner as required by the Phase II program. Additionally, the Town may want to consider regulating stormwater runoff from projects that may not currently be subject to Town land use regulations but which are known to be a source of stormwater quality and drainage issues (such as single family residential redevelopment outside of the Upland Review Area).

Two general approaches exist for implementing a comprehensive stormwater regulatory mechanism to meet Phase II stormwater program requirements and to incorporate LID principles and other specific community objectives. One approach involves developing a new stand-alone stormwater ordinance that could be incorporated into the Vernon Town Code and implemented by a single department or commission such as the Engineering Department. This approach has been used by Stratford and other communities throughout southern New England. An alternate approach would be to implement more comprehensive stormwater management/LID requirements in a new section of the Zoning Regulations and maintain the responsibility for administering the stormwater/LID provisions with the Planning and Zoning Commission. Such an approach has been used by Tolland and Guilford, Connecticut. Elements of both approaches are summarized as follows:

- a. Stand-Alone Stormwater Ordinance
  - Adopt a new stormwater ordinance as part of the Vernon Town Code. The ordinance could be similar to the draft ordinance which is provided in Attachment A of this memorandum and is based upon a model ordinance endorsed by the DEP. Typically, a new stormwater ordinance is a more efficient and effective way to address the Phase II Stormwater program regulatory mechanism requirement than separate revisions to the individual municipal land use regulations that are currently in place. The stormwater ordinance would apply to post-construction stormwater runoff from new development and redevelopment projects that disturb greater than a threshold value that could be selected by the Town. The Phase II General Permit requires that the ordinance apply to projects that would disturb one or more acres. Vernon could consider an alternative applicability threshold to ensure that the requirements would apply to in-fill development projects and other smaller land disturbance activities with the potential for drainage or water guality impacts. The sample draft ordinance provided in Attachment A would apply to all projects that disturb 5,000 square feet or more. Other applicability thresholds could be considered as well. The ordinance should incorporate by reference the technical standards and design guidance contained in a local stormwater manual and/or the Connecticut Stormwater Quality Manual, as amended.



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- The stand-alone stormwater ordinance could be administered by the Engineering Department, which would initially receive stormwater management permit applications for land disturbance activities subject to the ordinance. Stormwater Management Plans would then be reviewed by one or more of the applicable land use commissions (Planning and Zoning Commission or Inland Wetlands Regulatory Commission) with jurisdiction or expertise over the proposed project. Projects that do not fall under the jurisdiction of the Planning and Zoning Commission or the Inland Wetlands Regulatory Commission or the Inland Wetlands Regulatory Commission would be reviewed solely by the Engineering Department for compliance with the ordinance. This administrative structure places responsibility for stormwater management plan review on those agencies that already perform regulatory reviews (P&Z and IW), but consolidates authority for the stormwater ordinance under a single department (Engineering). A drawback to this approach is that the Engineering Department would bear the responsibility for administering the permit program and would likely require additional staff resources.
- The Town could consider creating a dedicated "stormwater inspector" position within the Engineering Department. The stormwater inspector would be responsible for conducting stormwater inspections during and after construction of stormwater facilities in support of the new ordinance, as well as augment the related inspection capabilities of Building Inspector and Zoning Enforcement Officer.
- Short-term funding for administration of the post-construction stormwater ordinance and other elements of the Town's Phase II program would most likely come from taxes and application fees. The Town could investigate implementation of a service charge-based system, such as user fees or a stormwater utility. However, these funding sources are often difficult to implement due to public resistance. Stormwater utilities have been established in Chicopee, Massachusetts, Burlington, Vermont, and elsewhere throughout the U.S. Stonington, Connecticut has investigated the feasibility of a stormwater utility. Several other Connecticut coastal communities are undertaking DEPfunded demonstration projects to explore the feasibility of developing and implementing a stormwater utility. Vernon may also explore the feasibility of a stormwater utility or similar stormwater service charge, although this would likely be a long-term potential funding source.
- b. Incorporation of Stormwater Management/LID Requirements in Zoning Regulations
  - Incorporate a new post-construction stormwater management and LID section into the existing Zoning Regulations. The new section could be similar to the stand-alone example ordinance in terms of applicability thresholds, exemptions, and general stormwater management standards and LID principles. Specific stormwater management standards and design guidance should not be included in the regulations, but rather in a local stormwater manual to avoid the need for



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significant future amendments to the regulations when the standards or design guidance are revised. A copy of the recent amendment to the Town of Tolland Zoning Regulations, which added a new LID section, is included as <u>Attachment</u> <u>B</u> of this memorandum.

• In addition, the Zoning Regulations could be modified to potentially require a Stormwater Management Plan for a proposed activity that only requires a Building Permit, such as a single-family dwelling, if it results in the disturbance of one or more acres (the Phase II permit minimum requirement) or a lower threshold selected by the Town. The following sample language is an excerpt from the Guilford Zoning Regulations:

Stormwater Management Plans shall be prepared for any Site Plan, Coastal Site Plan (CAM) or Special Permit Application in accordance with 273-75.F(3) of this Code. Futhermore, for an Application for Certificate of Zoning Compliance (Building Permit) for any new single family dwelling, the Town Engineer, or the Environmental Planner may require that a Stormwater Management Plan be prepared, all or in part, as required by 273-75.F.(3) when he/she has determined that the development if the single family dwelling may have an adverse impact on stormwater quality.

This approach consolidates stormwater management review within the Planning and Zoning Commission through the existing site plan and special permit application review process. The Subdivision and Inland Wetlands and Watercourses Regulations would also need to be modified to require a Stormwater Management Plan consistent with the Zoning Regulations.

### 3. LID Incentives and Obstacles

Although recent studies demonstrate that LID practices can reduce project costs and improve environmental performance, the perception still exists that site development using LID is more expensive than traditional approaches to stormwater management. Initial project costs may be higher in some cases than those for conventional design. However, significant savings are typically realized due to reduced costs for site grading and preparation, stormwater infrastructure, site paving, and landscaping (USEPA, Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, EPA publication number 841-F-07-006, December 2007).

Many states and local communities have adopted LID credit systems as an added incentive for developers to use LID, and in particular non-structural measures, to ultimately reduce the size and cost of structural stormwater management systems.

LID Site Design Credits encourage environmentally sensitive site design and LID techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet certain stormwater standards by implementing LID site design techniques according to a prescribed set of standards. The Tolland LID Design F:\P2005\0257\A20\Town Regulations and Data\Vernon\_Regulatory\_Review\_Memo\_20080605.doc Corres. (MA)



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Manual includes such an LID credit system. <u>Attachment C</u> of this memorandum contains an example LID Site Design Credit System that is also being considered by the Town of Greenwich.

Local land use regulations often contain design standards that preclude or limit the use of certain LID practices, particularly the use of curbless roads and roadside vegetated swales. Traditional curb-and-gutter systems convey stormwater with virtually no treatment or attenuation. Open vegetated channels remove pollutants by allowing infiltration and filtering to occur, and encourage groundwater recharge, which can reduce the volume of stormwater generated from a site. Traditionally, the use of curbless roads and vegetated open channels has been discouraged and, in many instances, specifically prohibited in local land use regulations and drainage design manuals, due to concerns over maintenance problems, pavement stability, and potential nuisances such as mosquitoes. Many of these concerns can be addressed through careful design and integration of open channels along streets.

The Vernon Subdivision Regulations contain provisions that limit the use of curbless roads and roadside vegetated swales. The Subdivision Regulations require curbs on all new streets and do not permit drainage ditches where it is feasible to install underground pipe. The Town should evaluate the underlying reasons for these restrictions and determine if the Subdivision Regulations should be amended to encourage the use of curbless roads and roadside swales, consistent with LID principles.

# 4. Local Regulations and Impervious Cover

Impervious cover in a watershed is a strong indicator of the overall quality of streams and aquatic ecosystems. The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. As impervious cover increases, overall stream health declines.

A goal of LID, which is a form of alternative site design, is to reduce impervious cover, disconnect impervious surfaces from the storm drainage system, and preserve natural site features. Local land use regulations and design requirements were typically not developed with impervious cover in mind. Rather, they evolved from perceived consumer demand, safety concerns, and land availability, often resulting in more impervious cover than is necessary due to expansive parking lots, wide streets, and large-lot subdivisions with little conserved natural areas and open space.

Communities interested in adopting LID and alternative sit design principles need to re-evaluate local land use regulations to overcome these challenges. Based on our review of the Vernon Subdivision and Zoning Regulations, some of the key design parameters that strongly influence impervious cover are already at or near optimal levels (e.g., off-street parking stall dimensions and configuration), while others should be reviewed to determine if further refinement is warranted and feasible (e.g., cul-de-sac design, road width, sidewalks, parking ratios).


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### 3.2 Preliminary Recommendations

This section contains preliminary recommendations based on our review of the existing land use regulations and planning documents, as well as our observations discussed in the previous section. These recommendations are intended to facilitate a discussion with the Technical Advisory Committee and Vernon land use commissioners during the upcoming workshop meeting, and to serve as a starting point and basis for further refinement and implementation.

- 1. Town Design Manual
  - Develop a Town stormwater and LID design manual. A local manual should reference applicable sections of the Connecticut Stormwater Quality Manual to take advantage of the existing design guidance, but also include more detailed guidance and stronger emphasis on LID practices and include specific stormwater standards tailored to the characteristics and needs of the Town (see Recommendation 2). The Town land use regulations should also reference the local stormwater design manual, thereby serving as a single, unifying guidance document that could be updated without the need for major revisions to the land use regulations.
  - Include a section of the design manual that addresses stormwater retrofits for redevelopment and drainage system upgrade and maintenance projects. Stormwater retrofits for residential and commercial redevelopment projects are an important element for the Town's stormwater management strategy given the level of existing development in the Town. Stormwater retrofits also present an opportunity to implement lot-level LID strategies as opposed to larger end-of-pipe controls where land may not be available for stormwater management facilities.
  - Incorporate/reference stormwater quantity and conveyance sections of the Connecticut DOT Drainage Manual for consistency with state drainage standards.
- 2. Stormwater Management Standards
  - Develop and incorporate into the Town stormwater design manual a set of stormwater management standards, which would become regulatory standards referenced by the existing Town land use regulations and/or new stormwater ordinance (see Recommendation 3). Development of stormwater management standards would allow Vernon to establish clearer, specific standards that all projects must meet in order to obtain local land use permits. The stormwater standards could include LID requirements, complement the hydrologic sizing criteria in the *Connecticut Stormwater Quality Manual* and be tailored (using variable minimum performance standards) to protect specific water bodies or sensitive resources in the Town of Vernon. An example set of stormwater management standards is included in <u>Attachment D</u>.



