Appendix A

Baseline Watershed Assessment
Watershed Field Inventories and Land Use Regulatory Review
(CD-ROM)
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
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END OF REPORT
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 sub-regional basin within the Hockanum River watershed (Figure 1-1). 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 1-1).

<table>
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<tr>
<th>Town Name</th>
<th>Town Acreage</th>
<th>Acreage in Watershed</th>
<th>% of Town in Watershed</th>
<th>% of Watershed</th>
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<td>Manchester</td>
<td>17,408</td>
<td>461</td>
<td>2.7</td>
<td>5.6</td>
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<td>Vernon</td>
<td>11,904</td>
<td>5,572</td>
<td>46.8</td>
<td>67.9</td>
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<tr>
<td>Tolland</td>
<td>25,856</td>
<td>1,547</td>
<td>5.9</td>
<td>18.6</td>
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<td>Bolton</td>
<td>9,920</td>
<td>646</td>
<td>6.5</td>
<td>7.9</td>
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<tr>
<td>Totals</td>
<td>65,088</td>
<td>8,226</td>
<td>100.0</td>
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A basic profile of the watershed is provided in Table 1-2. Later sections of this document provide more detailed information on these watershed characteristics.
Figure 1-1: Tankerhoosen River Watershed
Table 1-2: Profile of the Tankerhoosen River Watershed

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<tr>
<td>Area</td>
<td>12.85 square miles (8,226 acres)</td>
</tr>
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<td>Stream Length</td>
<td>approximately 17.2 miles</td>
</tr>
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<td>Subwatersheds</td>
<td>10 subwatersheds</td>
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<td>Jurisdictions</td>
<td>4 towns and cities</td>
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<td>Water Quality</td>
<td>2006 DEP Impaired Waters List for habitat for fish and other aquatic life</td>
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<td>Current Impervious Cover</td>
<td>9.8%</td>
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<td>Gages Brook</td>
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<td>Gages Brook South Tributary</td>
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<td>Lower Tankerhoosen River</td>
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<td>Walker Reservoir</td>
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<td>Lower Tankerhoosen River</td>
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<td>Middle Tankerhoosen River</td>
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<td>Tucker Brook</td>
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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 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.

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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 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).

4.2 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, 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 Figure 4-1). 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.
4.3 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.

4.4 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.

5.0  NATURAL RESOURCES

5.1  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 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. Figure 5-1 depicts the subwatersheds identified in this assessment, and Table 5-1 summarizes the basic characteristics of the identified subwatersheds.
### Table 5-1: Tankerhoosen River Subwatersheds

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

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 Water Quality

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. Table 5-2 summarizes the Connecticut Surface Water Quality Classifications.

Table 5-2: Connecticut Inland Surface Water Quality Classifications

<table>
<thead>
<tr>
<th>Designated Use</th>
<th>Class AA</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
<th>Class D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing/proposed drinking water supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential drinking water supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish and wildlife habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural and industrial use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Class C and D waters may be suitable for certain fish and wildlife habitat, certain recreational activities, industrial use, and navigation.

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

Figure 5-2 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. Table 5-3 summarizes the location and nature of the impairment.

**Table 5-3: Tankerhoosen River Watershed Impaired Waters**

<table>
<thead>
<tr>
<th>Location Description</th>
<th>Waterbody Segment Length</th>
<th>Impaired Designated Use</th>
<th>Use Support</th>
<th>Cause</th>
<th>TMDL Priority</th>
<th>Potential Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>From mouth at Hockanum River, upstream to Tankerhoosen Lake</td>
<td>1.51 miles</td>
<td>Habitat for Fish, Other Aquatic Life and Wildlife</td>
<td>P</td>
<td>Impairment Unknown</td>
<td>H</td>
<td>Source Unknown</td>
</tr>
</tbody>
</table>

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.
Figure 5-2: DEP Water Quality Classifications
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](image)

**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 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 5-8 depicts the extent and distribution of wetland soils in the Tankerhoosen River watershed based on Natural Resources Conservation Service soil classifications. Figure 5-8 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 5-4 summarizes wetland soils coverage by subwatershed.

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

<table>
<thead>
<tr>
<th>Subwatershed Name</th>
<th>Wetland Soils Area (ac)</th>
<th>% of Subwatershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>20</td>
<td>5.8 %</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>101</td>
<td>15.5 %</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>111</td>
<td>15.9 %</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>34</td>
<td>5.1 %</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>7</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>188</td>
<td>11.9 %</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>136</td>
<td>11.3 %</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>109</td>
<td>11.7 %</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>193</td>
<td>13.1 %</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>27</td>
<td>7.6 %</td>
</tr>
<tr>
<td><strong>Tankerhoosen River Watershed</strong></td>
<td><strong>926</strong></td>
<td><strong>11.3 %</strong></td>
</tr>
</tbody>
</table>
At least twenty vernal pools have been identified within the Tankerhoosen watershed by certified scientists (see Figure 5-8). 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).
Figure 5-8: Wetland Soils – Tankerhoosen River Watershed
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 Table 5-5. 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.

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

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

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 Table 5-6.

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).

### Table 5-6: Fish Species

<table>
<thead>
<tr>
<th>Bolton Notch Pond</th>
<th>Gages Brook</th>
<th>Lower Tankerhoosen River</th>
<th>Middle Tankerhoosen River</th>
<th>Upper Tankerhoosen River</th>
<th>Railroad Brook</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Eel</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brown Bullhead</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Black Crappie</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blacknose Dace</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brook Trout</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Brown Trout</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bluegill</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Chain Pickerel</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Shiner</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creek Chub</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fallfish</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fathead Minnow</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden Shiner</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longnose Dace</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Largemouth Bass</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkinseed Sunfish</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainbow Trout</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rockbass</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallmouth Bass</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tessellated Darter</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Sucker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Yellow Perch</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiger Trout</td>
<td></td>
<td></td>
<td>Stocked in Pond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden Trout</td>
<td></td>
<td></td>
<td>Stocked in Pond</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 Appendix A.

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 Appendix A. 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 (N DDB) 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.

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

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


- “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
6.0 WATERSHED MODIFICATIONS

6.1 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 6-1 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 6-1 lists the major drinking water supplies within the Tankerhoosen River watershed which are regulated under the DEP Water Diversion program.

Table 6-1: Major Drinking Water Supplies

<table>
<thead>
<tr>
<th>Name of Diversion</th>
<th>MGD</th>
<th>Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernon Well #1</td>
<td>0.1728</td>
<td>Vernon</td>
</tr>
<tr>
<td>Vernon Well #2</td>
<td>0.1728</td>
<td>Vernon</td>
</tr>
<tr>
<td>Vernon Well #3</td>
<td>0.1440</td>
<td>Vernon</td>
</tr>
<tr>
<td>Vernon Well #4</td>
<td>0.1728</td>
<td>Vernon</td>
</tr>
<tr>
<td>Vernon Well #5</td>
<td>0.4320</td>
<td>Vernon</td>
</tr>
<tr>
<td>New Bolton Well Field, Well #1,2,3</td>
<td>Various</td>
<td>Bolton</td>
</tr>
</tbody>
</table>

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 6-2. 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.
Figure 6-1: CTDEP Regulated Dams - Tankerhoosen River Watershed
Figure 6-2: CTDEP Aquifer Protection Areas - Tankerhoosen River Watershed
6.2 Wastewater Discharges

As summarized in Table 6-2, 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 6-2 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.

**Table 6-2: NPDES Regulated Facilities**

<table>
<thead>
<tr>
<th>Town</th>
<th>Facility</th>
<th>Location</th>
<th>Permit Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernon</td>
<td>Carpenter’s Mobil</td>
<td>447 Hartford Turnpike</td>
<td>GVS000915</td>
</tr>
<tr>
<td></td>
<td>Company 1 Firehouse</td>
<td>724 Hartford Turnpike</td>
<td>GVM000592</td>
</tr>
<tr>
<td></td>
<td>Connecticut Golf Club</td>
<td>95 Hartford Turnpike</td>
<td>GPL000108</td>
</tr>
<tr>
<td></td>
<td>First Student</td>
<td>25 Whitney Ferguson Road</td>
<td>GSI001217</td>
</tr>
<tr>
<td></td>
<td>Motiva Enterprises LLC</td>
<td>444 Hartford Turnpike</td>
<td>GGR001404</td>
</tr>
<tr>
<td></td>
<td>Moore’s Automotive</td>
<td>1245 Hartford Turnpike</td>
<td>GVM000806</td>
</tr>
<tr>
<td></td>
<td>Mount Vernon Apartments</td>
<td>1120 Hartford Turnpike</td>
<td>GVS000863</td>
</tr>
<tr>
<td></td>
<td>Oakland Meadows</td>
<td>1158 Hartford Turnpike</td>
<td>GSN001098</td>
</tr>
<tr>
<td></td>
<td>Tightico, Inc.</td>
<td>101-77 Industrial Park Road</td>
<td>GSI001599</td>
</tr>
<tr>
<td></td>
<td>Vernon Maintenance</td>
<td>37 Campbell Avenue</td>
<td>GVS000988 GSI000074</td>
</tr>
<tr>
<td></td>
<td>VMS Construction Company</td>
<td>120 Bolton Road</td>
<td>GVM000980</td>
</tr>
<tr>
<td>Bolton</td>
<td>Transportation Facility</td>
<td>326 Boston Turnpike</td>
<td>GSI001179</td>
</tr>
<tr>
<td></td>
<td>Hull’s Autobody</td>
<td>299-301 Boston Turnpike</td>
<td>GVM000800</td>
</tr>
<tr>
<td>Tolland</td>
<td>Dari Farms</td>
<td>Gerber Drive</td>
<td>GSN000814</td>
</tr>
<tr>
<td></td>
<td>Mr. Sparkle Car Wash</td>
<td>157 Hartford Turnpike</td>
<td>GVM000646</td>
</tr>
<tr>
<td></td>
<td>Connecticut Light &amp; Power Co.</td>
<td>45 Tolland Stage Road</td>
<td>GVS001027</td>
</tr>
<tr>
<td></td>
<td>Gerber Scientific Inc.</td>
<td>24 Industrial Park Road West</td>
<td>GSI000914</td>
</tr>
<tr>
<td></td>
<td>Standard Register Co.</td>
<td>259 Hartford Turnpike</td>
<td>GPP000152 GPH000345</td>
</tr>
<tr>
<td></td>
<td>CNC Software Inc.</td>
<td>671 Old Post Road</td>
<td>GSN000070</td>
</tr>
<tr>
<td></td>
<td>Belvedere Ridge</td>
<td>601 Old Post Road</td>
<td>GSN001308</td>
</tr>
</tbody>
</table>

Source: DEP December 2007
Figure 6-3 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 Regulated Sites

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.