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- 3. New or Modified Stormwater Regulations
  - Develop and implement new or revised stormwater regulations to 1) satisfy Phase II Stormwater Program regulatory requirements, 2) encourage or require LID principles to be implemented for development projects in Vernon, and 3) address other local drainage and natural resource protection issues identified by the Town. Two potential approaches have been identified –1) a new stand-alone stormwater ordinance, or 2) addition/amendments to the existing Zoning Regulations.
  - Form an advisory committee or workgroup consisting of representatives from the various land use commissions and selected Town departments to further evaluate and select the best approach for Vernon, including key decisions regarding:
    - If a new, stand-alone stormwater ordinance is selected, which department or commission will have responsibility for administering the program (i.e., the "Stormwater Authority")?
    - Which projects and activities will the new ordinance apply to (i.e., applicability)?
    - How will applications be received and reviewed?
    - o Who will be responsible for inspections and enforcement?
    - Will additional staff be required to handle the increased workload to review and process applications?
- 4. Other Amendments to Existing Regulations

### Subdivision Regulations

- Amend Section 6.4 to reference the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, as opposed to the outdated reference to the 1976 version of the Erosion and Sediment Control Handbook.
- Section 6.5.1.1 (Street Grading and Improvement): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.6.6 (Cul-de-sacs): Consider smaller cul-de-sac radius of (30 to 40 feet), or alternative designs such as hammerheads, to reduce impervious cover, such that the design allows for continuous turning movement of the largest fire fighting vehicle used by the Town of Vernon. Also consider encouraging the use of LID bioretention/rain gardens in cul-de-sac islands for stormwater management.
- Section 6.7.1 (Design Standards, Road Width): Consider pavement widths of between 24 and 28 feet, if such a reduction will not negatively impact public safety or emergency response. Refer to Table 4-3 in the Connecticut Stormwater Quality Manual for potential variation in residential roadway widths based on terrain and development density.



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- Section 6.7.2 (Design Standards, Curbs): Consider eliminating the curbing requirement for roads with grades less than 5% to encourage the use of vegetated swales and similar LID practices.
- Section 6.9 (Drainage and Storm Sewers): Modify these sections to reference stormwater management standards and LID principles contained in a stand-alone stormwater ordinance or new section of the Zoning Regulations, and/or the Town stormwater design manual.
- Section 6.9.3 (Drainage Design): Amend this section to allow the use of roadside vegetated swales designed in accordance with the Town stormwater design manual.
- Section 6.12.1 (Sidewalks): Consider requiring sidewalks on only one side of the street and reduce sidewalk width to 3 or 4 feet. Grade sidewalks to the front yard rather than to the street. Consider using alternative materials such as pavers, stone dust, or pervious concrete.
- Section 6.14 (Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

# Zoning Regulations

- Section 3.4 (General Provisions): If the Town develops a local stormwater design manual, change the reference to the Connecticut Stormwater Quality Manual to the Town manual.
- Sections 4.1 through 4.25 (Use Districts, Setbacks and Lot Dimensions): Review current setbacks and lot dimensions for potential to relax side yard setbacks and allow narrower frontages to reduce road length and site imperviousness, and to relax front setback requirements to reduce driveway length and lot imperviousness.
- Section 12 (Off-street Parking and Loading): Review existing parking ratios to see if lower ratios are warranted and feasible. The required parking ratio for a particular land use should be enforced as both a maximum and minimum to limit excess parking space construction and impervious cover. Consider allowing the Commission to approve parking lots with more spaces than the allowed maximum provided all of the spaces above the maximum number are composed of a pervious surface, and where adequate stormwater management is provided. Also consider parking spaces held in reserve for phased developments, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.



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Clarify Section 12 of the regulations to encourage the use of shared parking. Where shared parking is used, the Zoning Regulations should require a corresponding reduction in parking spaces.

Consider adding language to Section 12 that references specific stormwater management and landscape design standards in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.

• Section 18 (Activities Requiring a Certified Erosion and Sediment Control Plan): Amend the single family exemption such that the exemption only applies to single family dwellings that do not disturb 1 or more acres of land, which is consistent with the Phase II Stormwater Program regulatory requirement.

#### Inland Wetlands and Watercourses Regulations

• Section 4.5 (Evaluation of Proposed Activities): Add language referencing the stormwater management standards and LID principles contained in the Town stormwater manual and/or the Connecticut Stormwater Quality Manual.



# ATTACHMENT A

Draft Model Stormwater Ordinance

# DRAFT

# POST-CONSTRUCTION STORMWATER ORDINANCE (CITY NAME)

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- **1.0 PURPOSE AND AUTHORITY**
- 2.0 **DEFINITIONS**
- 3.0 APPLICABILITY
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- 5.0 STORMWATER MANAGEMENT PLANS
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- **11.0 SEVERABILITY**
- 12.0 PENALTIES
- **13.0 EFFECTIVE DATE**

#### 1.0 PURPOSE AND AUTHORITY

The purpose of this ordinance is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with post-construction stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land and wetlands, control stream channel erosion, reduce local flooding, improve water quality, and maintain after development, as nearly as possible, the pre-development runoff characteristics.

The provisions of this ordinance are pursuant to Connecticut State Statutes 7-148 (c) (8) (A)<sup>1</sup>, 8-2 (a)<sup>2</sup>, 8-25<sup>3</sup>, and 22a-36 to 22a-45 inclusive<sup>4</sup>, and 8-2(b)<sup>5</sup> and shall apply to all development occurring within the incorporated area of(City Name), Connecticut. The application of this ordinance and provisions expressed herein shall be the minimum stormwater management requirements and shall not be deemed a limitation or repeal of any other powers granted by State statute. The agencies defined in Section 2.0 as the

<sup>4</sup> The Inland Wetlands and Watercourses Act.

<sup>&</sup>lt;sup>1</sup> Municipal Powers: The municipality has the power to "Provide for the protection and improvement of the environment including, but not limited to, coastal areas, wetlands and areas adjacent to waterways in a manner not inconsistent with the general statutes.

<sup>&</sup>lt;sup>2</sup> Regulations: The zoning commission is authorized to adopt regulations "...to secure safety from ...flood and other dangers; to promote health and the general welfare..."

<sup>&</sup>lt;sup>3</sup> Subdivision of land: Authorizes the zoning commission to see "...that proper provision shall be made for... drainage..." and "that proper provision shall be made for protective flood control measures..."

<sup>&</sup>lt;sup>5</sup> "In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the zoning commission consider the environmental impact on Long Island sound of any proposal for development."

"Responsible Authority" shall be responsible for the coordination and enforcement of the provisions of this ordinance.

#### **1.1** Incorporation by Reference

For the purpose of this ordinance, the Connecticut Stormwater Quality Manual (as amended) is incorporated by reference by (City Name), Connecticut and shall serve as the official guide for stormwater principles, methods, and practices.

#### 2.0 **DEFINITIONS**

- A. For the purpose of this ordinance, the following definitions describe the meaning of the terms used in this ordinance:
  - (1) "Adverse impact" means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation.
  - (2) "Agricultural land management practices" means those methods and procedures used in the cultivation of land in order to further crop and livestock production and conservation of related soil and water resources.
  - (3) "Applicant" means any person, firm, or governmental agency who executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.
  - (4) "Aquifer" means porous water bearing geologic formation generally restricted to materials capable of yielding an appreciable supply of water.
  - (5) "BMP (Best Management Practice)" means a structural device or nonstructural practice designed to temporarily store or treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities.
  - (6) "Clearing" means the removal of trees and brush from the land (i.e., removal of vegetative cover) but shall not include the ordinary mowing of grass
  - (7) "DEP" means the Connecticut Department of Environmental Protection.
  - (8) "Design Manual" means the most current edition of the Connecticut Stormwater Quality Manual that serves as the official guide for the stormwater management principles, methods, and practices.
  - (9) "Detention structure" means a permanent structure for the temporary storage of runoff, which is designed so as not to create a permanent pool of water.
  - (10) "Develop land" means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, municipal, or institutional construction or alteration.
  - (11) "Direct discharge" means the concentrated release of stormwater to tidal waters or vegetated tidal wetlands from new development or redevelopment projects in the Critical Area.
  - (12) "Disturb" or "Disturbance" means any activity consisting of the removal of vegetation, topsoil, or overburden, or the placement of topsoil, spoil, or other material, as defined in the Guidelines.

- (13) "Drainage area" means an area that contributes runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.
- (14) "Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.
- (15) "Exemption" means those land development activities that are not subject to the stormwater management requirements contained in this ordinance.
- (16) "Extended detention" means a stormwater design feature that provides gradual release of a volume of water in order to increase settling of pollutants and protect downstream channels from frequent storm events. Methods for designing extended detention BMPs are specified in the Design Manual.
- (17) "Extreme flood volume" means the storage volume required to control those infrequent but large storm events in which overbank flows reach or exceed the boundaries of the 100-year floodplain.
- (18) "Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.
- (19) "Grading" means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled or any combination thereof.
- (20) "Groundwater recharge volume (GRV)" means that portion of the water quality volume used to maintain groundwater recharge rates at development sites. Methods for calculating the groundwater recharge volume are specified in the Design Manual.
- (21) "Guidelines" means the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, or as may be amended, established pursuant to Section 22a-328 of the Connecticut General Statutes.
- (22) "Infiltration" means the passage or movement of water into the soil surface.
- (23) "Off-site stormwater management" means the design and construction of a facility necessary to control stormwater from more than one development.
- (24) "On-site stormwater management" means the design and construction of systems necessary to control stormwater within an immediate development.
- (25) "Peak runoff attenuation" means controlling by structural practices the volume to prevent an increase in the frequency of out of bank flooding generated by development.
- (26) "Primary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that is capable of providing high levels of water quality treatment as a stand-alone measure.
- (27) "Redevelopment" means any construction, alteration, or improvement exceeding five thousand (5,000) square feet of land disturbance performed on sites where existing land use is commercial, industrial, municipal, institutional or multifamily residential.
- (28) "Responsible Authority" means employees, members, or designees of (City Name) (Agency Name). Other responsible agencies under this ordinance include:
  - (a) The Inland Wetlands and Watercourses Commission for stormwater runoff impacting wetlands and watercourses. (For the purposes of only this paragraph, the definition of "wetlands" and "watercourse" is the definition used in the most current version of the Inland Wetland and Watercourses regulations of (City Name).

- (b) The Engineering Division of the Department of Public Works for stormwater runoff from public roads and sidewalks.
- (c) The Planning Commission and Zoning Commission for all other stormwater runoff.
- (29) "Responsible Official" means (City Name) Director of Public Works ("Director").
- (30) "Retention structure" means a permanent structure that provides for the storage of runoff by means of a permanent pool of water.
- (31) "Retrofitting" means the construction of a structural BMP in a previously developed area, the modification of an existing structural BMP, or the implementation of a nonstructural practice to improve water quality over current conditions.
- (32) "Secondary treatment practice", as defined in the Design Manual, means a stormwater treatment practice that may not be suitable as stand-alone treatment because is not capable of meeting the water quality treatment performance criteria in the Design Manual or has not yet received the thorough evaluation needed to demonstrate the capabilities for meeting the performance criteria in the Design Manual.
- (33) "Sediment" means soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity as a product of erosion.
- (34) "Site" means:
  - (a) For "new development" any tract, lot or parcel of land or combination of tracts, lots, or parcels of land, which are in one ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.
  - (b) For "redevelopment" the area of new construction as shown on an approved site plan or the original parcel. Final determination of the applicable area shall be made by the Responsible Authority.
- (35) "Stabilization" means the prevention of soil movement by any of various vegetative and/or structural means.
- (36) "Stormwater management" means the selective use of various management measures to effectively address the adverse water quality and quantity impacts of urban stormwater runoff.
- (37) "Stormwater Management Plan" means a set of drawings or other documents that describe the potential water quality and quantity impacts associated with a development project after construction. A stormwater management plan also identifies selected source controls and treatment practices to address those potential impacts, the engineering design of the treatment practices, and maintenance requirements for proper performance of the selected practices.
- (38) "Stormwater Treatment Practice", as defined in the Design Manual, means a measure constructed for primary treatment or secondary treatment of stormwater runoff.
- (39) "Stream Channel Protection" means restricting peak flows from storm events that result in flow conditions where the stream is flowing to the full extent of its banks so the damaging effects to the channel of increased runoff from urbanization can be reduced. Methods for calculating stream channel protection are specified in the most current edition of the Design Manual.

- (40) "Variance" means the modification of the minimum stormwater management requirements for specific circumstances such that strict adherence to the requirements would result in necessary hardship and not fulfill the intent of this ordinance.
- (41) "Waiver" means the relinquishment from stormwater management requirements by the Responsible Authority for a specific development on a case-by-case review basis.
  - (a) "Quality stormwater management waiver" includes water quality volume and groundwater recharge volume design parameters.
  - (b) "Quantity stormwater management waiver" includes stream channel protection, peak runoff attenuation, and extreme flood volume design parameters.
- (38) "Watercourse" means any natural or artificial stream, river, brook, lake, pond, marsh, swamp, bog, ditch, channel, canal, conduit, culvert, drain, waterway, gully, ravine, wash, and all other bodies of water, natural or artificial, vernal or intermittent, public or private in and including any adjacent area that is subject to inundation from overflow or flood water.
- (39) "Watershed" means the total drainage area contributing runoff to a single point.
- (40) "Water quality volume" means the volume of runoff generated by one inch of rainfall on the site.

#### 3.0 APPLICABILITY

#### 3.1 Scope

No person shall develop land for residential, commercial, industrial, municipal, or institutional uses without having provided stormwater management measures that control or manage runoff from such development, except as provided within this section. The stormwater management measures must be designed consistent with the Design Manual and constructed according to an approved plan for new development or the policies stated in Section 3.4 for redevelopment.

#### 3.2 Exemptions

The following development activities are exempt from the provisions of this ordinance and the requirements of providing stormwater management, except as noted:

- A. Development of single family residential property that results in the disturbance of less than one (1) acre of land, not including projects less than one (1) acre that are part of a larger common plan of development or sale that will ultimately disturb greater or equal to one (1) acre must conform to the requirements presented in Section 4.4.
- B. Agricultural land management practices;
- C. Any activity that will disturb an area less than five thousand (5,000) square feet over the total project;
- D. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;
- E. Repair or replacement of an existing roof of a single family dwelling;
- F. Construction of utilities (gas, water, electric, telephone, sanitary sewer, etc.) other than drainage, which will not alter terrain, ground cover, or drainage patterns;

G. Emergency repairs to any stormwater management facility or practice that poses a threat to public health or safety, or as deemed necessary by the Responsible Authority.

#### 3.3 Waivers / Watershed Management Plans

- A. Stormwater management quantity control waivers may be granted by the Responsible Authority to projects when the Responsible Authority determines that circumstances exist that prevent the reasonable implementation of quantity control practices.
- B. Stormwater management quality control waivers granted by the Responsible Authority apply to:
  - (1) In-fill development projects where implementation of stormwater management quality controls is not feasible;
  - (2) Redevelopment projects if the requirements of Section 3.4 of this ordinance are satisfied; or
  - (3) Sites where the Responsible Authority determines that circumstances exist that prevent or make unnecessary the reasonable implementation of quality control practices.
- C. Waivers must be requested in writing one week in advance of the regular meeting of the (Responsible Authority Agency Name) in a manner prescribed by the Director of Public Works.
- D. Waivers granted must:
  - (1) Be on a case-by-case basis;
  - (2) Consider the cumulative effects of the waiver policy; and
  - (3) Reasonably ensure the development will not adversely impact stream quality.

#### 3.4 Redevelopment

- A. All redevelopment projects shall reduce existing site impervious area by 20%. Where site conditions prevent the reduction of impervious area, then stormwater management practices shall be implemented to provide quality control for at least 20% of the site's impervious area. The elements and principles of stormwater quality control are noted in the Design Manual.
- B. Where conditions prevent impervious area reduction or on-site stormwater management, the Responsible Authority may consider practical alternatives including:
  - (1) Watershed or stream restoration;
  - (2) Retrofitting; or
  - (3) Other practices approved by Responsible Authority.

#### 3.5 Variance

The Responsible Authority may grant a written variance from any requirement of Section 4.0 (Stormwater Management Criteria), of this ordinance if there are exceptional circumstances applicable to the site such that strict adherence will result in unnecessary hardship and not fulfill the intent of this ordinance. A written request for variance shall be provided to the Responsible Authority and shall state the specific variances sought and reasons for their granting. The Responsible Authority shall not grant a variance unless and until the person developing land provides sufficient justification.

### 4.0 STORMWATER MANAGEMENT CRITERIA

#### 4.1 Minimum Control Requirements

A. The minimum control criteria established in this section and the Design Manual are as follows:

- (1) Shall require that the groundwater recharge volume, water quality volume, and peak runoff attenuation for the 2-year frequency storm event be used to design BMPs according to the Design Manual. Control of the 10-year frequency storm event is required according to the Design Manual. Control of larger storm events may be required at the discretion of the Responsible Authority if a flooding problem exists and downstream floodplain development and conveyance system design cannot be controlled.
- (2) Shall require that the groundwater recharge volume, water quality volume, and stream channel protection sizing criteria be used to design BMPs according to the Design Manual.
- (3) The Responsible Authority may require more than the minimum control requirements specified in this ordinance if hydrologic or topographic conditions warrant or if flooding, stream channel erosion, or water quality problems exist downstream from a proposed project.
- B. Stormwater management and development plans where applicable, shall be consistent with adopted and approved watershed management plans or flood management plans as approved by the DEP.

#### 4.2 Stormwater Management Measures

The structural and nonstructural stormwater management measures established in this ordinance shall be used, either alone or in a combination, in developing a stormwater management plan.

- A. Nonstructural Stormwater Management Measures.
  - (1) The following nonstructural stormwater management practices shall be applied according to the Design Manual to minimize increases in new development runoff:
    - (a) Natural area conservation;
    - (b) Disconnection of rooftop runoff;
    - (c) Disconnection of non-rooftop runoff;
    - (d) Sheet flow to buffers;
    - (e) Grass channels; and
    - (f) Environmentally sensitive development and Low Impact Development (LID) practices;
  - (2) The use of nonstructural stormwater management practices shall be encouraged to minimize the reliance on structural BMPs.
  - (3) The minimum control requirements listed in Section 4.1 of this ordinance may be reduced when nonstructural stormwater management practices are incorporated into site designs according to the Design Manual.
  - (4) The use of nonstructural stormwater management practices may not conflict with existing State or local laws, ordinances, or policies.
  - (5) Nonstructural stormwater management practices used to reduce the minimum control requirements must be recorded and remain unaltered by subsequent property owners. Prior approval from the Responsible Authority shall be obtained before nonstructural stormwater practices are altered.
- B. Structural Stormwater Management Measures.

- (1) The following structural stormwater management practices or "Stormwater Treatment Practices" shall be designed according to the Design Manual to satisfy the applicable minimum control requirements established in Section 4.1 of this ordinance.
  - (a) Primary Treatment Practices, including stormwater ponds, stormwater wetlands, stormwater infiltration practices, stormwater filtering practices, and water quality swales.
  - (b) Combination of primary treatment practices and secondary treatment practices.
  - (c) Multiple secondary treatment practices, at the discretion of the Responsible Authority.
- (2) The performance criteria specified in the Design Manual with regard to general feasibility, conveyance, pretreatment, treatment and geometry, environment and landscaping, and maintenance shall be considered when selecting structural stormwater management practices.
- (3) Structural stormwater management practices shall be selected to accommodate the unique hydrologic or geologic regions of the state.
- C. Alternative structural and nonstructural stormwater management practices may be used for new development water quality control if they meet the performance criteria established in the Design Manual. Practices used for redevelopment projects shall be approved by the Responsible Authority.
- D. For the purposes of modifying the minimum control requirements or design criteria, the owner/developer shall submit at the request of the Responsible Authority an analysis of the impacts of stormwater flows downstream in the watershed. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed development upon a dam, highway, structure, or natural point of restricted stream flow. The point of investigation is to be established with the concurrence of the Responsible Authority.

#### 4.3 Specific Design Criteria

The basic design criteria, methodologies, and construction specifications, subject to the approval of the Responsible Authority, shall be those of the Design Manual.

#### 4.4 Single Family Residence Lot Level Controls

Construction of single family residences that results in the disturbance of less than 1 acre of land must minimize or disconnect impervious area runoff from the public storm drainage system by implementing stormwater management measures designed in accordance with the Design Manual. The applicant shall submit evidence on a form prescribed by the Responsible Official that the requirements of Section 4.4 have been met prior to issuance of a building permit.

#### 5.0 STORMWATER MANAGEMENT PLANS

#### 5.1 Review and Approval of Stormwater Management Plans

A. For any proposed development, the developer shall submit a stormwater management plan or waiver application to the Responsible Authority for review and approval, unless otherwise exempted. The stormwater management plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire development. The Responsible Authority shall

review the plan to determine compliance with the requirements of this ordinance prior to approval. The plan shall serve as the basis for all subsequent construction.

B. Notification of approval or reasons for disapproval or modification shall be given to the applicant within [time frame] after submission of the completed stormwater plan. If a decision is not made within [time frame] the applicant shall be informed of the status of the review process and the anticipated completion date. The stormwater management plan shall not be considered approved without the inclusion of the signature and date of signature of the responsible official on the plan.

#### 5.2 Contents of the Stormwater Management Plan

A. The developer is responsible for submitting a stormwater management plan that meets the design requirements of this ordinance. The plan shall be accompanied by a report that includes sufficient information to evaluate the environmental characteristics of affected areas, the potential impacts of the proposed development on water resources, and the effectiveness and acceptability of measures proposed for managing stormwater runoff. An engineer licensed in Connecticut shall certify on the drawings that all clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the plan. If a stormwater management plan involves direction of some or all runoff off the site, it is the responsibility of the developer to obtain from adjacent property owners any easements or necessary property interests concerning flowage of water. Approval of a stormwater management plan does not create or affect any right to direct runoff onto adjacent property without that property owner's permission.

The minimum information submitted for support of a stormwater management plan or application for a waiver shall be as follows:

- B. Reports submitted for stormwater management plan approval shall include:
  - (1) A brief narrative description of the project;
  - (2) Geotechnicial investigations including soil maps, borings, site-specific recommendations, and any additional information necessary for the proposed stormwater management design;
  - (3) Descriptions of all watercourses, impoundments, and wetlands on or adjacent to the site or into which stormwater directly flows;
  - (4) Hydrologic computations, including drainage area maps depicting pre development and post development runoff flow path segmentation and land use that demonstrate compliance with Section 4.0 of this ordinance;
  - (5) Hydraulic computations;
  - (6) Structural computations;
  - (7) Hydrologic sizing criteria computations according to the Design Manual; and
  - (8) Any other information required by the Responsible Authority.
- C. Construction drawings submitted for stormwater management plan approval shall include the following:
  - (1) A vicinity map;
  - (2) Topography survey showing existing and proposed contours, including the area necessary to determine downstream analysis for proposed stormwater management facilities;
  - (3) Any proposed improvements including location of buildings or other structures, impervious surfaces, storm drainage facilities, and all grading;

- (4) The location of existing and proposed structures and utilities;
- (5) Any easements and rights-of-way;
- (6) The delineation, if applicable, of the 100-year floodplain and any on-site wetlands;
- (7) Structural and construction details for all components of the proposed drainage system or systems, and stormwater management facilities.
- (8) All necessary construction specifications;
- (9) A sequence of construction;
- (10) Data for total site area, disturbed area, new impervious area, and total impervious area;
- (11) A table showing the hydrologic sizing criteria volumes described in the Design Manual;
- (12) A table of materials to be used for stormwater management facility planting;
- (13) All soil boring logs and locations;
- (14) A maintenance schedule;
- (15) Certification by a Connecticut certified engineer that all stormwater management construction will be done according to this plan;
- (16) An as-built certification signature block to be executed after project completion; and
- (17) Any other information required by the Responsible Authority.