**Table 6-3: Summary of Regulated Sites**

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Number of sites</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vernon</td>
<td>Tolland</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Generator</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Air Emissions</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CERCLA Site</td>
<td>1 (1 on Final NPL)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>


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
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 Current Conditions

7.1.1 Land Use

Figure 7-1 depicts general land use patterns in the Tankerhoosen River watershed. The data in Figure 7-1 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 7-1). 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 I-84/Route 30 and I-384.

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

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Acres</th>
<th>Percent of Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>103</td>
<td>1 %</td>
</tr>
<tr>
<td>One Family</td>
<td>3160</td>
<td>38 %</td>
</tr>
<tr>
<td>Two Family</td>
<td>48</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Three Family</td>
<td>2</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Multi Family</td>
<td>39</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Condominium</td>
<td>165</td>
<td>2 %</td>
</tr>
<tr>
<td>Group Quarters</td>
<td>12</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Commercial</td>
<td>110</td>
<td>1 %</td>
</tr>
<tr>
<td>Retail</td>
<td>88</td>
<td>1 %</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>3</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Industrial</td>
<td>183</td>
<td>2 %</td>
</tr>
<tr>
<td>Government/ Non-Profit</td>
<td>102</td>
<td>1 %</td>
</tr>
<tr>
<td>School</td>
<td>26</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Cemetery</td>
<td>22</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Health/ Medical</td>
<td>6</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Resource/ Recreation</td>
<td>2398</td>
<td>29 %</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>851</td>
<td>10 %</td>
</tr>
<tr>
<td>Right-of-way</td>
<td>770</td>
<td>9 %</td>
</tr>
<tr>
<td>Water</td>
<td>77</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Unknown</td>
<td>61</td>
<td>&lt;1 %</td>
</tr>
</tbody>
</table>
Figure 7-1: 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 7-2 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

Figure 7-3 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
7.1.3 Land Cover

Figure 7-4 depicts the general land cover in the Tankerhoosen River watershed. Data shown in Figure 7-4 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 7-2). 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).

### Table 7-2: Land Cover - Tankerhoosen River Watershed

<table>
<thead>
<tr>
<th>Land Cover Type</th>
<th>1985</th>
<th>2002</th>
<th>Relative Percent Change¹</th>
<th>Relative Rate of Change²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>Percent of Watershed</td>
<td>Acres</td>
<td>Percent of Watershed</td>
</tr>
<tr>
<td>Barren</td>
<td>91</td>
<td>1 %</td>
<td>162</td>
<td>2 %</td>
</tr>
<tr>
<td>Coniferous Forest</td>
<td>454</td>
<td>6 %</td>
<td>430</td>
<td>5 %</td>
</tr>
<tr>
<td>Deciduous Forest</td>
<td>4581</td>
<td>56 %</td>
<td>4085</td>
<td>50 %</td>
</tr>
<tr>
<td>Developed</td>
<td>1793</td>
<td>22 %</td>
<td>2201</td>
<td>27 %</td>
</tr>
<tr>
<td>Forested Wetland</td>
<td>192</td>
<td>2 %</td>
<td>175</td>
<td>2 %</td>
</tr>
<tr>
<td>Non-forested Wetland</td>
<td>2</td>
<td>&lt; 1 %</td>
<td>19</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Other grasses and</td>
<td>551</td>
<td>7 %</td>
<td>603</td>
<td>7 %</td>
</tr>
<tr>
<td>agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turf and grass</td>
<td>448</td>
<td>5 %</td>
<td>447</td>
<td>5 %</td>
</tr>
<tr>
<td>Utility Right of Way</td>
<td>19</td>
<td>&lt; 1 %</td>
<td>17</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>Water</td>
<td>95</td>
<td>2 %</td>
<td>88</td>
<td>1 %</td>
</tr>
</tbody>
</table>

¹Calculation = % land cover 2002 - % land cover 1985
²Calculation = (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.
• 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 7-3 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
**Table 7-3: Forest Cover - Tankerhoosen River Watershed**

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

Table 7-3 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.
Table 7-4: Forest Cover in Riparian Areas in the Tankerhoosen River Subwatersheds

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

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 7-2) 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. Figure 7-5 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).

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% (Table 7-5). 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 7-6, 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%.

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Percent Impervious Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>16.6 %</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>17.2 %</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>11.5 %</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>11.3 %</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>15.8 %</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>12.9 %</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>1.7 %</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>8.1 %</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>4.5 %</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>19.9 %</td>
</tr>
<tr>
<td>Total</td>
<td>9.7 %</td>
</tr>
</tbody>
</table>

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.
Figure 7-6: Current Impervious Cover by Subwatershed
7.2 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.

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:

- **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 CRCOG 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 7-6 and Figure 7-7 summarize the amount of developable land by subwatershed, including the new development and redevelopment categories.

**Table 7-6: Developable Land - Tankerhoosen Watershed**

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>New Development (acres)</th>
<th>New Development Percent in Subwatershed</th>
<th>Redevelopment (acres)</th>
<th>Redevelopment Percent in Subwatershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>49</td>
<td>14.3 %</td>
<td>11</td>
<td>3.2 %</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>57</td>
<td>8.8 %</td>
<td>52</td>
<td>8.1 %</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>129</td>
<td>18.5 %</td>
<td>72</td>
<td>10.3 %</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>123</td>
<td>18.1 %</td>
<td>102</td>
<td>15.0 %</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>91</td>
<td>28.5 %</td>
<td>17</td>
<td>5.4 %</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>127</td>
<td>8.0 %</td>
<td>141</td>
<td>8.9 %</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>212</td>
<td>17.6 %</td>
<td>172</td>
<td>14.3 %</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>122</td>
<td>13.1 %</td>
<td>89</td>
<td>9.5 %</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>238</td>
<td>16.1 %</td>
<td>150</td>
<td>10.2 %</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>108</td>
<td>31.3 %</td>
<td>13</td>
<td>3.8 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1257</strong></td>
<td><strong>15.3 %</strong></td>
<td><strong>820</strong></td>
<td><strong>10.0 %</strong></td>
</tr>
</tbody>
</table>
Figure 7-7: Developable Land - Tankerhoosen River Watershed
The future land use buildout scenario was estimated by assigning new land uses to developable areas (See Section 7.2.1), 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 7-7 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.

### Table 7-7: Assigned Future Land Use Category

<table>
<thead>
<tr>
<th>Zoning Category</th>
<th>Assigned Future Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 Unit Residential, High Density</td>
<td>Condominium</td>
</tr>
<tr>
<td>1-3 Unit Residential, Medium Density</td>
<td>Three Family</td>
</tr>
<tr>
<td>1-3 Unit Residential, Medium-Low Density</td>
<td>Two Family</td>
</tr>
<tr>
<td>1-3 Unit Residential, Low Density</td>
<td>One-Family</td>
</tr>
<tr>
<td>Cluster/ Open Space Residential</td>
<td>One-Family</td>
</tr>
<tr>
<td>Industrial</td>
<td>Industrial</td>
</tr>
<tr>
<td>Multi-Family</td>
<td>Multi-Family</td>
</tr>
<tr>
<td>Planned Area Development Including Residential</td>
<td>Mixed Use</td>
</tr>
<tr>
<td>Planned Industrial</td>
<td>Industrial</td>
</tr>
<tr>
<td>Planned Residential</td>
<td>Multi-Family</td>
</tr>
<tr>
<td>Town Center</td>
<td>Mixed Use</td>
</tr>
<tr>
<td>Town Scale Commercial</td>
<td>Commercial</td>
</tr>
</tbody>
</table>

The results of the buildout analysis are summarized in Table 7-8, 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

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Acres&lt;sub&gt;Existing&lt;/sub&gt;</th>
<th>Percent of Basin&lt;sub&gt;Existing&lt;/sub&gt;</th>
<th>Acres&lt;sub&gt;Future&lt;/sub&gt;</th>
<th>Percent of Basin&lt;sub&gt;Future&lt;/sub&gt;</th>
<th>Relative Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>103</td>
<td>1 %</td>
<td>89</td>
<td>1 %</td>
<td>0</td>
</tr>
<tr>
<td>One Family</td>
<td>3160</td>
<td>38 %</td>
<td>3415</td>
<td>42 %</td>
<td>4%</td>
</tr>
<tr>
<td>Two Family</td>
<td>48</td>
<td>&lt;1 %</td>
<td>811</td>
<td>10 %</td>
<td>10%</td>
</tr>
<tr>
<td>Three Family</td>
<td>2</td>
<td>&lt;1 %</td>
<td>3</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Multi Family</td>
<td>39</td>
<td>&lt;1 %</td>
<td>60</td>
<td>1 %</td>
<td>1%</td>
</tr>
<tr>
<td>Condominium</td>
<td>165</td>
<td>2 %</td>
<td>177</td>
<td>2 %</td>
<td>0</td>
</tr>
<tr>
<td>Group Quarters</td>
<td>12</td>
<td>&lt;1 %</td>
<td>12</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Commercial</td>
<td>110</td>
<td>1 %</td>
<td>206</td>
<td>3 %</td>
<td>2%</td>
</tr>
<tr>
<td>Retail</td>
<td>88</td>
<td>1 %</td>
<td>88</td>
<td>1 %</td>
<td>0</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>3</td>
<td>&lt;1 %</td>
<td>33</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Industrial</td>
<td>183</td>
<td>2 %</td>
<td>270</td>
<td>3 %</td>
<td>1%</td>
</tr>
</tbody>
</table>
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.

Table 7-9 presents estimates of existing and future impervious cover (Figure 7-8) 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.

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Acres&lt;sub&gt;Existing&lt;/sub&gt;</th>
<th>Percent of Basin&lt;sub&gt;Existing&lt;/sub&gt;</th>
<th>Acres&lt;sub&gt;Future&lt;/sub&gt;</th>
<th>Percent of Basin&lt;sub&gt;Future&lt;/sub&gt;</th>
<th>Relative Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government/ Non-Profit</td>
<td>102</td>
<td>1 %</td>
<td>102</td>
<td>1 %</td>
<td>0</td>
</tr>
<tr>
<td>School</td>
<td>26</td>
<td>&lt;1 %</td>
<td>26</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Cemetery</td>
<td>22</td>
<td>&lt;1 %</td>
<td>14</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Health/ Medical</td>
<td>6</td>
<td>&lt;1 %</td>
<td>6</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Resource/ Recreation</td>
<td>2398</td>
<td>29 %</td>
<td>1787</td>
<td>22 %</td>
<td>-7%</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>851</td>
<td>10 %</td>
<td>233</td>
<td>3 %</td>
<td>-7%</td>
</tr>
<tr>
<td>Right-of-way</td>
<td>770</td>
<td>9 %</td>
<td>770</td>
<td>9 %</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>77</td>
<td>&lt;1 %</td>
<td>77</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>61</td>
<td>&lt;1 %</td>
<td>46</td>
<td>&lt;1 %</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 7-9: Percent Impervious Cover – Existing and Future Conditions

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Existing Percent Impervious Cover</th>
<th>Future Percent Impervious Cover</th>
<th>Percent Change (IC&lt;sub&gt;Future&lt;/sub&gt; - IC&lt;sub&gt;Existing&lt;/sub&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>16.6 %</td>
<td>18.9 %</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>17.2 %</td>
<td>20.6 %</td>
<td>3.4 %</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>11.5 %</td>
<td>14.2 %</td>
<td>2.7 %</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>11.3 %</td>
<td>13.5 %</td>
<td>2.2 %</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>15.8 %</td>
<td>23.0 %</td>
<td>7.2 %</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>12.9 %</td>
<td>15.5 %</td>
<td>2.6 %</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>1.7 %</td>
<td>3.4 %</td>
<td>1.7 %</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>8.1 %</td>
<td>10.3 %</td>
<td>2.2 %</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>4.5 %</td>
<td>4.7 %</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>19.9 %</td>
<td>29.13 %</td>
<td>9.2 %</td>
</tr>
<tr>
<td>Total</td>
<td>9.87 %</td>
<td>12.47 %</td>
<td>2.6 %</td>
</tr>
</tbody>
</table>

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 Figure 7-5). 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).

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

<table>
<thead>
<tr>
<th>Stream Health</th>
<th>% Watershed Impervious Cover</th>
<th>% Natural Vegetation in 100-ft Stream Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>&lt; = 6%</td>
<td>&gt;=65%</td>
</tr>
<tr>
<td>Good</td>
<td>6-10%</td>
<td>60-65%</td>
</tr>
<tr>
<td>Fair</td>
<td>10-25%</td>
<td>40-60%</td>
</tr>
<tr>
<td>Poor</td>
<td>&gt; 25%</td>
<td>&lt;40%</td>
</tr>
</tbody>
</table>

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 Section 7.0. 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 Appendix B.

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 7.0 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 Section 7.0. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. Table 8-1 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).
### Table 8-1: Projected Pollutant Loading Rate and Load Increases

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Loading Rate Increase</th>
<th>Load Increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Load Increase per Acre, mass [lb or ton]/ac-yr)</td>
<td>(Total for Each Watershed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>Bolton Notch Pond (318 ac)</td>
<td>0.66</td>
<td>0.10</td>
</tr>
<tr>
<td>Clarks Brook (647 ac)</td>
<td>0.91</td>
<td>0.13</td>
</tr>
<tr>
<td>Gages Brook (695 ac)</td>
<td>1.29</td>
<td>0.19</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>0.73</td>
<td>0.11</td>
</tr>
<tr>
<td>(680 ac)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>1.31</td>
<td>0.10</td>
</tr>
<tr>
<td>(306 ac)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>0.63</td>
<td>0.07</td>
</tr>
<tr>
<td>(1570 ac)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railroad Brook (1203 ac)</td>
<td>0.89</td>
<td>0.06</td>
</tr>
<tr>
<td>Tucker Brook (934 ac)</td>
<td>0.67</td>
<td>0.04</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>0.24</td>
<td>0.05</td>
</tr>
<tr>
<td>(1472 ac)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walker Reservoir (322 ac)</td>
<td>1.86</td>
<td>0.28</td>
</tr>
<tr>
<td>Total (8149 ac)</td>
<td>0.77</td>
<td>0.09</td>
</tr>
</tbody>
</table>

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 Section 5.1 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.
### Table 9-1: Summary of Subwatershed Vulnerability Metrics

<table>
<thead>
<tr>
<th>Subwatershed Metric</th>
<th>How Metric is Measured</th>
<th>Indicates Higher Vulnerability Potential When</th>
<th>Metric Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Impervious Cover Change</td>
<td>% increase in impervious cover in subwatershed</td>
<td>Increase in IC is high, suggesting greater development potential and stream impacts</td>
<td>Award 1 pt for each 1% increase in impervious cover</td>
</tr>
<tr>
<td>2. Impervious Cover Threshold</td>
<td>Comparison of current and future IC relative to ICM threshold</td>
<td>Predicted IC crosses “impacted” (12%) threshold, development could result in significant stream impacts</td>
<td>Award 5 pts for each exceedance of the 12% threshold</td>
</tr>
<tr>
<td>3. Stream Order</td>
<td>% of subwatershed consisting of 1st or 2nd order streams</td>
<td>Subwatershed consists of more lower order streams, vulnerability of headwater streams for habitat and water quality protection</td>
<td>Award 6 pts if 100% of streams are 1st and 2nd order; 4 pts if 50% are 1st and 2nd order; 2 pts if 33% are 1st and 2nd order; 0 pts if 0% are 1st and 2nd order</td>
</tr>
<tr>
<td>4. Pollutant Loading</td>
<td>% increase in pollutant loading in subwatershed</td>
<td>Increase in pollutant loading is high, suggesting water quality impacts from future development</td>
<td>Award 1 pt for each pollutant loading parameter &gt; 10% and 3 pts for each parameter &gt;20%</td>
</tr>
<tr>
<td>5. Industrial/ Commercial Land</td>
<td>% of subwatershed as industrial or commercial land</td>
<td>Industrial/ commercial land is high, greater potential for water quality impacts from pollutant hot spot</td>
<td>Award 1 pt for each 2% of subwatershed classified as industrial or commercial/ retail</td>
</tr>
<tr>
<td>6. Forest Cover</td>
<td>% of subwatershed with developable forest cover</td>
<td>Area of developable forest cover is high, potential for significant future reductions in forested land</td>
<td>Award 1 pt for each 5% of subwatershed with developable forest cover</td>
</tr>
<tr>
<td>7. Stream Corridor Forest Cover</td>
<td>% of stream corridor that is forested</td>
<td>Corridor forest cover is high, potential for significant future reductions in forested riparian areas if public ownership of corridor is low</td>
<td>Add 1 pt for each 10% increase in forest cover</td>
</tr>
<tr>
<td>8. Public Ownership of Stream Corridor</td>
<td>% of stream corridor that is publicly owned</td>
<td>Public ownership is low (see metric 7)</td>
<td>Add 1 pt for each 10% reduction of stream corridor in public ownership</td>
</tr>
<tr>
<td>9. Road Crossings</td>
<td>number of road crossings / square mile</td>
<td>Number of road crossings is high, greater potential for direct stormwater discharges from roadways</td>
<td>&lt;1 = 0pts; 1 to 5 = 1 pts; 5 to 8 = 3 pts; 9 to 12 = 5 pts; 13-15 = 7pt; &gt;15 = 10 pts</td>
</tr>
<tr>
<td>10. Developed Areas with Septic</td>
<td>% of subwatershed served by septic</td>
<td>Area served by septic is high, indicating potential for pollutant loadings from failing septic systems</td>
<td>Award 1 pt for each 5% of subwatershed area served by septic</td>
</tr>
<tr>
<td>11. Drinking Water Resources</td>
<td>Acreage of developable land within a public drinking water supply area</td>
<td>Area of developable land is high, greater potential for impacts to sensitive surface and groundwater drinking water supplies</td>
<td>Award 3 pts for each subwatershed within an aquifer protection area</td>
</tr>
</tbody>
</table>
9.1 Priority Subwatersheds for Conservation

The results of the subwatershed vulnerability analysis are summarized in Table 9-2.

Table 9-2: Results of Subwatershed Vulnerability Analysis

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

As shown in Table 9-2, 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.
Table 9-3: Summary of Subwatershed Restoration Potential Metrics

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

The results of the subwatershed restoration potential analysis are summarized in Table 9-4.

**Table 9-4: Results of Subwatershed Restoration Potential Analysis**

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Existing Impervious Cover</th>
<th>Publicly-owned Land</th>
<th>Industrial Land</th>
<th>Forest Cover</th>
<th>Wetland Cover</th>
<th>Development Potential</th>
<th>Stream Density</th>
<th>Stream Corridor</th>
<th>Forest Cover</th>
<th>Public Ownership of Stream Corridor</th>
<th>Road Crossings</th>
<th>Developed Acres Served by Septic</th>
<th>Water Quality Impairments</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>0</td>
<td>4</td>
<td>11</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Gages Brook</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>12</td>
<td>3</td>
<td>5</td>
<td>679</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>14</td>
<td>2</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>957</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>5</td>
<td>11</td>
<td>7</td>
<td>5</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>4</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>12</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>352</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>6</td>
<td>55</td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 9-4, 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.
10.0 REFERENCES


Nationwide Urban Runoff Program (1983). Results of the Nationwide Urban Runoff Program. U.S. Environmental Protection Agency Water Planning Division, PB 84-185552, Washington, D.C.


Tetra Tech., Inc. Spreadsheet Tool for the Estimation of Pollutant Load (STEPL). Version 4.0. Developed for the U.S. EPA.


APPENDIX A

SPECIES LIST
BELDING WILDLIFE MANAGEMENT AREA
APPENDIX A

FLORA OF BELDING WMA.