#### 5.3 Preparation of the Stormwater Management Plan

- A. A professional engineer licensed in the State shall design and prepare a stormwater management plan as necessary to protect the public and the environment.
- B. If a stormwater treatment practice requires either a dam safety permit from DEP or approval from the Inland Wetlands and Watercourses Agency, the Responsible Authority shall require that a professional engineer licensed in the State prepare the design.

#### 6.0 **PERMITS**

#### 6.1 Permit Requirement

A building permit may not be issued for any parcel or lot unless a stormwater management plan has been approved or waived by the Responsible Authority as meeting all the requirements of this ordinance. Where appropriate, a building permit may not be issued without:

- A. Recorded easements for the stormwater management facility and easements to provide adequate access for inspection and maintenance from a public right-of-way;
- B. A recorded stormwater management maintenance agreement;
- C. A cash bond; and
- D. Permission from adjacent property owners as necessary.

#### 6.2 Permit Fee

A non-refundable permit fee will be collected at the time the stormwater management plan or application for waiver is submitted. The permit fee will provide for the cost of plan review, administration, and management of the permitting process, and inspections by the Responsible Authority of all projects subject to this ordinance. A permit fee schedule shall be established by the Responsible Authority based upon the relative complexity of the project and may be amended from time to time.

#### 6.3 Permit Suspension and Revocation

Any building permit issued by the Responsible Authority may be suspended or revoked after written notice is given to the permittee for any of the following reasons:

- A. Any violation(s) of the conditions of the stormwater management plan approval.
- B. Changes in site runoff characteristics upon which an approval or waiver was granted.
- C. Construction is not in accordance with the approved plan.
- D. Noncompliance with correction notice(s) or stop work order(s) issued for the construction of the stormwater management facility.
- E. An immediate danger exists in a downstream area in the opinion of the Responsible Authority.

#### 6.4 **Permit Conditions**

In granting the plan approval, the Responsible Authority may impose such conditions that may be deemed necessary to ensure compliance with the provisions of this ordinance and the preservation of the public health and safety.

#### 7.0 CASH BOND

The Responsible Authority shall require from the developer a cash bond prior to the issuance of any building permit for the construction of a development requiring a stormwater management facility. The amount of the security shall not be less than the total estimated construction cost of the stormwater management facility. The bond required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this ordinance, and other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the Responsible Authority, submission of "as-built" plans, and certification of completion by the Responsible Authority that the stormwater management facilities comply with the approved plan and the provisions of this ordinance. A procedure may be used to release parts of the bond held by the Responsible Authority after various stages of construction have been completed and accepted by the Responsible Authority. The procedures used for partially releasing performance bonds must be specified by the Responsible Authority in writing prior to stormwater management plan approval.

[1) a cash bond posted within the Town treasury or 2) a surety bond that the town could investigate/ approve. Language should be consistent with language currently under review/development by Town Counsel.]

The bond requirement under this ordinance may be waived by the Responsible Authority provided that a bond is required by another agency in the amount equal to or greater than the total estimated construction cost of the stormwater management facilities for the project.

#### 8.0 INSPECTION

#### 8.1 Inspection Schedule and Reports

- A. The developer shall notify the Responsible Official at least 48 hours before commencing any work in conjunction with the stormwater management plan and upon completion of the project when a final inspection will be conducted.
- B. The developer shall retain a professional engineer licensed in the State to conduct inspections. Written inspection reports shall be made of the periodic inspections necessary during construction of stormwater management systems to ensure compliance with the approved plans.
- C. Written inspection reports shall be provided by the developer's engineer to the Responsible Authority on a standard form provided by the Town.
- D. The owner/developer and on-site personnel shall be notified in writing when violations are observed. Written notification shall describe the nature of the violation and the required corrective action.
- E. No work shall proceed until the Responsible Authority approves the work previously completed. The inspector shall provide the developer and Responsible Authority with the results of the inspection reports as soon as possible after completion of each required inspection.

#### 8.2 Inspection Requirements During Construction

- A. At a minimum, inspections shall be made and documented at the following specified stages of construction:
  - (1) For stormwater ponds:
    - (a) Upon completion of excavation to sub-foundation and when required, installation of structural supports or reinforcement for structures, including but not limited to:

- (i) Core trenches for structural embankments
- (ii) Inlet and outlet structures, anti-seep collars or diaphragms, and watertight connectors on pipes; and
- (iii) Trenches for enclosed storm drainage facilities;
- (b) During placement of structural fill, concrete, and installation of piping and catch basins;
- (c) During backfill of foundations and trenches;
- (d) During embankment construction; and
- (e) Upon completion of final grading and establishment of permanent stabilization.
- (2) For stormwater wetlands at the stages specified for pond construction in 8.2 A (1) of this section, during and after wetland reservoir area planting, and during the second growing season to verify a vegetation survival rate of at least 50 percent.
- (3) For infiltration trenches:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems and observation wells;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization;
- (4) For infiltration basins at the stages specified for pond construction in 8.2 A (1) of this section and during placement and backfill of underdrain systems.
- (5) For filtering systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems;
  - (c) During placement of geotextiles and all filter media;
  - (d) During construction of appurtenant conveyance systems such as flow diversion structures, pre-filters and filters, inlets, outlets, orifices, and flow distribution structures; and
  - (e) Upon completion of final grading and establishment of permanent stabilization.
- (6) For open channel systems:
  - (a) During excavation to subgrade;
  - (b) During placement and backfill of underdrain systems for dry swales;
  - (c) During installation of diaphragms, check dams, or weirs; and
  - (d) Upon completion of final grading and establishment of permanent stabilization.
- (7) For nonstructural practices upon completion of final grading, the establishment of permanent stabilization, and before issuance of use and occupancy approval.
- (8) For secondary treatment practices, including subsurface manufactured devices:

- (a) During excavation to subgrade;
- (b) During placement and backfill of treatment unit;
- (c) During construction of appurtenant conveyance systems such as diversion structures, pre-filters and filters, inlets, outlets, and flow distribution structures; and
- (e) Upon completion of final grading and establishment of permanent stabilization;
- B. The Responsible Authority may, for enforcement purposes, use any one or a combination of the following actions:
  - (1) A notice of violation shall be issued specifying the need for a violation to be corrected if the stormwater management plan noncompliance is identified;
  - (2) A stop work order shall be issued for the site by the Responsible Authority if a violation persists;
  - (3) Bonds or securities may be withheld or the case may be referred for legal action if reasonable efforts to correct the violation have not been undertaken; or
  - (4) In addition to any other sanctions, a civil action or criminal prosecution may be brought against any person in violation of the Stormwater Management subtitle or this ordinance.
- C. Any step in the enforcement process may be taken at any time, depending on the severity of the violation.
- D. Once construction is complete, as-built plan certification shall be submitted by a professional engineer licensed in the State to ensure that constructed stormwater management practices and conveyance systems comply with the specifications contained in the approved plans. At a minimum, as-built certification shall include a set of drawings comparing the approved stormwater management plan with what was constructed the Responsible Authority may require additional information.

#### 9.0 MAINTENANCE

#### 9.1 Maintenance Inspection

- A. The owner (or the developer during construction) shall ensure that all stormwater management systems are inspected for performance of preventative maintenance. Inspection shall occur during the first year of operation and at least once every 3 years thereafter. In addition, a maintenance agreement between the owner and the Responsible Authority shall be executed for privately owned stormwater management systems as described in 9.2 of this section.
- B. The owner (or the developer during construction) shall maintain inspection reports for all stormwater management systems.
- C. Inspection reports for stormwater management systems shall include the following:
  - (1) The date of inspection;
  - (2) Name of inspector;
  - (3) The condition of:
    - (a) Vegetation or filter media;
    - (b) Fences or other safety devices;

- (c) Spillways, valves, or other control structures;
- (d) Embankments, slopes, and safety benches;
- (e) Reservoir or treatment areas;
- (f) Inlet and outlet channels or structures;
- (g) Underground drainage;
- (h) Sediment and debris accumulation in storage and forebay areas;
- (i) Any nonstructural practices to the extent practicable; and
- (j) Any other item that could affect the proper function of the stormwater management system.
- (4) Description of needed maintenance.
- D. After notification is provided to the owner of any deficiencies discovered from an inspection of a stormwater management system, the owner shall have 30 days or other time frame mutually agreed to between the Responsible Authority and the owner to correct the deficiencies. The Responsible Authority shall then conduct a subsequent inspection to ensure completion of the repairs.
- E. If repairs are not undertaken or are not done properly, then enforcement procedures following 9.2 C of this section shall be followed by the Responsible Authority
- F. If, after an inspection by the Responsible Authority, the condition of a stormwater management facility presents an immediate danger to the public health or safety, because of an unsafe condition or improper maintenance, the Responsible Authority shall take such action as may be necessary to protect the public and make the facility safe. Any cost incurred by (City Name) shall be assessed against the owner(s), as provided in Section 9.2 C.

#### 9.2 Maintenance Agreement

- A. Prior to the issuance of any building permit for which stormwater management is required, the Responsible Authority shall require the applicant or owner to execute an inspection and maintenance agreement binding on all subsequent owners of land served by a private stormwater management facility. Such agreement shall provide for access to the facility at reasonable times for regular inspections by the Responsible Authority or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards.
- B. The applicant and/or owner shall record the agreement in the land records of (City Name).
- C. The agreement shall also provide that, if after notice by the Responsible Authority to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within a reasonable period of time (30 days maximum), the Responsible Authority may perform all necessary work to place the facility in proper working condition. The owner(s) of the facility shall be assessed the cost of the work and any penalties. This may be accomplished by placing a lien on the property, which may be placed on the tax bill and collected as ordinary taxes by the County/Municipality.

#### 9.3 Maintenance Responsibility

A. The owner of the property on which work has been done pursuant to this ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B. A maintenance schedule shall be developed for the life of any stormwater management facility and shall state the maintenance to be completed, the time period for completion, and who shall perform the maintenance. This maintenance schedule shall be printed on the approved stormwater management plan.

#### 10.0 APPEALS

Any person aggrieved by the action of any official charged with the enforcement of this ordinance, as the result of the disapproval of a properly filed application for a permit, issuance of a written notice of violation, or an alleged failure to properly enforce this ordinance in regard to a specific application, shall have the right to appeal in a manner prescribed in the regulations and procedures of the Responsible Authority and the State of Connecticut.

#### **11.0 SEVERABILITY**

If a court of competent jurisdiction holds any portion of this ordinance invalid or unconstitutional, such portion shall not affect the validity of the remaining portions of this ordinance. It is the intent of (City Name) that this ordinance shall stand, even if a section, subsection, sentence, clause, phrase, or portion may be found invalid.

#### 12.0 PENALTIES

Any person convicted of violating the provisions of this ordinance shall be guilty of a misdemeanor, and upon conviction thereof, shall be subject to a fine of not more than Five Thousand Dollars (\$5,000.00) or imprisonment not exceeding 1 year or both for each violation with costs imposed in the discretion of the court. Each day that a violation continues shall be a separate offense. In addition, the Responsible Authority may institute or cause to be instituted injunctive, mandamus or other appropriate action or proceedings of law to correct violations of this ordinance. Any court of competent jurisdiction shall have the right to issue temporary or permanent restraining orders, injunctions or mandamus, or other appropriate forms of relief.