Club Mosses
Club-moss family (Lycopodiaceae)
Tree club moss (*Lycopodium obscurum*)

Ferns
Bracken Fern Family (Dennstaedtiaceae)
Hay-scented fern (*Dennstaedtia punctilobula*)
Bracken fern (*Pteridium aquilinum*)

Wood fern family (Dryopteridaceae)
Sensitive fern (*Onoclea sensibilis*)
Spinulose wood fern (*Dryopteris spinulosa*)
Christmas fern (*Polystichum acrostichoides*)
Rock polypody (*Polypodium virginianum*)

Royal fern family (Osmundaceae)
Cinnamon fern (*Osmunda cinnamomea*)
Interrupted fern (*Osmunda claytoniana*)
Royal fern (*Osmunda regalis*)

Maidenhair Fern family (Pteridaceae)
Maidenhair fern (*Adiantum pedatum*)

Marsh Fern family (Thelypteridaceae)
New York fern (*Thelypteris noveboracensis*)

Gymnosperms
Pine family (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)

Magnolia family (Magnoliaceae)
Tulip tree (*Liriodendron tulipifera*)

Laurel family (Lauraceae)
Northern spicebush (*Lindera benzoin*)
Sassafras (*Sassafras albidum*)
Barberry family (Berberidaceae)
Japanese barberry (Berberis thunbergii)

Buttercup family (Ranunculaceae)
Wood anemone (Anemone quinquefolia)
Rue anemone (Thalictrum thalictroides)
Goldthread (Coptis groenlandica)
Kidneyleaf buttercup (Ranunculus abortivus)
American pokeweed (Phytolacca Americana)

Buckwheat family (Polygonaceae)
Arrow-leaf tearthumb (Polygonum sagittatum)

Witch-hazel family (Hamamelidaceae)
Witchhazel (Hamamelis virginiana)

Plane-tree family (Plantanaeaceae)
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)

Birch family (Betulaceae)
Speckled alder (Alnus rugosa)
Black birch (Betula lenta)
Gray birch (Betula populifolia)
Paper birch (Betula papyrifera)
Yellow birch (Betula alleghaniensis)

Bayberry family (Myricaceae)
Sweetfern (Comptonia peregrina)

Walnut family (Juglandaceae)
Pignut hickory (Carya glabra)
Shagbark hickory (Carya ovata)

(Hypericaceae)
St. John’s wort (hypericum perforatum)

Wintergreen family (Pyrolaceae)
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)

Primrose family (Primulaceae)
Starflower (Trientalis borealis)
Whorled loosestrife (Lysimachia quadrifolia)

Violet family (Violaceae)
Common blue violet (Viola papilionacea)
Northern white violet (Viola pallens)
Sweet white violet (Viola blanda)
Field violet (Viola arvensis)

Willow family (Salicaceae)
Quaking aspen (Populus tremuloides)

Cucumber family (Cucurbitaceae)
Bur cucumber (Cucurbita lobata)

Elm family (Ulmaceae)
American elm (Ulmus americana)

Rose family (Rosaceae)
White meadowsweet (Spiraea latifolia)
Steepbush (Spiraea 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 (Vicia cracca)

Maple family
Sugar maple (Acer saccharum)
Red maple (Acer rubrum)
Cashew family (Anacardiaceae)
Staghorn sumac (Rhus typhina)
Poison ivy (Toxicodendron radicans)

Touch-me-not Family (Balsaminaceae)
Spotted touch-me-not (Impatiens capensis)

Milkwort family (Polygalaceae)
Fringed polygala (Polygala paucifolia)
Field milkwort (Polygala sanguinea)

Staff-tree family (Celastraceae)
Winged euonymus (Euonymus alatus)
Asiatic bittersweet (Celastrus orbiculatus)

Holly family (Aquifoliaceae)
Winterberry (Ilex verticillata)

Oleaster family (Eleagnaceae)
Autumn olive (Eleagnus umbellata)
Russian olive (Eleagnus angustifolium)

Grape family (Vitaceae)
Virginia creeper (Parthenocissus quinquefolia)
Fox Grape (Vitis labrusca)

Dogwood family (Cornaceae)
Silky dogwood (Cornus amomum)

Ginseng family (Araliaceae)
Ginseng (Panax quinquefolium)
Dwarf ginseng (Panax trifolium)

Carrot family (Apiales)
Queen Anne’s Lace (Daucus carota)

Honeysuckle family (Caprifoliaceae)
Tartarian Honeysuckle (Lonicera tatarica)
Elderberry (Sambucus canadensis)
Maple-leaved viburnum (Viburnum acerifolium)
Arrowwood (Viburnum dentatum)

Aster family (Asteraceae)
Yarrow (Achillea millefolium)
New York Aster (Aster novi-belgii)
Oxeye daisy (Chrysanthemum leucanthemum)
Bull thistle (Cirsium vulgare)
Joe-Pye weed (*Eupatorium maculata*)
Black-eyed Susan (*Rudbeckia hirta*)
Rough-stemmed goldenrod (*Solidago rugosa*)
Common dandelion (*Taraxacum officinale*)
Pineapple weed (*Matricaria matricarioides*)
Horseweed (*Erigeron canadensis*)

**Bedstraw family** (Rubiaceae)
Bluets (*Houstonia caerulea*)
Partridgeberry (*Mitchella repens*)

**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 (*Mimusulus 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*)

**Cathrier family** (Smilaceae)
Greenbrier (*Smilax rotundifolia*)

**Orchid family** (Orchidaceae)
Nodding ladies’ tresses (*Spiranthes cernua*)
Pink lady’s slipper (*Cypripedium acaule*)
Rattlesnake plantain (*Goodyera pubescens*)

**Asparagus family** (Asparagaceae)
Asparagus (*Asparagus officinalis*)

**Spiderwort family** (Commelinaceae)
Asiatic dayflower

**Rush family** 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 (*Carex 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 arundinacea*)
Green foxtail (*Setaria viridis*)
Velvet grass (*Holcus lanatus*) - Metzler
Timothy (*Phleum pretense*) - Metzler
Cheatgrass (*Bromus tectorum*) - Metzler
Sweet vernal grass (*Anthoxanthum odoratum*) - Metzler

**Water plantain family** Alismataceae
Arrowhead (*Sagittaria latifolia*)

**Arum family** (Araceae)
Skunk cabbage (*Symplocarpus foetidus*)
Jack-in-the-pulpit (*Arisaema triphyllum*)
Cat-tail family (Typhaceae)
Common cattail (Typha latifolia)

FAUNA OF BELDING W MA.

INVERTEBRATES

Annelids
Earthworm (Oligochaeta)
Leech (Hirudinea)

Crustaceans
Crayfish (Decapoda)

Molluscs
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)
Stenonecia (Ileptageniidae)
Bactidae

True flies (Diptera)
Midge (Chironomidae)
Dance fly (Empididae)
Sand fly (Psychodidae)
Black fly (Simuliidae)
Crane fly (Tipulidae)
Phantom crane fly (Psychopteridae : Bittacomorpha clavipes)

Stoneflies (Plecoptera)
Chloroperlidae
Glossosomatidae
Nemouridae
Peltoperlidae
Perlidae
Perlodidae

Caddisflies (Trichoptera)
Chimarra
Hydropsychidae
Lepidostoma
Limnephilidae
Philopotamidae
Rhyacophila

Dobsonflies and fishflies (Megloptera)
Corydalus
Nigronia

Beetles (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 (Lesies 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 (Ereveres comyns)
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 (Pycholoma peritana)
Lesser maple spanworm moth (Itame pustularia)
Blurry chocolate angle (Semiaothia transitoria)
Minor angle (Semiaothia minorata)
Four-spotted angle (Semiaothia quadriotaria)
White spring moth (Lomographa vestalata)
Lesser grapevine looper moth (Eulithis diversilineata)
Greater grapevine looper moth (Eulithis gracileneata)
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 rimos)
Painted lichen moth (Hypospreia fucosa)
Clymene moth (Haploa clymene)
Harnessed moth (Apanteles phalerata)
Pink-shaded fern moth (Callopistria mollissina)
Copper underwing (Amphipyra pyramidaloides)
Common pinkband (Ogdoconta cinereola)
Eight-spotted forester (Alypia octomaculata)
Pink-barred lithacodia (Lithacodia carneola)
Decorated owlet (Pangrapta decoralis)
Spotted grass moth (Rivula propinquis)
American idia (Idia americalis)
Common idia (Idia aemula)
Early zanclognatha (Zanclognatha cruralis)
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 (*Semoitius corporalis*)
Golden Shiner (*Notemigonus crysoleucas*)
Longnose Dace (*Rhinichthys cataractae*)
Largemouth Bass (*Micropterus salmoides*)
Rainbow Trout (*Oncorhynchus mykiss*)
Tessellated darter (*Etheostoma oligstedi*)
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 (*Notiphthalmus 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 (*Buteo platypterus*)
Cooper's hawk (*Accipiter cooperi*)
Sharp-shinned hawk (*Accipiter striatus*)
Galliformes
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
Tyrannidae
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*)
Hirundidae
Tree Swallow (*Iridoprocne bicolor*)
Barn Swallow (*Hirundo rustica*)

Paridae
Black-capped Chickadee (*Poecile atricapillus*)
Tufted Titmouse (*Baeolophus bicolor*)

Sittidae
Red-breasted Nuthatch (*Sitta carolinensis*)
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 fusciscens*)
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 cerulea*)
Black-and-white warbler (*Mniotilta varia*)
American redstart (*Setophaga ruticilla*)
Ovenbird (*Seiurus 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 (Ondatra zibethicus)
Porcupine (Erethizon dorsatum)
Eastern cottontail rabbit (Sylvilagus floridanus)
Gray fox (Urocyon cinereoargenteus)
Raccoon (Procyon lotor)
Short-tailed weasel (Mustela erminea)
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 Section 7.0 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 Section 7.2 of Fuss & O’Neill 2008), 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 a 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. Table 1 shows EMC values from several sources for the pollutants of interest.

<table>
<thead>
<tr>
<th>Source</th>
<th>Pollutant</th>
<th>Cropland</th>
<th>Open Space</th>
<th>Commercial</th>
<th>High Density Residential</th>
<th>Institutional</th>
<th>Industrial</th>
<th>Low Density Residential</th>
<th>Forest</th>
<th>Transport</th>
<th>Vacant</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>1.9</td>
<td>1.5</td>
<td>2</td>
<td>2.2</td>
<td>1.8</td>
<td>2.5</td>
<td>2.2</td>
<td>0.2</td>
<td>3</td>
<td>1.5</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>0.3</td>
<td>0.15</td>
<td>0.2</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.1</td>
<td>0.5</td>
<td>0.15</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>BOD</td>
<td>4</td>
<td>4</td>
<td>9.3</td>
<td>10</td>
<td>7.8</td>
<td>9</td>
<td>10</td>
<td>0.5</td>
<td>9.3</td>
<td>4</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>TSS</td>
<td>-</td>
<td>70</td>
<td>75</td>
<td>100</td>
<td>67</td>
<td>120</td>
<td>100</td>
<td>-</td>
<td>150</td>
<td>70</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>N*</td>
<td>-</td>
<td>1.2</td>
<td>2.2</td>
<td>2</td>
<td>-</td>
<td>2.1</td>
<td>-</td>
<td>-</td>
<td>2.3</td>
<td>-</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>-</td>
<td>0.25</td>
<td>0.22</td>
<td>0.3</td>
<td>-</td>
<td>0.26</td>
<td>-</td>
<td>-</td>
<td>0.25</td>
<td>-</td>
<td>mg/L</td>
</tr>
<tr>
<td></td>
<td>BOD</td>
<td>-</td>
<td>4.2</td>
<td>11.9</td>
<td>9</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

Table 1. Runoff Event Mean Concentrations (EMCs)
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 Section 4.0) 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 Table 2.