#### **13.0 EFFECTIVE DATE**

And be it further enacted, that this ordinance shall take effect [number] days from the date it becomes adopted.



# ATTACHMENT B

Tolland Zoning Regulation Amendments Low Impact Development

# ARTICLE XXIV LOW IMPACT DEVELOPMENT

The Town of Tolland requires that Low Impact Development techniques be implemented on all development projects within the boundaries of the Town to protect high quality wetlands, watercourses, open water bodies and other sensitive areas from the impacts of point and non-point sources of storm water due to land development projects.

The concept of Low Impact Development (LID) utilizes many tools to reduce the impact of development on the environment. A primary benefit of LID is a better balance between Conservation of Natural Resources, growth, ecosystem protection and the public health.

## A. Goals of Low Impact Development

- Preserve Open Space within developments by using Cluster and Open Space subdivision standards as found in Section 170-38 of these regulations.
- Incorporate natural site elements (ridge lines, significant trees, open meadows, suitable soils for infiltration, wetlands and streams) into the design as features.
- Minimize land clearing and disturbance and increase natural landscape buffers at the limit of development to improve storm water management.
- Incorporate decentralized storm water management systems in to the site design, treat storm water runoff at its source, disconnect impervious areas.
- Maintain pre-development Times of Concentrations for post-development runoff Maintain sheet flow to the maximum extent possible, avoid concentrating runoff, reduce runoff volumes by infiltration.
- Provide water quality treatment to remove pollutants from storm water, pollution, modify human activities to reduce the introduction of pollutants into the environment.
- Encourage public education and participation in environmental protection within the community

# B. Benefits of Low Impact Development

There are many benefits associated with the use of Low Impact Development for all of the stakeholders in the development field. The three stakeholders in the development field are the environment, the municipality, and the developer. The benefits of LID for each stakeholder are stated below.

- 1. Environmental Benefits:
  - Preserve the biological and ecological integrity of natural systems through the preservation of trees and natural vegetation,
  - Protect the water quality by reducing sediment, nutrient and toxic loads to wetland/watercourse aquatic environments and also terrestrial plants and animals.

- 2. Municipality Benefits:
  - Increase collaborative public/private partnerships on environmental protection by the protection of regional flora and fauna.
  - Balance Growth needs with environmental protections.
  - Reduce municipal infrastructure and utility maintenance costs (roads, and storm water drainage systems)
- 3. Developer Benefits:
  - Reduce land clearing and earth disturbance costs, reduce infrastructure costs (roads, storm water conveyance and treatment systems)
  - Reduce storm water management costs by the reduction of structural components of a drainage system.
  - Increase quality of building lots and community marketability.

### C. Low Impact Development Strategies

- 1. Vegetation and Soils:
  - Retain native forest cover on undeveloped sites, restore vegetated area on previously cleared sites when possible as vegetation captures rainfall, thus increasing evapotranspiration and infiltration.
- 2. Site Design:
  - Define and locate Critical Resource areas, such as wetlands/watercourses, unusual forest features, and soils with moderate to high infiltrative capacities, locate roads, driveways, parking areas, home sites and other buildings away from critical resource areas
  - Minimize impervious surfaces such as roads, driveways, parking areas, and roof tops. Eliminate direct discharges of runoff from impervious areas to wetlands and watercourses
- 3. Storm Water Management:
  - Reduce reliance on the use of traditional storm water collection and conveyance systems (catch basins, pipes, and detention basins) and use small scale storm water management systems, such as bioretention, and rain gardens. Integrate source storm water controls during the design process.
  - Create a site design that slows runoff from rainfall events and increases the amount of time that runoff stays on the site. Incorporate multiple Low Impact Development treatment systems in a treatment train to increase the redundancy of the system to reduce the possibility of system failure
- 4. Education and Maintenance
  - Develop reliable long-term maintenance protocols for LID systems with built in enforcement provisions.

• Educate homeowners, building owners and landscape contractors on the appropriate maintenance requirements for LID systems

#### D. Types of LID Storm Water Systems:

- 1. Vegetated Systems:
  - Vegetated Buffers, Rain Gardens, Bioretention Systems, Water Quality Swales (wet and dry), Grass Filter Strips, Vegetated Level Spreaders, and Vegetated Roofs

#### 2. Infiltration Systems:

- Soil Amendments, Surface Sand Filters, Underground Sand Filters, Gravel Infiltration Trenches, Underground Infiltration Systems, (large diameter perforated PVC pipes and galleries), and Tree Wells
- 3. Surface Treatment Systems:
  - Permeable Pavement, Permeable Concrete, Concrete or PVC Pavers with gravel or grass surface
- 4. Storm Water Ponds and Wetland Systems:
  - Wet Ponds, Multiple Ponds in series, Gravel Wetland Systems, Micropool extended detention pond, Shallow Wetlands, Pond/wetland system, and Extended detention ponds

Refer to Town of Tolland Design Manual for more information on individual systems.

References:

1. Low-Impact Development Design Strategies – An Integrated Design Approach Prepared by: Prince George's County, Maryland; Department of Environmental

Resources, Programs and Planning Division; June 1999 2. Low-Impact Development Hydrologic Analysis

Prepared by: Prince George's County, Maryland; Department of Environmental Resources, Programs and Planning Division; July 1999

3. LOW IMPACT DEVELOPMENT – Technical Guidance Manual for Puget Sound; January 2005

Prepared by Puget Sound Action Team \* Washington State University Pierce County Extension

4. 2004 Connecticut Stormwater Quality Manual by the Connecticut Department of Environmental Protection

5. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control by The Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection



# ATTACHMENT C

# Example LID Site Design Credit System

### LOW IMPACT DEVELOPMENT (LID) SITE DESIGN CREDIT SYSTEM

# DRAFT

The Low Impact Development (LID) Site Design Credits encourage environmentally sensitive site design and Low Impact Development techniques for managing stormwater that minimize impervious surfaces and preserve natural hydrologic conditions. The credits allow project proponents to reduce or eliminate the structural stormwater BMPs otherwise required to meet Standards 3 and 4 by directing stormwater runoff to qualifying pervious surfaces that provide recharge and treatment.

## Available LID Site Design Credits

There are five types of LID credits that can be obtained:

- Credit 1 Natural Area Conservation,
- Credit 2 Environmentally Sensitive Development,
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area,
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area,
- Credit 5 Sheet Flow to Buffer.

The credits may be used to reduce the required Groundwater Recharge Volume (GRV) and the required Water Quality Volume (WQV) provided that any pervious surfaces used to treat and infiltrate stormwater runoff meet the requirements set forth herein. A proponent of a project that is eligible for the site design credit is required to comply with all other applicable stormwater management standards. The application of these credits does not relieve the design engineer or reviewer from the standard of engineering practice associated with safe conveyance of stormwater runoff and good drainage design.

# Not Eligible for Credits

The LID Site Design Credits may <u>not</u> be applied to reduce the required Groundwater Recharge Volume and the required Water Quality Volume:

- At sites where stormwater runoff is directed to non-permeable soils, such as bedrock and soils classified as Hydrologic Soil Group D; and
- At sites with urban fill, soils classified as contaminated pursuant to the Connecticut Remediation Standards Regulations, and soils with seasonal high groundwater groundwater elevation within 2 feet of the land surface.

Sites with land uses with higher potential pollutant loads are not eligible for Credit No. 2.

Sites with land uses with higher potential pollutant loads are eligible for Credits 3 and 4, provided that no runoff from the areas or activities that may generate runoff with higher potential pollutant loads is directed to the pervious surfaces used to satisfy the credit, and provided further that the proposal satisfies all the other requirements set forth herein.



Runoff from metal roofs is only eligible for Credit 3 when the metal roof is located outside a recharge areas for public water supplies (groundwater and surface water supplies) and the building is not used for industrial purposes.

Runoff from green roofs is not eligible for Credit 3.

1. Natural Area Conservation Credit

A credit is given when natural areas are conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. A simple WQV credit is granted for all conservation areas permanently protected under conservation easements. Under this credit, the design engineer can substract the conservation areas from the total site area when computing the water quality volume. The volumetric runoff coefficient, R, is still based upon the percent impervious cover for the entire site. As an additional incentive, the post-development curve number (CN) for all natural areas permanently protected can be assumed to be woods in good condition when calculating the total site CN.

Minimum Criteria for Credit:

- The area shall not be disturbed during the construction process.
- The area shall be protected from having the limits of disturbance clearly shown on all construction and mitigation plans and shall be delineated in the field.
- The area shall be located within an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- The area shall be located on the development project site.
- 2. Environmentally Sensitive Development Credit

This credit is given for environmentally sensitive site design techniques that "cluster development" or reduce development scale, to leave a significant amount of the site undisturbed in its natural state. If a site is designed, constructed, operated and maintained in accordance with the requirements of this credit, the credit eliminates the need for structural practices to treat the WQV (Standard 4) and GRV (Standard 5) for low density or cluster residential developments.

### Minimum Criteria for Credit:

#### Single Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.

#### Multiple Lot Development

- Total site impervious cover is less than 15%.
- Lot size shall be at least 1 acre if clustering techniques are not used.

- If clustering techniques are used, the average lot shall not be less than \_\_\_\_\_ square feet, which is the minimum residential lot size as identified in the Town of \_\_\_\_\_ Building Zone Regulations.
- Rooftop runoff is disconnected in accordance with the criteria listed in Credit 3 and qualifying pervious areas are used to convey runoff from roads and driveways instead of curb and gutter systems in accordance with the criteria listed in Credit 4.
- A minimum of 25% of the site is placed in a natural conservation area maintained by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.
- 3. Rooftop Runoff Directed to Qualifying Pervious Area Credit

This credit is available when rooftop runoff is directed to a qualifying pervious area where it can either infiltrate into the soil or flow over it with sufficient time and reduced velocity to allow for filtering. Qualifying pervious areas are relatively flat locations, where the discharge is directed via sheet flow and not as a point source discharge. The credit may be obtained by grading the site to induce sheet flow over specially designed flat vegetated areas or bioretention areas that can treat and infiltrate rooftop runoff. If rooftop runoff is adequately directed to a qualifying pervious area, the rooftop area can be deducted from total impervious area, therefore reducing the required WQV and the size of the structural treatment practices.