### Table 2. Impervious Surface Coefficients

<table>
<thead>
<tr>
<th>Land Use</th>
<th>STEPL</th>
<th>NEMO ¹</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>0.85</td>
<td>0.205 - 0.557</td>
<td>0.50</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.70</td>
<td>0.264 - 0.557</td>
<td>0.40</td>
</tr>
<tr>
<td>Institutional</td>
<td>0.50</td>
<td>-</td>
<td>0.30</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.95</td>
<td>0.433</td>
<td>0.43</td>
</tr>
<tr>
<td>Multi-family</td>
<td>0.75</td>
<td>0.09 - 0.39</td>
<td>0.24</td>
</tr>
<tr>
<td>Single-family</td>
<td>0.30</td>
<td>0.065 - 0.12</td>
<td>0.10</td>
</tr>
<tr>
<td>Vacant (developed)</td>
<td>0.70</td>
<td>-</td>
<td>0.41</td>
</tr>
<tr>
<td>Open Space</td>
<td>0.01</td>
<td>0.001 - 0.094</td>
<td>0.01</td>
</tr>
</tbody>
</table>

¹ 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 Section 7.0 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. Table 3 summarizes the assignment of STEPL land use categories for each of the land use/land cover data categories.

<table>
<thead>
<tr>
<th>Data Category</th>
<th>STEPL Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Cropland</td>
</tr>
<tr>
<td>Cemetery</td>
<td>Open Space (urban)</td>
</tr>
<tr>
<td>Commercial</td>
<td>Commercial (urban)</td>
</tr>
<tr>
<td>Condominium</td>
<td>Multi-family (urban)</td>
</tr>
<tr>
<td>Government/ Non-Profit</td>
<td>Institutional (urban)</td>
</tr>
<tr>
<td>Group Quarters</td>
<td>Institutional (urban)</td>
</tr>
<tr>
<td>Health/ Medical</td>
<td>Institutional (urban)</td>
</tr>
<tr>
<td>Industrial</td>
<td>Industrial (urban)</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>Commercial (urban)</td>
</tr>
<tr>
<td>Multi-Family</td>
<td>Multi-family (urban)</td>
</tr>
<tr>
<td>One Family</td>
<td>Multi- or Single-family (urban)</td>
</tr>
<tr>
<td>Resource/ Recreation</td>
<td>Forest</td>
</tr>
<tr>
<td>Retail</td>
<td>Commercial (urban)</td>
</tr>
<tr>
<td>ROW</td>
<td>Transportation (urban)</td>
</tr>
<tr>
<td>School</td>
<td>Institutional (urban)</td>
</tr>
<tr>
<td>Three Family</td>
<td>Multi-family (urban)</td>
</tr>
<tr>
<td>Two Family</td>
<td>Multi-family (urban)</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>Forest</td>
</tr>
<tr>
<td>Unknown</td>
<td>Vacant - Developed (urban)</td>
</tr>
<tr>
<td>Water</td>
<td>Not Considered</td>
</tr>
</tbody>
</table>

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. Table 4 summarizes the composition of single-family residential land use based on parcel size ranges.

Table 4. Composition of Single-Family Residential Land Use Based on Parcel Size

<table>
<thead>
<tr>
<th>Watershed</th>
<th>0 - 22k sf</th>
<th>22k sf - 2 ac</th>
<th>2 - 5 acres</th>
<th>&gt; 5 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>3.2%</td>
<td>49.7%</td>
<td>47.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>21.4%</td>
<td>36.0%</td>
<td>18.0%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>11.4%</td>
<td>37.8%</td>
<td>25.4%</td>
<td>25.4%</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>0.9%</td>
<td>47.4%</td>
<td>33.6%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>21.4%</td>
<td>43.9%</td>
<td>34.4%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>13.6%</td>
<td>60.3%</td>
<td>15.7%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>0.2%</td>
<td>45.9%</td>
<td>53.7%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>22.0%</td>
<td>54.4%</td>
<td>11.1%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>1.0%</td>
<td>79.9%</td>
<td>18.8%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>17.0%</td>
<td>43.2%</td>
<td>24.0%</td>
<td>15.7%</td>
</tr>
</tbody>
</table>

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 Input

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 Section 7.1 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.
## Table 5. Land Use Input Data

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Urban (ac)</th>
<th>Cropland (ac)</th>
<th>Forest (ac)</th>
<th>Total (ac)</th>
<th>Urban (%)</th>
<th>Cropland (%)</th>
<th>Forest (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>183.9</td>
<td>0.0</td>
<td>134.7</td>
<td>318.6</td>
<td>58%</td>
<td>0%</td>
<td>42%</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>533.3</td>
<td>3.6</td>
<td>110.5</td>
<td>647.4</td>
<td>82%</td>
<td>1%</td>
<td>17%</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>485.8</td>
<td>28.2</td>
<td>181.5</td>
<td>695.5</td>
<td>70%</td>
<td>4%</td>
<td>26%</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>491.3</td>
<td>5.7</td>
<td>183.3</td>
<td>680.3</td>
<td>72%</td>
<td>1%</td>
<td>27%</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>179.4</td>
<td>0.0</td>
<td>127.1</td>
<td>306.5</td>
<td>59%</td>
<td>0%</td>
<td>41%</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>1185.5</td>
<td>22.6</td>
<td>362.4</td>
<td>1570.5</td>
<td>75%</td>
<td>1%</td>
<td>23%</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>377.6</td>
<td>0.0</td>
<td>825.3</td>
<td>1202.8</td>
<td>31%</td>
<td>0%</td>
<td>69%</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>648.8</td>
<td>43.0</td>
<td>241.8</td>
<td>933.5</td>
<td>69%</td>
<td>5%</td>
<td>26%</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>519.2</td>
<td>0.0</td>
<td>952.6</td>
<td>1471.9</td>
<td>35%</td>
<td>0%</td>
<td>65%</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>192.2</td>
<td>0.0</td>
<td>129.8</td>
<td>322.0</td>
<td>60%</td>
<td>0%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Table 6 presents the composition of the urban land use areas listed in Table 5. 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.

## Table 6. Urban Land Use Composition

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>25.5</td>
<td>2.1</td>
<td>5.7</td>
<td>29.4</td>
<td>17.6</td>
<td>15.7</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>4.2</td>
<td>11.9</td>
<td>0.3</td>
<td>13.9</td>
<td>49.7</td>
<td>18.6</td>
<td>1.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>13.7</td>
<td>16.7</td>
<td>8.8</td>
<td>7.7</td>
<td>27.5</td>
<td>25.0</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>2.4</td>
<td>0.0</td>
<td>4.0</td>
<td>19.7</td>
<td>35.4</td>
<td>37.9</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>4.3</td>
<td>4.1</td>
<td>9.8</td>
<td>32.6</td>
<td>30.6</td>
<td>14.1</td>
<td>2.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>2.7</td>
<td>1.9</td>
<td>1.8</td>
<td>17.9</td>
<td>55.8</td>
<td>18.5</td>
<td>1.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>4.5</td>
<td>43.4</td>
<td>50.7</td>
<td>1.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>0.3</td>
<td>0.0</td>
<td>4.5</td>
<td>11.9</td>
<td>63.9</td>
<td>19.3</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
<td>13.6</td>
<td>66.9</td>
<td>15.1</td>
<td>3.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>6.3</td>
<td>2.7</td>
<td>0.0</td>
<td>37.8</td>
<td>39.4</td>
<td>11.5</td>
<td>2.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 7 presents the total estimated number of septic systems in the Tankerhoosen River watershed, determined using the methods described in Section 4.0. 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 Section 4.0, “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.

Table 7. Estimated Number of Septic Systems

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Residential</th>
<th>Other</th>
<th>Equivalent Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>43</td>
<td>2</td>
<td>53</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>108</td>
<td>8</td>
<td>148</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>81</td>
<td>1</td>
<td>86</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>236</td>
<td>4</td>
<td>256</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>43</td>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>169</td>
<td>7</td>
<td>204</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>76</td>
<td>0</td>
<td>76</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>98</td>
<td>0</td>
<td>98</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>198</td>
<td>3</td>
<td>213</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>42</td>
<td>2</td>
<td>52</td>
</tr>
</tbody>
</table>

5.2 Results

Table 8 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 Table 8 identifies subwatersheds with high (orange), moderate (yellow), and low (green) pollutant loadings.

Table 8. Estimated Existing Pollutant Loads

<table>
<thead>
<tr>
<th>Watershed</th>
<th>N</th>
<th>P</th>
<th>BOD</th>
<th>Sediment</th>
<th>N</th>
<th>P</th>
<th>BOD</th>
<th>Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond (318 ac)</td>
<td>2175</td>
<td>385</td>
<td>7895</td>
<td>51</td>
<td>6.8</td>
<td>1.2</td>
<td>24.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Clarks Brook (647 ac)</td>
<td>4157</td>
<td>669</td>
<td>15686</td>
<td>92</td>
<td>6.4</td>
<td>1.0</td>
<td>24.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Gages Brook (695 ac)</td>
<td>4640</td>
<td>787</td>
<td>18084</td>
<td>115</td>
<td>6.7</td>
<td>1.1</td>
<td>26.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Gages Brook South Tributary (680 ac)</td>
<td>4062</td>
<td>720</td>
<td>14877</td>
<td>89</td>
<td>6.0</td>
<td>1.1</td>
<td>21.9</td>
<td>0.1</td>
</tr>
<tr>
<td>Lower Tankerhoosen River (306 ac)</td>
<td>2009</td>
<td>343</td>
<td>6987</td>
<td>47</td>
<td>6.6</td>
<td>1.1</td>
<td>22.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>
### Table 9. Pollutant Source by Land Use

<table>
<thead>
<tr>
<th>Source</th>
<th>N Load</th>
<th>P Load</th>
<th>BOD Load</th>
<th>Sediment Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>91.9%</td>
<td>81.5%</td>
<td>93.1%</td>
<td>88.6%</td>
</tr>
<tr>
<td>Cropland</td>
<td>1.9%</td>
<td>2.6%</td>
<td>1.0%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Forest</td>
<td>2.3%</td>
<td>6.7%</td>
<td>1.5%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Septic</td>
<td>3.9%</td>
<td>9.2%</td>
<td>4.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

- **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 Table 9. 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 Table 5)
By subdividing the urban pollutant loads into the distinct urban categories that were included in the model (See Table 10), 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 Table 6). 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 Table 1).