Minimum Criteria for Credit:

- To take credit for rooftop disconnection associated with a land use with higher potential pollutant loads, the rooftop runoff must not commingle with runoff from any paved surfaces or activities or areas on the site that may generate higher pollutant loads.
- Disconnection shall cause no basement seepage.
- The contributing area of the rooftop to each disconnected discharge point (gutter pipe) shall not exceed 1,000 square feet.
- The length of the qualifying pervious area shall be 75 feet or greater.
- The width of the qualifying pervious area (in feet) shall be equal to or greater than the roof length. For example, if a roof section is 20 feet wide by 50 feet long (1,000 ft2 roof), the width of the qualifying pervious area shall be at least 50 feet.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the disconnection length is less than 75 feet.
- Although they may abut, there shall be no overlap between qualifying pervious areas. For example, the runoff from two 1,000 square foot sections of roof must be directed to separate qualifying pervious areas. They may not be directed to the same area.
- The lot must be greater than \_\_\_\_\_ square feet.
- The slope of the qualifying pervious area shall be less than or equal to 5%.
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage reconnection to the stormwater management system.
- Where a gutter/downspout system is not used, the rooftop runoff must be designed to sheet flow at low velocity away from the structure housing the roof.
- Qualifying pervious areas should be located on relatively permeable soils (HSG "A" and "B"). A soil evaluation by a Registered Professional Engineer or soil scientist is required to confirm the soil type. The soil evaluation shall also confirm that the depth to groundwater is 2 feet or more and that the long-term saturated hydraulic conductivity of

the soil is at least 0.17 inches/hour. The soil evaluation must identify the soil texture, Hydrologic Soil Group and depth to groundwater. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG "C"), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction of the soil in the qualifying pervious area, construction vehicles must not be allowed to drive over the area. If it becomes compacted, the soil must be amended, tilled and revegetated to restore its infiltrative capacity once construction is complete.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area Credit

Credit is given for practices that direct runoff from impervious roads, driveways, and parking lots to pervious areas where plants provide filtration (through sheet flow) and infiltration into the soil can occur. This credit can be obtained by grading the site to promote overland vegetative filtering and infiltration. This credit is available for paved driveways, roads, and parking lots associated with all land uses, except for high-intensity parking lots that generate 1,000 or more vehicle trips per day or runoff not segregated from land uses with higher potential pollutant loads.

Disconnected impervious areas can be subtracted from the site impervious area when computing the WQV. In addition, disconnected impervious surfaces can be used to reduce the GRV.

Minimum Criteria for Credit:

- The maximum contributing impervious flow path length shall be 75 feet.
- The length of the qualifying pervious area must be equal to or greater than the length of the contributing impervious area.
- Dry wells, rain gardens, or other filtration/infiltration treatment practices may be utilized to compensate if the site cannot meet the required length of the qualifying pervious area.
- The width of the qualifying pervious area shall be no less than the width of the contributing impervious surface. For example, if a driveway is 15 feet wide, the qualifying pervious area width shall be no less than 15 feet.
- The entire qualifying pervious area shall be on a slope less than or equal to 5%.
- The impervious area draining to any one discharge location cannot exceed 1,000 square feet.
- Qualifying pervious areas should be located on relatively permeable soils (HSGs A and B). A soil evaluation is required to confirm the soil type. The soil evaluation shall also

confirm that the depth to groundwater is 2 feet or more, and that the long term saturated hydraulic conductivity of the soil is at least 0.17 inches/hour. For saturated hydraulic conductivity, use Rawls Rates for the actual location where the qualifying pervious area is located.

- If a qualifying pervious area is located in less permeable soils (HSG C), the water table depth and permeability shall be evaluated by a Registered Professional Engineer to determine if a spreading device is needed to sheet flow stormwater over vegetated surfaces.
- To prevent compaction, construction vehicles must not be allowed to drive over the qualifying pervious area. If compacted, the soil must be amended, tilled, and revegetated once construction is complete to restore its infiltrative capacity.
- Runoff from driveways, roadways and parking lots may be directed over soft shoulders, through curb cuts, or level spreaders to qualifying pervious areas. Measures must be employed at the discharge point to the qualifying pervious area to prevent erosion and promote sheet flow.
- The qualifying pervious area may not include any wetland areas.
- The qualifying pervious area must be owned or controlled (e.g., drainage easement) by the property owner.
- For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be taken, not both.
- 5. Sheet Flow to Buffer Credit

This credit is given when stormwater is effectively treated by a natural buffer to a stream or forested area. Effective treatment is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site. This credit includes subtracting the area draining by sheet flow to a buffer from the total area in the WQV calculation and the area draining to the buffer contributes to the GRV requirement.

Minimum Criteria for Credit:

- The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the bank elevation of a stream or the boundary of a wetland.
- The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.
- The average contributing overland slope to and across the stream buffer shall be less than or equal to 5%.
- Runoff shall enter the stream buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained.
- The credit is not applicable if rooftop or non-rooftop disconnection is already provided (i.e., no double counting).
- Stream buffers shall remain unmanaged other than routine debris removal.
- Buffers shall be protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area.



# ATTACHMENT D

# Example Stormwater Management Standards

# STORMWATER MANAGEMENT STANDARDS

## DRAFT

The following stormwater standards establish minimum stormwater management criteria for all development and redevelopment activities in the Town of \_\_\_\_\_\_ and reflect the unique natural resources and development characteristics of the Town of \_\_\_\_\_\_. These standards encourage groundwater recharge and reduce the potential for stormwater discharges to cause or contribute to pollution of surface water and groundwater. The standards also promote low impact development (LID) techniques, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater BMPs. The standards are also consistent with the recommended stormwater management approaches and design guidance contained in the Connecticut Department of Environmental Protection *Connecticut Stormwater Quality Manual.* 

Standard 1: Stormwater Management Practices

Stormwater Management Practices shall be used to meet the conditions below for control of peak flow and total volume of runoff, water quality protection, and maintenance of on-site groundwater recharge.

- A. Stormwater management practices shall be selected to accommodate the unique hydrologic and geologic conditions of the site.
- B. Proponents shall demonstrate how the proposed control(s) will comply with these standards, including the control of peak flow and total volume of runoff, protection of water quality, and recharge of stormwater to groundwater. The proponent must provide design calculations and other back-up materials necessary.
- C. At the discretion of the Stormwater Authority, stormwater management systems shall incorporate designs that allow for shutdown and containment in the event of an emergency spill or other unexpected contamination event.
- D. Pumping of stormwater is prohibited as part of a proposed stormwater management system design because of the significant runoff volumes, maintenance requirements, standby power requirements, and overflows associated with large storms. All other feasible approaches must be investigated to avoid the use of pumps for stormwater management. If the event the Stormwater Authority determines that pumps are necessary, the proponent must submit required backup information as described in the \_\_\_\_\_\_ Stormwater Drainage Manual.

Standard 2: Low Impact Development

A. Project proponents must consider the use of environmentally-sensitive site design and Low Impact Development (LID) techniques to reduce runoff rates, volumes, and pollutant loads. The proponent shall demonstrate why the use of environmentallysensitive site design and LID techniques is not possible before proposing to use traditional, structural stormwater management measures. Such environmentally-sensitive site design and LID techniques include, but are not limited to:



- b. Minimize grading and clearing;
- c. Delineate potential building envelopes, avoiding environmental resource areas and appropriate buffers by clustering buildings and reducing building footprints;
- d. Develop methods to minimize impervious surfaces, and protect and preserve open space. Reduce impervious surfaces wherever possible through alternative street design, such as omission of curbs and use of narrower streets, shared driveways and through the use of shared parking areas;
- e. Lengthen flow paths and maximize sheet flow;
- f. Use nonstructural, low-tech methods including open drainage systems, disconnection of roof runoff, and street sweeping where possible;
- g. Use native plant vegetation in buffer strips and in rain gardens (small planted depressions that can trap and filter runoff);
- h. Use drought-resistant vegetation;
- i. Manage runoff using smaller, decentralized, low-tech stormwater management techniques to treat and recharge stormwater close to the source in place of a centralized system comprised of closed pipes that direct all the drainage from the entire site into one large detention basin.
- j. Integrate management techniques into the site design to create a hydrologically functional lot or development site, including but not limited to grass swales along roads, rain gardens, buffer strips, green roofs, tree box filters, use of amended soils that will store, filter and infiltrate runoff, bioretention areas (rain gardens), rain barrels and cisterns, and permeable pavement.

[NOTE: An "LID Site Design Credit" is available to encourage proponents to incorporate LID techniques in their projects. In exchange for directing runoff from roads and driveways to vegetated open areas, preserving natural areas on development sites, or directing runoff to landscaped or undisturbed areas, the LID credit system allows developers to reduce in size or eliminate the traditional BMPs used to treat and infiltrate stormwater. By using this credit, proponents can reduce the volume of stormwater subject to the Water Quality and Groundwater Recharge Standards. The proposed LID Site Design Credits include:

- Credit 1 Natural Area Conservation
- Credit 2 Environmentally Sensitive Development
- Credit 3 Rooftop Runoff Directed to Qualifying Pervious Area
- Credit 4 Roadway, Driveway or Parking Lot Runoff Directed to Qualifying Pervious Area]



# Standard 3: Protection of Natural Hydrology

[NOTE: These standards are further reinforced through the LID Credit System.]

- A. Site disturbance shall be minimized. The area outside the project disturbance area shall be maintained at natural grade and retaining existing, mature vegetated cover. The project disturbance area shall be depicted on the design, construction, and mitigation plans and shall be delineated in the field prior to commencing land disturbance activities. The project disturbance area shall include only the area necessary to reasonably accommodate construction activities.
- B. Soil compaction on site shall be minimized by using the smallest (lightest) equipment possible and minimizing travel over areas that will be revegetated (e.g., lawn areas) or used to infiltrate stormwater (e.g., bioretention areas). In no case shall excavation equipment be placed in the bottom of an infiltration area during construction.
- C. Development shall follow the natural contours of the landscape. A grading plan shall be submitted as part of the site plan review process showing both existing and finished grades for the proposed development. The original, natural grade of a lot shall not be raised or lowered more than 10 feet at any point for the construction of any structure or improvements. Retaining walls must comply with the requirements of the Building Zone Regulations. Basements that reach grade should be constructed as walk-outs.
- D. No ground disturbed as a result of site construction and development shall be left as exposed bare soil at project completion. All areas exposed by construction, with the exception of finished building, structure, and pavement footprints, shall be decompacted (aerated) and covered with a minimum thickness of six inches of non-compacted topsoil, and shall be subsequently planted with a combination of living vegetation such as grass, groundcovers, trees, and shrubs, and other landscaping materials (mulch, loose rock, gravel, stone).
- E. Priority shall be given to maintaining existing surface waters and systems, including, but not limited to, perennial and intermittent streams, wetlands, vernal pools, and natural swales.
- F. Where roadway or driveway crossings of surface waters cannot be eliminated, disturbance to the surface water shall be minimized, hydrologic flows shall be maintained, there shall be no direct discharge of runoff from the roadway to the surface water, and the area shall be revegetated post-construction.
- G. Roadway and driveway crossings over streams shall comply with the Connecticut Department of Environmental Protection *Stream Crossing Guidelines* (as amended) to accommodate high flows, minimize erosion, and support aquatic habitat and wildlife passage.

#### Standard 4: Post-Development Peak Discharge

A. Stream Channel Protection – The two-year, 24-hour post-development peak flow rate shall be (a) less than or equal to 50 percent of two-year, 24-hour storm pre-development
peak flow rate and (b) less than or equal to the one-year, 24-hour storm predevelopment peak flow rate. This Standard may be waived under certain conditions, as described in the *Connecticut Stormwater Quality Manual*.

- B. Conveyance Protection The 10-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows within internal and external conveyance systems associated with stormwater treatment practices.
- C. Peak Runoff Attenuation The 10-year and 25-year, 24-hour post-development peak flow rate shall not exceed the pre-development peak flow rate for all flows off-site. This Standard may be waived for sites that discharge to a large river, lake, estuary, tidal waters, or land subject to coastal storm flows, as described in the *Connecticut Stormwater Quality Manual*.
- D. Emergency Outlet Sizing size the emergency outlet to safely pass the postdevelopment peak runoff from the 100-year storm in a controlled manner without eroding the outlet works and downstream drainages and property.
- E. Measurement of peak discharge rates shall be calculated using point of discharge or the downgradient property boundary. The topography of the site may require evaluation at more than one location if flow leaves the property in more than one direction. Calculations shall include runoff from adjacent upgradient properties. A proponent may demonstrate that a feature beyond the property boundary is more appropriate as a design point.
- F. A downstream hydrologic analysis must be performed to determine whether peak flows, velocities, and hydraulic effects are attenuated by controlling the 2-year, 10-year, 25-year and 100-year, 24-hour storms. This analysis must be performed at the outlet(s) of the site and at critical downstream locations (stream confluences, culverts, other channel constrictions, and flood-prone areas) to a confluence point where the site drainage area represents 10% of the total drainage area above that point.
- G. The proponent shall provide pre- and post-development total runoff volumes. The post-development total runoff volume shall be equal to 90 to 110 percent of the predevelopment total runoff volume (based on a 2-year, 10-year, 25-year, and 50-year, 24-hour storms). Calculations shall include runoff onto the project site from adjacent upgradient properties.



## Standard 5: Water Quality

- A. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspend Solids (TSS). This standard is met when:
  - a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
  - b. Stormwater management practices are sized to treat the Water Quality Volume or Water Quality Flow;
  - c. Appropriate pretreatment is provided in accordance with the \_\_\_\_\_\_ Stormwater Drainage Manual; and
  - d. Stormwater treatment practices are maintained as designed.
- B. Compliance with the groundwater recharge requirements under Standard 6 shall be considered adequate to meet the treatment standards specified in 5.A above for the Groundwater Recharge Volume.

Standard 6: Groundwater Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized to the maximum extent practicable through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater management practices, and good operation and maintenance. At a minimum the annual recharge from the post-development site shall approximate the annual recharge from the pre-development or existing site conditions. Infiltration of stormwater runoff from land uses with higher potential pollutant loads near or to a critical area is prohibited. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to a critical area, taking into account site-specific factors.

A. For all areas covered by impervious surfaces, the total volume of recharge that must be maintained shall be calculated as follows:

[NOTE: The NRCS classifies soils into four hydrologic groups A thru D indicative of the minimum infiltration obtained for a soil after prolonged wetting. Group A soils have the lowest runoff potential and the highest infiltration rates, while Group D soils have the highest runoff potential and the lowest infiltration rates. The prescribed stormwater volume that is required to be infiltrated must be determined using existing site conditions and the infiltration rates are set forth below.

Hydrologic Group Volume to Recharge (x Total Impervious Area)

A gravels, sand, loamy sand or sandy loam 0.6 inches of runo	ff
B silty loam 0.35 inches of runo	<mark>ff</mark>
C sandy clay loam 0.25 inches of runo	<mark>ff</mark>
D clay, silty clay loam, sandy clay, silty clay 0.10 inches of runo	<mark>ff</mark>

For each NRCS Hydrologic Group on the site, the volume that must be recharged equals the recharge volume above multiplied by the total area within that NRCS Hydrologic Group

that is impervious. Infiltration of these volumes must be accomplished using appropriate BMPs. These BMPs include bioretention areas, rain gardens, dry wells, infiltration basins, infiltration chambers and galleys, infiltration trenches, leaching catch basins, and vegetated filter strips. Roof runoff may be infiltrated without any treatment, and that infiltrated volume may be used to satisfy the total recharge volume and reduce the water quality volume.

To size infiltration BMPs, proponents may use either the static method or the dynamic infiltration method. The static method assumes that the entire volume is discharged to storage instantaneously, is easy to calculate and generally results in a larger recharge volume than the dynamic method. The dynamic method assumes that that the recharge BMP is infiltrating as it fills and requires certain technical calculations that take this recharge into account when sizing the infiltration BMP.]

- B. When designing infiltration BMPs, adequate subsurface information needs to be obtained. Infiltration systems must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). Surface infiltration structures must be able to drain fully within 72 hours. In addition, there must be at least a three-foot separation from the bottom of the infiltration structure and the seasonal high ground water table or bedrock/ledge. Soils under BMPs shall be scarified or tilled to improve infiltration.
- C. Pre-Treatment Requirements All runoff must be pretreated prior to its entrance into the groundwater recharge device to remove materials that would clog the soils receiving the recharge water. Pretreatment devices shall be provided for each BMP, shall be designed to accommodate a minimum of one-year's worth of sediment, shall be designed to capture anticipated pollutants, and be designed and located to be easily accessible to facilitate inspection and maintenance.
- D. Infiltration of stormwater may be prohibited or subject to additional pre-treatment requirements, at the discretion of the Stormwater Authority, for 1) land uses with higher potential pollutant loads (see Standard 7), 2) areas with soil or groundwater contamination such as brownfield sites, and 3) public drinking water aquifer recharge areas, wellhead protection areas, or water supply intake protection areas.

Standard 7: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads require the use of specific source control and pollution prevention measures and specific stormwater management practices, approved by the Stormwater Authority for such use.

- A. The following uses or activities are considered "high-load areas," with the potential to contribute higher pollutant loads to stormwater, and must comply with the requirements set forth in this section.
  - a. Areas within an industrial site that are the location of activities subject to the DEP Industrial Stormwater General Permit (except where a No Exposure Certification for Exclusion from the General Permit has been executed)
  - b. Vehicle salvage yards and recycling facilities
  - c. Auto fueling facilities (gas stations and other facilities with on-site vehicle fueling)



- d. Exterior fleet storage areas (cars, buses, trucks, public works equipment)
- e. Exterior vehicle service, maintenance and equipment cleaning areas
- f. Commercial parking lots with high intensity use (1,000 vehicle trips per day or more). Such areas typically include fast food restaurants, convenience stores, high turnover (chain) restaurants, shopping centers and supermarkets.
- g. Road salt storage facilities (if exposed to rainfall)
- h. Commercial nurseries
- i. Non-residential facilities having uncoated metal roofs with a slope flatter than 20 percent.
- j. Outdoor storage and loading/unloading of hazardous substances or materials
- k. Facilities subject to chemical inventory reporting under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), if materials or containers are exposed to rainfall)
- I. Marinas (service, painting and hull maintenance areas).
- m. Confined disposal facilities, disposal sites, landfills or wastewater residuals landfills if stormwater that may come into contact with the confined disposal area, disposal site, landfill or wastewater residuals landfill may cause or contribute to the discharge of pollutants to wetlands, surface waters or ground water or otherwise result in a release or threat of release
- n. Other land uses and activities as designated by the Stormwater Authority
- B. In addition to implementation of BMPs for designing site-specific stormwater management controls, high-load areas shall provide a stormwater pollution prevention plan (SWPPP) describing methods for source reduction and methods for pretreatment.
- C. If a high-load area demonstrates, through a SWPPP, the use of BMPs that result in no exposure of regulated substances to precipitation or runoff or release of regulated substances, it shall no longer be considered a high-load area.
- D. Infiltration of stormwater from high-load areas are prohibited within critical areas (see Standard 8). Infiltration of stormwater from high-load areas outside of critical areas (see Standard 8) is allowed. For such discharges, proponents should use one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- E. For high-load areas, the following stormwater management practices may be used for treatment only if lined or sealed: Sand Filters/Organic Filters (may also be used for pretreatment), Wet Retention Basins, Detention Basins, Constructed Wetlands, Bioretention Areas, including rain gardens (underdrain required).

Standard 8: Critical Areas

- A. Critical Areas are defined as:
  - a. Shellfish growing areas,
  - b. Bathing beaches,
  - c. Recharge areas for public water supplies (groundwater and surface water supplies),
  - d. Any listed water bodies and wetlands as designated by the Town of \_\_\_\_\_\_.



- B. The stormwater BMPs approved for discharges to or near critical areas shall be designed to treat the Water Quality Volume (WQV) for the post-development site. These practices are included in the *Connecticut Stormwater Quality Manual* and the \_\_\_\_\_\_ Stormwater Drainage Manual. These stormwater discharges require the use of a treatment train that provides 80% TSS removal prior to discharge. This treatment train shall include at least one pretreatment BMP, one terminal treatment BMP, and one infiltration BMP.
- C. Infiltration of stormwater from high-load areas are prohibited within critical areas.

## Standard 9: Parking

- A. Snow may not be plowed to, dumped in, or otherwise stored within 15 feet of a wetland or waterbody, except for snow that naturally falls into this area. Snow storage areas shall be shown on the site plan to comply with these requirements.
- B. At the discretion of the Stormwater Authority, parking spaces may be required to be constructed of a pervious surface (i.e. grass, pervious asphalt, pervious pavers).
- C. Infrequently used emergency access points or routes shall be constructed with pervious surfaces (i.e. grass, pervious asphalt, pervious pavers).

### Standard 10: Redevelopment

- A. Redevelopment projects are defined to include the following:
  - a. Maintenance and improvement of existing roadways including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving;
  - b. Development, rehabilitation, expansion and phased projects on previously developed sites; and
  - c. Remedial projects specifically designed to provide improved stormwater management.
- B. Redevelopment of previously developed sites must meet Standards 3, 4, 5, and 6 to the maximum extent practicable as determined by the Stormwater Authority. To make this determination the Stormwater Authority shall consider the benefits of redevelopment as compared to development of raw land with respect to stormwater. All projects involving redevelopment or reuse activities shall also improve existing conditions.
- C. For all redevelopment projects, new stormwater controls (retrofitted or expanded) must be incorporated into the design and result in a reduction in annual stormwater pollutant loads from the site. Proponents of redevelopment projects shall make full use of all opportunities for controlling the sources of pollution and to incorporate environmentally sensitive site design and low impact development techniques. This is particularly important for constrained redevelopment sites where it is not possible to install BMPs that treat the entire water quality volume. All redevelopment projects shall also incorporate measures that will address water quantity issues by reducing the peak and total runoff from the site and by increasing groundwater recharge. Actions to improve existing conditions should address known water quality and water quantity

problems such as documented failures to meet the Surface Water Quality Standards, low stream flow, or repeated flood events.

- D. Redevelopment activities shall not infiltrate stormwater through materials or soils containing regulated or hazardous substances or areas with soil or groundwater contamination.
- E. The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 10. Any development on previously undeveloped portions of a property must comply fully with all of the other Stormwater Management Standards.

Standard 11: Construction Erosion and Sediment Control

- A. A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) must be developed and implemented in accordance with the *Connecticut Guidelines for Soil Erosion and Sediment Control* (as amended).
- B. All development, regardless of the area of disturbance, must implement erosion and sedimentation controls prior to and during construction.

Standard 12: Easements

- A. Where a site is traversed by or requires construction of a watercourse or drainageway, an easement of adequate width may be required for such purpose.
- B. There shall be at least a 10-foot wide permanent maintenance easement corridor on each side of any stormwater management system element, as well as at least a 10-foot wide temporary construction easement corridor contiguous with the boundaries of the permanent easement. For systems using underground pipes, the maintenance easement may need to be wider, depending on the depth of the pipe.

Standard 13: Operation and Maintenance

A. A long-term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed. This plan shall be reviewed and approved as part of the review of the proposed permanent (post-construction) stormwater management system and incorporated in the Stormwater Management Plan. Execution of the O&M Plan shall be considered a condition of approval of a stormwater management permit application. If the stormwater management system is not dedicated to the town pursuant to a perpetual offer of dedication, the Stormwater Authority may require a project proponent to establish a homeowners association or similar entity to maintain the stormwater management system. For high-load areas or activities under Standard 7, the O&M Plan shall include implementation of a SWPPP.