**Table 10. Pollutant Loads and Sources for Urban Categories**

<table>
<thead>
<tr>
<th>Urban Land Use</th>
<th>N Load</th>
<th>P Load</th>
<th>BOD Load</th>
<th>Sediment Load</th>
<th>N Load</th>
<th>P Load</th>
<th>BOD Load</th>
<th>Sediment Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb/year</td>
<td>lb/year</td>
<td>lb/year</td>
<td>tons/year</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Commercial</td>
<td>2242</td>
<td>408</td>
<td>10191</td>
<td>51</td>
<td>6%</td>
<td>8%</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Industrial</td>
<td>1898</td>
<td>304</td>
<td>6834</td>
<td>46</td>
<td>5%</td>
<td>6%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Institutional</td>
<td>1061</td>
<td>177</td>
<td>4596</td>
<td>20</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Transportation</td>
<td>17400</td>
<td>2900</td>
<td>53938</td>
<td>435</td>
<td>49%</td>
<td>55%</td>
<td>40%</td>
<td>54%</td>
</tr>
<tr>
<td>Dense Residential</td>
<td>9890</td>
<td>989</td>
<td>45990</td>
<td>185</td>
<td>28%</td>
<td>19%</td>
<td>34%</td>
<td>23%</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>2970</td>
<td>495</td>
<td>12871</td>
<td>55</td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Vacant</td>
<td>297</td>
<td>30</td>
<td>792</td>
<td>7</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Open Space</td>
<td>39</td>
<td>4</td>
<td>103</td>
<td>1</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

6.0 **FUTURE POLLUTANT LOADINGS**

6.1 **Input**

Future land use estimates, presented in Table 11, were used in the STEPL model to simulate a watershed buildout scenario. Also summarized in Table 11 is the predicted "increase" in urban land use for each subwatershed. These model inputs were derived from the data presented in Section 7.2 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.

**Table 11. Land Use Input Data**

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Land Use Area (ac)</th>
<th>Land Use Composition</th>
<th>Urban Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Cnpland</td>
<td>Forest</td>
</tr>
<tr>
<td>Bolton Notch Pond</td>
<td>233.3</td>
<td>0</td>
<td>85.3</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>590.4</td>
<td>2.4</td>
<td>54.6</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>614.4</td>
<td>28.2</td>
<td>55.2</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>614.3</td>
<td>5.7</td>
<td>66.1</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>270.7</td>
<td>0</td>
<td>35.8</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>1312.5</td>
<td>10.1</td>
<td>24.9</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>589.9</td>
<td>0</td>
<td>61.9</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>771.2</td>
<td>43.0</td>
<td>119.3</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>746.1</td>
<td>0</td>
<td>725.7</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>296.4</td>
<td>0</td>
<td>25.7</td>
</tr>
</tbody>
</table>
Table 12 summarizes a break-down of the urban land uses presented in Table 5. 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.

**Table 12. Urban Land Use Composition**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>20.2</td>
<td>6.5</td>
<td>4.5</td>
<td>23.2</td>
<td>16.0</td>
<td>26.6</td>
<td>3.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>6.0</td>
<td>15.2</td>
<td>0.3</td>
<td>12.6</td>
<td>57.1</td>
<td>7.6</td>
<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>15.6</td>
<td>16.8</td>
<td>7.0</td>
<td>6.1</td>
<td>23.2</td>
<td>30.8</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>2.6</td>
<td>3.5</td>
<td>3.2</td>
<td>15.7</td>
<td>30.3</td>
<td>44.2</td>
<td>0.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>3.5</td>
<td>2.7</td>
<td>6.5</td>
<td>21.6</td>
<td>59.8</td>
<td>2.8</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>5.9</td>
<td>1.7</td>
<td>1.6</td>
<td>16.1</td>
<td>67.5</td>
<td>6.0</td>
<td>0.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>2.9</td>
<td>86.1</td>
<td>10.1</td>
<td>0.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>0.2</td>
<td>0.0</td>
<td>3.8</td>
<td>10.0</td>
<td>81.5</td>
<td>4.4</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>0.0</td>
<td>0.0</td>
<td>0.5</td>
<td>9.5</td>
<td>33.9</td>
<td>55.0</td>
<td>0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>15.1</td>
<td>3.7</td>
<td>0.0</td>
<td>24.5</td>
<td>36.9</td>
<td>19.8</td>
<td>0.1</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 13 presents the total estimated number of existing and future septic systems in the Tankerhoosen River watershed, determined using the methods described in Section 4.0. 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 Section 4.0, “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.

**Table 13. Estimated Number of Septic Systems**

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Existing Equivalent Total</th>
<th>Future Residential Systems</th>
<th>Other Future Systems</th>
<th>Future Equivalent Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton Notch Pond</td>
<td>53</td>
<td>8</td>
<td></td>
<td>61</td>
</tr>
<tr>
<td>Clarks Brook</td>
<td>148</td>
<td>3</td>
<td>9</td>
<td>196</td>
</tr>
<tr>
<td>Gages Brook</td>
<td>86</td>
<td>5</td>
<td></td>
<td>91</td>
</tr>
<tr>
<td>Gages Brook South Tributary</td>
<td>256</td>
<td>14</td>
<td>1</td>
<td>275</td>
</tr>
<tr>
<td>Lower Tankerhoosen River</td>
<td>48</td>
<td>4</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>204</td>
<td>11</td>
<td>9</td>
<td>260</td>
</tr>
<tr>
<td>Railroad Brook</td>
<td>76</td>
<td>26</td>
<td></td>
<td>102</td>
</tr>
<tr>
<td>Tucker Brook</td>
<td>98</td>
<td>6</td>
<td></td>
<td>104</td>
</tr>
<tr>
<td>Upper Tankerhoosen River</td>
<td>213</td>
<td>19</td>
<td></td>
<td>232</td>
</tr>
<tr>
<td>Walker Reservoir</td>
<td>52</td>
<td>7</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

6.2 Results
Table 14 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.

Table 14. Projected Future Pollutant Loads and Load Increases

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Total Future Load</th>
<th>Projected Load Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>Bolton Notch Pond (318 ac)</td>
<td>2384</td>
<td>416</td>
</tr>
<tr>
<td>Clarks Brook (647 ac)</td>
<td>4745</td>
<td>756</td>
</tr>
<tr>
<td>Gages Brook (695 ac)</td>
<td>5538</td>
<td>921</td>
</tr>
<tr>
<td>Gages Brook South Tributary (680 ac)</td>
<td>4559</td>
<td>793</td>
</tr>
<tr>
<td>Lower Tankerhoosen River (306 ac)</td>
<td>2410</td>
<td>374</td>
</tr>
<tr>
<td>Middle Tankerhoosen River (1570 ac)</td>
<td>10357</td>
<td>1585</td>
</tr>
<tr>
<td>Railroad Brook (1203 ac)</td>
<td>2964</td>
<td>432</td>
</tr>
<tr>
<td>Tucker Brook (934 ac)</td>
<td>5111</td>
<td>736</td>
</tr>
<tr>
<td>Upper Tankerhoosen River (1472 ac)</td>
<td>4228</td>
<td>759</td>
</tr>
<tr>
<td>Walker Reservoir (322 ac)</td>
<td>2909</td>
<td>481</td>
</tr>
<tr>
<td>Total (8149 ac)</td>
<td>45207</td>
<td>7252</td>
</tr>
</tbody>
</table>

Table 15 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 Table 15 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

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Projected Future Loading Rate Increase</th>
<th>Projected Load Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>Bolton Notch Pond (318 ac)</td>
<td>0.66</td>
<td>0.10</td>
</tr>
<tr>
<td>Clarks Brook (647 ac)</td>
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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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NURP (1983). Results of the Nationwide Urban Runoff Program. U.S. Environmental Protection Agency Water Planning Division, PB 84-185552, Washington, D.C.


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
WATERSHED FIELD INVENTORIES AND LAND USE REGULATORY REVIEW
Tankerhoosen River Watershed

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LAND USE REGULATORY REVIEW
Tankerhoosen River Watershed

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END OF REPORT
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 (Figure 1):

- Clarks Brook,
- Gages Brook,
- Gages Brook South Tributary,
- Lower Tankerhoosen River,
- Middle Tankerhoosen River,
- Tucker Brook,
- Walker Reservoir.
Figure 1. Tankerhoosen River Watershed
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 1. Copies of completed field assessment forms are provided in Appendix A (stream corridor assessments) and Appendix B (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 Appendix C.

### Table 1: Field Inventory Nomenclature

<table>
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<tr>
<th>Subwatershed</th>
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<tr>
<td>Clarks Brook</td>
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<tr>
<td>Lower Tankerhoosen River</td>
<td>LTR</td>
</tr>
<tr>
<td>Middle Tankerhoosen River</td>
<td>MTR</td>
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<tr>
<td>Walker Reservoir</td>
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<tr>
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<tr>
<td>Gages Brook South Tributary</td>
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</tr>
<tr>
<td>Tucker Brook</td>
<td>TB</td>
</tr>
<tr>
<td><strong>Stream Corridor Assessment</strong></td>
<td>Abbreviation</td>
</tr>
<tr>
<td>Reach Level Assessment</td>
<td>RCH</td>
</tr>
<tr>
<td>Channel Modification</td>
<td>CM</td>
</tr>
<tr>
<td>Severe Bank Erosion</td>
<td>ER</td>
</tr>
<tr>
<td>Impacted Buffer</td>
<td>IB</td>
</tr>
<tr>
<td>Stormwater Outfall</td>
<td>OT</td>
</tr>
<tr>
<td>Stream Crossing</td>
<td>SC</td>
</tr>
<tr>
<td>Trash &amp; Debris</td>
<td>TB</td>
</tr>
<tr>
<td>Utilities</td>
<td>UT</td>
</tr>
<tr>
<td><strong>Upland Assessment</strong></td>
<td>Abbreviation</td>
</tr>
<tr>
<td>Hotspot Investigation</td>
<td>HSI</td>
</tr>
<tr>
<td>Neighborhood Site Assessment</td>
<td>NSA</td>
</tr>
<tr>
<td>Streets and Storm Drains</td>
<td>SSD</td>
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</table>
2.1 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. 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 backyards. 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 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. 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 (Appendix A). 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. Table 2 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

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<tr>
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<th>CM</th>
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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). 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 4 summarizes stream reach assessment scores and classifications for the assessed stream reaches.

### Table 3: Stream Reach Classifications

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<td>Good</td>
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<td>Fair</td>
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<td>≥84</td>
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<td>Poor</td>
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<tr>
<td>Very Poor</td>
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Table 4: Stream Reach Assessment Scores and Classifications

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Note: TB04C and CB-05 were not scored during the reach level assessment.

As depicted in Figure 2, 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.
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.
• 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 streambank 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 re-emerges 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.**
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.

CB-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.](image-url)
• 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
Figure 5: Middle Tankerhoosen River Subwatershed Field Assessment 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.
• 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.