- B. The O&M Plan shall at a minimum identify:
  - a. Stormwater management system(s) owners;
  - b. The party or parties responsible for operation and maintenance including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
  - c. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
  - d. Plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
  - e. Description and delineation of public safety features; and
  - f. Estimated operations and maintenance budget.
- C. The stormwater management system owner is generally considered to be the landowner of the property, unless other legally binding agreements are established.
- D. The proponent shall include with the stormwater management permit application a mechanism for implementing and enforcing the O&M Plan. The proponent shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The proponent shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs. In the event that the stormwater BMPs will be operated and maintained by an entity, municipality, state agency or person other than the sole owner of the lot upon which the stormwater management facilities are placed, the proponent shall provide a plan and easement deed that provides a right of access for the legal entity to be able to perform said operation and maintenance functions, including inspections.

[NOTE: It is recommended that the stormwater management permit include a condition requiring that the responsible party provide a copy of the permit approval and the legal instrument to each unit or lot owner at or before the purchase of each unit or lot to be serviced by the stormwater BMPs.]

- E. The owner shall keep the O&M Plan current, including making modifications to the O&M Plan as necessary to ensure that BMPs continue to operate as designed and approved. Proposed modifications of O&M Plans including, but not limited to, changes in inspection frequency, maintenance schedule, or maintenance activity along with appropriate documentation, shall be submitted to the Stormwater Authority for review and approval within thirty days of change.
- F. Parties responsible for the operation and maintenance of a stormwater management system shall keep records of the installation, maintenance and repairs to the system, and shall retain records for at least five years.
- G. Parties responsible for the operation and maintenance of a stormwater management system shall provide records of all maintenance and repairs during inspections and/or upon request.
- H. When the responsible party fails to implement the O&M Plan, including, where applicable, the SWPPP, the municipality is authorized to assume responsibility for their



implementation and to secure reimbursement for associated expenses from the responsible party, including, if necessary, placing a lien on the subject property.

Standard 14: Stormwater Management Plan

A. All stormwater management permit applications must include a Stormwater Management Plan. This plan shall document how the proposed project complies with the stormwater standards and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the State of Connecticut.

## Standard 15: Illicit Discharges

A. All illicit discharges to the stormwater management system are prohibited.

[NOTE: The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities:

- Landscape irrigation,
- Uncontaminated groundwater discharges such as pumped groundwater, foundation drains, water from crawl space pumps, and footing drains,
- Irrigation water,
- Lawn watering runoff,
- Residual street wash water,
- Discharges of uncontaminated air conditioner condensate,
- Discharges of flows from fire fighting activities,
- Discharges containing no chemical additives (including chlorine) from the flushing of fire protection systems, and
- Naturally occurring discharges such as rising groundwater, uncontaminated groundwater infiltration, springs, and flows from riparian habitats and wetlands.]



# Appendix C

Targeted Stream Corridor Recommendations













**Tucker Brook Subwatershed** Watershed Management Plan - Stream Corridor Recommendations

825

1,650 Feet



Watershed Management Plan - Stream Corridor Recommendations

Disciplines to Deliver

740

1,480 Feet





Gages Brook Subwatershed Watershed Management Plan - Stream Corridor Recommendations













# Appendix D

Stormwater Retrofit Concept Designs



LMAN

CTB



LMAN





MS VIEW:

LMAN:



LMAN:



CTB:

MS VIEW:

LMAN:

:: C2:

GRAPHIC SCALE

78 INTERSTATE DR

WEST SPRINGFIELD, MA 01089 413.452.0445 TANKED

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT



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MS VIEW:

GRAPHIC SCALE

78 INTERSTATE DR

WEST SPRINGFIELD, MA 01089 413.452.0445

LMAN:

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

7



CONNECTICUT

TANKERHOOSEN RIVER WATERSHED

GRAPHIC SCALE

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STORMWATER STRUCTURE PLANTING ZONES								
ZONE	DESCRIPTION							
I	DEEP WATER AREA	INUNDATED WITH I TO 3 FEET OF WATER THROUGHOUT THE GROWING SEASON						
2	SHALLOW WATER BENCH	INUNDATED WITH 0.5 TO I FOOT OF WATER THROUGHOUT THE GROWING SEASON						
3	SHORELINE FRINGE	Regulary inundated, ranging from 0.5 ft above to 0.5 ft.below the permanent pool elevation						
4	Riparian Fringe	PERIODICALLY OR SEASONALLY INUNDATED, FROM 0.5 FT. ABOVE THE PERMANENT POOL ELEVATION TO THE APPROXIMATE 2- YEAR STORM WATER SURFACE ELEVATION						
5	FLOODPLAIN TERRACE	INFREQUENTLY OR IRREGULARLY INUNDATED, FROM THE APPROXIMATE 2- YEAR WATER SURFACE ELEVATION TO THE $10-$ YEAR WATER SURFACE ELEVATION						
6	UPLAND	Above the 10- year water surface elevation						

### GENERAL PLANTING NOTES:

Grasses, Forbs, and Sedges in Zones 1, 2 and 3. Plant selections should be appropriate for the field environmental conditions of the planting site.

•Zone 1 - Deep Water Emergents: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 2 herbaceous species shall be selected, for placement in each of the Zone 1 planting areas.

•Zone 2 - Shallow Water Bench Emergents: The designer should employ a method of

"triangularspacing", and an approximate density of about 0.5 plants per square foot. A minimum of 3 herbaceous species shall be selected, for placement in each of the Zone 2 planting areas. •Zone 3 - Shoreline Fringe: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 4 herbaceous species shall be selected, for placement in each of the Zone 3 planting areas.

Grasses, Forbs, and Sedges (Seed Mixes) in Zones 4, 5 and 6.

•Zone 4 - Riparian Fringe, Zone 5 - Floodplain Terrace and Zone 6 - Planting zones shall receive preparation and seeding, with an appropriate seed mix, for establishing Native Wet Meadow, or Native Dry Meadow.

Trees, Shrubs, and Vines in Zones 4, 5 and 6 (ALL BMP's EXCEPT BIORETENTION): In designing and executing the plantings for Zone 4 - Riparian Fringe, Zone 5 - Floodplain Terrace and Zone 6 -

Upland Plantings, the designer should consider the following: •Employ a method of "random spacing", and a density of 1000 stems per acre. A full 70% of the species shall be Large Maturing Deciduous Tree species, and 30% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species.

• A minimum of 5 Large Maturing Deciduous Tree species shall be selected for each planting area and a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.

•The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.

•In addition to the 5 large stock tree and the 3 small stock tree requirements, each planted area shall contain, interspersed randomly among the stock, large maturing decidious trees at a planting density of 20 trees per acre, and a minimum size of two-inch caliper (2"cal.).

Trees, Shrubs, and Vines in BIORETENTION AREAS ONLY: In designing and executing the plantings for Bioretention Areas, the designer should consider the following:

•Employ a method of "random spacing", and a density of 2000 stems per acre. A maximum of 10% of the species shall be Large Maturing Deciduous Tree species, and 90% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species. Up to 25% of the Small Maturing Tree requirement (90%) may be substituted with certain grasses that grow to 3-ft to 5-ft in height if planted in five or seven-gallon pots.

•A minimum of 3 Large Maturing Deciduous Tree species shall be selected for each planting area, and

a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.

•The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT PLANTING NOTES

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

DET 7

78 INTERSTATE DR



## Appendix E

Site-Specific Stormwater Retrofit Cost Estimates

## Site-Specific Stormwater Retrofit Cost Estimates – Tankerhoosen River Watershed Management Plan

					Design, Permitting, Contingency				espan			ost/yr
	Unit Cost	C	Units	Construction Cost (2009)	% Construction	Cost	Total Cost	Lifespan (yrs)	Annual Cost Over Lif	O&M (% Cost)	O&M (\$/yr)	Total Capitalized Co over lifespan
Tankerhoosen Lake												
Sediment Forebay	77,000	total, 2004 dollars (BEC estimate)	1	\$93,700	32%	\$30,000	\$123,700	30	\$6,310	6%	\$380	\$6,690
4 Deep Sump CBs, piping, and swale	20,000	total, 2004 dollars (BEC estimate)	1	\$24,300	32%	\$7,800	\$32,100	50	\$1,250	15%	\$190	\$1,440
Northeast School												
Bioretention Area 1	\$14.56	/ft <sup>2</sup> (commercial/ industrial area	2892	\$42,100	32%	\$13,500	\$55,600	15	\$4,660	8%	\$370	\$5,030
Bioretention Area 2	\$14.56	/ft <sup>2</sup> (commercial/ industrial area	2137	\$31,100	32%	\$10,000	\$41,100	15	\$3,440	8%	\$280	\$3,720
SW Basin	\$7.27	/ft <sup>3</sup> (developed area)	2495	\$18,100	32%	\$5,800	\$23,900	30	\$1,220	6%	\$70	\$1,290
Mount Vernon Apartments	Mount Vernon Apartments											
SW Basin	\$7.27	/ft <sup>3</sup> (developed area)	5862	\$42,600	32%	\$13,600	\$56,200	30	\$2,870	6%	\$170	\$3,040
Deep sump CBs	\$3,125.00	ea.	6	\$18,800	32%	\$6,000	\$24,800	50	\$960	20%	\$190	\$1,150
Fire Station (Route 30)	ta 03			+ - 1 /	222/	+ ( 000	+00 500				+	+
SW Basin	\$7.27	/ft° (developed area)	2976	\$21,600	32%	\$6,900	\$28,500	30	\$1,450	6%	\$90	\$1,540
Vegetated Swale	\$14.56	/ft-	59	\$900	32%	\$300	\$1,200	10	\$140	1%	\$10	\$150
Vernon Historical Society (Route 30)	20 41/0 71 (02¢)	/H <sup>3</sup>	1001	¢E E00	220/	¢1 000	¢7 200	10	¢040	60/	¢E0	¢010
Vegetated swale	\$11.56	/11 /ft <sup>2</sup>	657	\$9,500	32%	\$1,800	\$7,300	10	\$000 \$1./00	6%	00¢	\$910
ConnDOT Commuter Lot (Route 6/44 and L-3)	84 Interchange)	//1	037	\$9,000	3270	\$3,100	\$12,700	10	\$1,490	070	\$90	φ1,000
Vegetated swale	\$14.56	/ft <sup>2</sup>	532	\$7,700	32%	\$2,500	\$10,200	29	\$530	7%	\$40	\$570
SW Basin	\$7.27	/ft <sup>3</sup> (developed area)	7105	\$51,700	32%	\$16.500	\$68.200	30	\$3,480	6%	\$210	\$3,690
ConnDOT Commuter Lot (I-84, Exit 67)	· · · - ·			+ /		+ /	+ • • • - • •		+ = / . = =			+ = / = : =
SW Basin	\$7.27	/ft <sup>3</sup> (developed area)	5299	\$38,500	32%	\$12,300	\$50,800	30	\$2,590	6%	\$160	\$2,750
Vegetated Swale	\$14.56	/ft <sup>2</sup>	103	\$1,500	32%	\$500	\$2,000	10	\$230	7%	\$20	\$250
Gerber Technologies Office Building												
Sediment Forebay	\$50	/yd <sup>3</sup> of riprap	40	\$2,000	32%	\$600	\$2,600	30	\$130	30%	\$40	\$170
Discharge Channel	\$3.86	/ft2	2324	\$9,000	32%	\$2,900	\$11,900	30	\$610	10%	\$60	\$670
Lake Street School												
Bioretention	\$14.56	/ft² in commercial/ industrial area	4900	\$71,300	32%	\$22,800	\$94,100	15	\$7,880	8%	\$630	\$8,510
Note:	40/											
Kale of Inflation Used =	4%											
interest (discount) rate used =	1 %	1	1	1	1	1	1	1	1		1	1