• 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 Assessment 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.](image)

- **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.
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. In-stream 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
Figure 7. Gages Brook Subwatershed Field Assessment Locations

Legend
- Subwatersheds
- Tankerhoosen River Watershed
- Municipal Boundary
- Waterbody
- Marsh
- Stream Reach
- Neighborhood Assessment Areas
- Hotspots

Gages Brook Subwatershed
Stream and Neighborhood Assessment
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 on-site 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.](image-url)
• 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.

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.
• 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](image)

- **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 16-inch 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 15-inch 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 50-foot 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 Tankerhoosen 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.
A 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 8-inch 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.
• 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 Appendix B.

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. Table 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.

Table 5: Hotspot Site Investigation Summary

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

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 Section 2.2.5). 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.
The Dari Farms Ice Cream 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.
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 Section 2.2.4). 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.

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 Section 2.2.1) 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.
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.

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

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.

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.
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 Section 2.2.7). 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 Section 2.2.7, 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 Table 7, and the completed field forms are included in Appendix B.
<table>
<thead>
<tr>
<th>Location</th>
<th>Storm Drains</th>
<th>Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell Avenue</td>
<td><img src="Campbell_Avenue_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="Campbell_Avenue_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td>Mount Vernon Apartments</td>
<td><img src="Mount_Vernon_Apartments_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="Mount_Vernon_Apartments_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td>Valley View Drive/ Andrew Way</td>
<td><img src="Valley_View_Drive_Andrew_Way_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="Valley_View_Drive_Andrew_Way_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td>High Manor Mobile Home Park</td>
<td><img src="High_Manor_Mobile_Home_Park_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="High_Manor_Mobile_Home_Park_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td>Gerber Technologies</td>
<td><img src="Gerber_Technologies_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="Gerber_Technologies_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td>Clark Road Industrial Park</td>
<td><img src="Clark_Road_Industrial_Park_Storm_Drain_1.jpg" alt="Storm Drain Photo" /></td>
<td><img src="Clark_Road_Industrial_Park_Street_1.jpg" alt="Street Photo" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[No photo]</td>
</tr>
</tbody>
</table>
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 mechanisms 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 (Table 8).

<table>
<thead>
<tr>
<th>Town</th>
<th>Land Use Commissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>• Planning and Zoning Commission (acts as Inland Wetlands and Watercourses Agency)</td>
</tr>
<tr>
<td></td>
<td>• Zoning Board of Appeals</td>
</tr>
<tr>
<td>Vernon</td>
<td>• Planning and Zoning Commission</td>
</tr>
<tr>
<td></td>
<td>• Inland Wetlands and Watercourses Agency</td>
</tr>
<tr>
<td></td>
<td>• Conservation Commission</td>
</tr>
<tr>
<td></td>
<td>• Design Review Board</td>
</tr>
<tr>
<td></td>
<td>• Open Space Task Force</td>
</tr>
<tr>
<td>Tolland</td>
<td>• Planning and Zoning Commission</td>
</tr>
<tr>
<td></td>
<td>• Inland Wetlands and Watercourses Commission</td>
</tr>
<tr>
<td></td>
<td>• Conservation Commission</td>
</tr>
<tr>
<td></td>
<td>• Design Advisory Board</td>
</tr>
<tr>
<td>Bolton</td>
<td>• Planning and Zoning Commission</td>
</tr>
<tr>
<td></td>
<td>• Inland Wetlands Commission</td>
</tr>
<tr>
<td></td>
<td>• Conservation Commission</td>
</tr>
<tr>
<td></td>
<td>• Open Space Preservation, Acquisition, and Conservation Committee</td>
</tr>
</tbody>
</table>

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

Table 9 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.
### Table 9: Municipal Land Use Regulations

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Manchester</th>
<th>Vernon</th>
<th>Tolland</th>
<th>Bolton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdivision Regulations</td>
<td>2005</td>
<td>2007</td>
<td>2008</td>
<td>2004</td>
</tr>
<tr>
<td>Zoning Regulations</td>
<td>2008</td>
<td>2006</td>
<td>2008</td>
<td>2005</td>
</tr>
<tr>
<td>Floodplain Management</td>
<td>1994</td>
<td>In Zoning Regs.</td>
<td>None</td>
<td>2005</td>
</tr>
</tbody>
</table>

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. Table 10 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

<table>
<thead>
<tr>
<th>Town</th>
<th>Regulating Agency</th>
<th>Upland Review Area</th>
<th>Wetlands and Watercourses of Special Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>Planning &amp; Zoning Commission</td>
<td>50’ wetlands and watercourses</td>
<td>None identified</td>
</tr>
</tbody>
</table>
| Vernon         | Inland Wetlands & Watercourses Agency | 100’ wetlands 200’ designated watercourses | • Vernal pools on Box Mountain Road  
• Tankerhoosen River  
• Hockanum River  
• Belding Preserve and Wildlife Management Areas |
<p>| Tolland        | Inland Wetlands &amp; Watercourses Commission | 50’ wetlands 100’ watercourses | Preliminary*                                                                         |</p>
<table>
<thead>
<tr>
<th>Town</th>
<th>Regulating Agency</th>
<th>Upland Review Area</th>
<th>Wetlands and Watercourses of Special Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolton</td>
<td>Inland Wetlands Commission, Conservation Commission</td>
<td>100’ wetlands and watercourses</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

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 stormwater 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).
Table 11. Status of Municipal Open Space Plans in the Tankerhoosen River Watershed

<table>
<thead>
<tr>
<th>Town</th>
<th>Open Space Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>2004</td>
</tr>
<tr>
<td>Vernon</td>
<td>2002</td>
</tr>
<tr>
<td>Tolland</td>
<td>2006</td>
</tr>
<tr>
<td>Bolton</td>
<td>2004</td>
</tr>
</tbody>
</table>

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. Table 12 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.

Table 12. Open Space Regulations

<table>
<thead>
<tr>
<th>Town</th>
<th>Allow ‘Cluster’ Development</th>
<th>Allow ‘Open Space’ Subdivisions</th>
<th>Subdivision Open Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Manchester</td>
<td>Yes</td>
<td>No</td>
<td>Yes, 6%</td>
</tr>
<tr>
<td>Vernon</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Tolland</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, 10%</td>
</tr>
<tr>
<td>Bolton</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Hockanum River – State of the Watershed Land Use Questionnaire, North Central Conservation District, 2005
3.3 **Summary of Existing Regulations and Preliminary Recommendations**

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.

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 Appendix D.

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?
  - 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


APPENDIX A

Stream Corridor Assessment Field Forms and Data
Reach Level Assessment

**SURVEY REACH ID:** [L5301]  
**WTRSHD/SUBSHD:** Clarks Brook  
**DATE:** 7/2/08  
**ASSESSED BY:** Friends

- **START**  
  **TIME:** 9:38 AM/PM  
  **LMK:**  
  **LAT:** 49°49'19.9"  
  **LONG:** 72°07'23.5"

- **END**  
  **TIME:**  
  **LMK:**  
  **LAT:** 49°58'7"
  **LONG:** 72°07'19.7"

**DESCRIPTION:**

- 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.

**BASE FLOW AS %**
- 0-25%  
- 50%-75%  
- 75-100%

**CHANNEL WIDTH**
- 25-50%  
- 75-100%

**DOMINANT SUBSTRATE**
- Silt/clay (fine or slick)  
- Sand (gritty)  
- Gravel (0.1-2.5")  
- Cobble (2.5-10")  
- Boulder (>10")  
- Bed rock

**WATER CLARITY**
- Clear  
- Turbid (suspended matter)  
- Stained (clear, naturally colored)  
- Opaque (milky)  
- Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM**
- Attached: none  
- some  
- lots

- Floating: none  
- some  
- lots

**WILDLIFE IN OR AROUND STREAM**
- Fish  
- Beaver  
- Deer  
- Snails  
- Other

**STREAM SHADING**
- Mostly shaded (≥75% coverage)  
- Halfway (≥50%)  
- Partially shaded (≥25%)  
- Unshaded (<25%)

**CHANNEL DYNAMICS**
- Downcutting  
- Widening  
- Headcutting  
- Aggrading  
- Sed. deposition

- Bed scour  
- Bank failure  
- Bank scou  
- Slope failure  
- Channelized

**CHANNEL HEIGHT**
- LT bank: 3 (ft)  
- RT bank: 3 (ft)

**CHANNEL WIDTH**
- (FACING DOWNSM)  
- Bottom: 3 (ft)  
- Top: 4 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**NOTES:** (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES**
- Yes  
- No
<table>
<thead>
<tr>
<th>In-Stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERAL STREAM CONDITION</strong></td>
<td>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).</td>
<td>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 new fall, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong></td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat; evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCROACHMENT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
</tr>
</tbody>
</table>

**OVERALL BUFFER AND FLOODPLAIN CONDITION**

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</strong></td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat; evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
</tr>
</tbody>
</table>

Sub Total In-stream: 93 / 80 + Buffer/Floodplain: 35 / 80 = Total Survey Reach: 78 / 160
**Storm Water Outfalls**

**Watershed/Subshed:** Charles Brook

**Survey Reach ID:** CB01

**Site ID (Condition #):** OT-03

**Date:** 7/21/08

**Assessed By:** Friends

**Time:** 10:48 AM/PM

**Photo ID:** (Camera-Pic #) #10 (2408)

**Lat:** 41° 49' 57.2" " Long: 72° 07' 26.2"

**LMK:**

**GPS:** (Unit ID)

### Bank:
- [ ] LT
- [ ] RT
- [ ] Head

### Flow:
- [ ] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

### Type:
- [ ] Closed pipe
- [ ] Other:

### Material:
- [ ] Concrete
- [ ] Metal
- [ ] PVC/Plastic
- [ ] Brick
- [ ] Other:

### Shape:
- [ ] Single
- [ ] Circular
- [ ] Elliptical
- [ ] Triangular
- [ ] Double
- [ ] Parabolic
- [ ] Other:

### Dimensions:
- Diameter: 18 (in)
- Depth: ______ (in)
- Width (Top): ______ (in)
- " (Bottom): ______ (in)

### Submerged:
- [ ] No
- [ ] Partially
- [ ] Fully

### 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 Growth:
- [ ] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

### Pool Quality:
- [ ] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

### For Flowing Only:
- Color:
  - [ ] Clear
  - [ ] Brown
  - [ ] Grey
  - [ ] Yellow
  - [ ] Green
  - [ ] Orange
  - [ ] Red
  - [ ] Other:

- Turbidity:
  - [ ] None
  - [ ] Slight Cloudiness
  - [ ] Cloudy
  - [ ] Opaque

- Floatables:
  - [ ] None
  - [ ] Sewage (toilet paper, etc.)
  - [ ] Petroleum (oils sheen)
  - [ ] Other:

### Other Concerns:
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

### Potential Restoration Candidate:
- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] 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?
  - [ ] Yes
  - [ ] No
  - [ ] Not investigated
- Land Use description:
- 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 stream; discharge appears to be having a significant impact downstream.
  - 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.
  - Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

### Sketch/Notes:

**Reported to authorities:** [ ] Yes [ ] No
### Storm Water Outfalls

**Watershed/Subshed:** Charles Brooks

**Survey Reach ID:** CBA

**Site ID (Condition-#):** OT-04

**Date:** 2/1/08

**Time:** 10:50 AM/PM

**Photo ID:** (Camera-Pic #) #1 (244)

**Latitude:** 43.19571, **Longitude:** 22.87257

**LMK:**

**Gps:** (Unit ID)

---

**Bank:**
- [X] LT [ ] RT [ ] Head

**Flow:**
- [ ] None [ ] Trickle [ ] Moderate [ ] Substantial [ ] Other:

**Condition:**
- [X] None [ ] Chip/Cracked [ ] Peeling Paint [ ] Corrosion [ ] Other:

**Type:**
- [X] Closed pipe

**Material:**
- [X] Concrete [ ] Metal [ ] PVC/Plastic [ ] Brick [ ] Other:

**Shape:**
- [ ] Single [ ] Circular [ ] Double [ ] Elliptical [ ] Triple [ ] Other:

**Dimensions:**
- Diameter: [ ] in (in)

**Depth:** [ ] in (in)

**Width (Top):** [ ] in (in)

**Submerged:**
- [X] No [ ] Partially [ ] Fully

---

**For Flowing Only**

**Color:**
- [ ] Clear [ ] Brown [ ] Grey [ ] Yellow [ ] Green [ ] Orange [ ] Red [ ] Other:

**Turbidity:**
- [X] None [ ] Slight Cloudiness [ ] Cloudy [ ] Opaque

**Floatables:**
- [X] None [ ] Sewage (toilet paper, etc.) [ ] Petroleum (oil sheen) [ ] Other:

**Other Concerns:**
- [ ] Excess Trash (paper/plastic bags) [ ] Dumping (bulk) [ ] Excessive Sedimentation [ ] Needs Regular Maintenance [ ] Bank Erosion [ ] Other:

---

**Potential Restoration Candidate**
- [ ] Discharge Investigation [ ] Stream Daylighting [ ] Local Stream Repair/Outfall Stabilization [ ] Storm Water Retrofit [ ] 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?**
- [X] Yes [ ] No [ ] Not Investigated

**Land Use Description:**

**Area Available:**

---

**Outfall Severity:**

**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 having a significant impact downstream.**

**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.**

**Outfall does not have dry weather discharge; staining, or appearance of causing any erosion problems.**

---

**Sketch/Notes:**

---

**Reported to Authorities:** [X] Yes [ ] No
Storm Water Outfalls

WATERSHED/SUBSHED: Clark's Brook

SURVEY REACH ID: CB01

SITE ID (Condition #): OT-1

LAT 41° 49' 58.6" LONG 72° 27' 20.4"

Waves

REPORTED TO AUTHORITIES: YES NO
**Storm Water Outfalls**

**Watershed/Subshed:**

**Survey Reach ID:** C601

**Site ID (Condition-#): OT - 7

**Date:** 7/12/08

**Site ID (Condition-#): OT - 7

**Time:** 10:40 AM/PM

**Photo ID:** (Camera Pic #: # 9)

**Reported to authorities:** Yes

**Assessed by:** Friends [Signature]

**Watershed/Subshed:** Charles Brack

**Site ID (Condition-#): OT - 7

**Latitude:** 41° 49' 55.8" " Longitude: 71° 27' 28.5"

**LMK:**

**GPS:** (Unit ID)

**Bank:**

- [ ] LT
- [ ] RT
- [ ] Head

**Flow:**

- [ ] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

**Type:**

- [ ] Closed pipe

**Material:**

- [ ] Concrete
- [ ] Metal
- [ ] PVC/Plastic
- [ ] Brick
- [ ] Other:

**Shape:**

- [ ] Single
- [ ] Circular
- [ ] Double
- [ ] Elliptical
- [ ] Triple
- [ ] Other:

**Dimensions:**

- [ ] Diameter: ____(in)

**Submerged:**

- [ ] No
- [ ] Partially
- [ ] Fully

**NOT APPLICABLE**

**Condition:**

- [ ] None
- [ ] Chip/Cracked
- [ ] Peeling Paint
- [ ] Corrosion
- [ ] Other:

**Odor:**

- [ ] No
- [ ] Gas
- [ ] Sewage
- [ ] Rancid/Sour
- [ ] Sulfide
- [ ] Other:

**Deposits/Stains:**

- [ ] None
- [ ] Oily
- [ ] Paint
- [ ] Flow Line
- [ ] Other:

**Vegetation Density:**

- [ ] None
- [ ] Normal
- [ ] Inhibited
- [ ] Excessive
- [ ] Other:

**Pipe Benthic Growth:**

- [ ] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

**Pool Quality:**

- [ ] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

**For Flowing Only:**

**Flowing Only:**

- [ ] Color:
  - [ ] Clear
  - [ ] Brown
  - [ ] Grey
  - [ ] Yellow
  - [ ] Green
  - [ ] Orange
  - [ ] Red
  - [ ] Other:

**Turbidity:**

- [ ] None
- [ ] Slight Cloudiness
- [ ] Cloudy
- [ ] Opaque

**Floatables:**

- [ ] None
- [ ] Sewage (toilet paper, etc.)
- [ ] Petroleum (oil sheen)
- [ ] Other:

**Other Concerns:**

- [ ] Excess Trash (paper/plastic bags)
- [ ] Dumping (bulk)
- [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance
- [ ] Bank Erosion
- [ ] Other:

**Potential Restoration Candidate:**

- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] 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?

- [ ] Yes
- [ ] No
- [ ] Not investigated

Land Use description: _______________________

Area available: ___________________________

**Outfall Severity:**

- [ ] 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 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.
- [ ] Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

**Sketch/Notes:**

---

**Reported to authorities:** Yes

---
**Stream Crossing**

**Watershed/Subshed:** Charles Brook

**Date:** 7/12/08

**Assessed By:** Frierdys

**Survey Reach ID:** CB-01

**Time:** 11:00 AM/PM

**Photo ID:** (Camera-Pic #) #12 (2405)

**Site ID:** (Condition-#) SC-01

**Lat:** 41° 49' 51.1"

**Long:** 72° 27' 20.2"

**LMK:**

**GPS (Unit ID):**

<table>
<thead>
<tr>
<th>Type:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Shape:</th>
<th>Arch</th>
<th>Box</th>
<th>Elliptical</th>
<th>Circular</th>
<th>Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th># Barrels:</th>
<th>Single</th>
<th>Double</th>
<th>Triple</th>
<th>Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Material:</th>
<th>Concrete</th>
<th>Metal</th>
<th>Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Alignment:</th>
<th>Flow-aligned</th>
<th>Not flow-aligned</th>
<th>Do not know</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dimensions:</th>
<th>(If variable, sketch)</th>
</tr>
</thead>
</table>

- **For Road/Railroad Crossings Only**
  - **Shape:**
    - Arch
    - Box
    - Elliptical
    - Circular
    - Other:
  - **# Barrels:**
    - Single
    - Double
    - Triple
    - Other:
  - **Material:**
    - Concrete
    - Metal
    - Other:
  - **Alignment:**
    - Flow-aligned
    - Not flow-aligned
    - Do not know
  - **Dimensions:** (If variable, sketch)
    - Barrell diameter: 5.5 (ft)
    - Height: (ft)
    - Culvert length: 34 (ft)
    - Width: (ft)
    - Roadway elevation: 2 (ft)

<table>
<thead>
<tr>
<th>Potential Restoration Candidate</th>
<th>Fish barrier removal</th>
<th>Culvert repair/replacement</th>
<th>Upstream storage retrofit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
<td><strong>Yes</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is SC acting as grade control</th>
<th>No</th>
<th>Yes</th>
<th>Unknown</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Extent of Physical Blockage:</th>
<th>Total</th>
<th>Partial</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause:</th>
<th>Drop too high</th>
<th>Water Drop: ____ (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow too shallow</td>
<td>Water Depth: ____ (in)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blockage Severity: (circle #)</th>
</tr>
</thead>
</table>

- **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 visible fish habitat above it; natural barriers such as waterfalls.**

<table>
<thead>
<tr>
<th>Notes/Sketch:</th>
</tr>
</thead>
</table>

**Reported to authorities:** Yes No
### Reach Level Assessment

**Survey Reach ID:** cB822  
**Wtrshd/Subshd:** Clarke's Brook  
**Date:** 7/2/03  
**Assessed By:**  
**Start Time:** 11:49 AM/PM  
**LMK:**  
**End Time:**  
**LMK:**  
**GPS ID:**  

<table>
<thead>
<tr>
<th>Rain in Last 24 Hours</th>
<th>Present Conditions</th>
<th>Surrounding Land Use</th>
<th>Average Conditions (check applicable)</th>
<th>Reach Sketch and Site Impact Tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Heavy rain</td>
<td>□ Steady rain</td>
<td>□ Intermittent</td>
<td>□ Trace</td>
<td>□ Overcast</td>
</tr>
<tr>
<td>□ None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base Flow as %</th>
<th>Channel Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 0-25%</td>
<td>□ 25-50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dominant Substrate</th>
<th>Water Clarity</th>
<th>Aquatic Plants in Stream</th>
<th>Wildlife in or Around Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Silt/clay (fine or slick)</td>
<td>□ Clear</td>
<td>Attached: □ none □ some □ lots</td>
<td>□ Fish □ Beaver □ Deer</td>
</tr>
<tr>
<td>□ Sand (gritty)</td>
<td>□ Turbid (suspended matter)</td>
<td>Floating: □ none □ some □ lots</td>
<td>□ Snails □ Other:</td>
</tr>
<tr>
<td>□ Gravel (0.1-2.5&quot;)</td>
<td>□ Stained (clear, naturally colored)</td>
<td>□ Clear □ Opaque (milky)</td>
<td>(Evidence of)</td>
</tr>
<tr>
<td>□ Boulder (&gt;10&quot;)</td>
<td>□ Other (chemicals, dyes)</td>
<td>□ Other:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stream Shading (water surface)</th>
<th>Channel Dynamics</th>
<th>Channel Dimensions (Facing Downstream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Mostly shaded (&gt;75% coverage)</td>
<td>□ Sed. deposition</td>
<td>Height: LT bank 6 ft (ft)</td>
</tr>
<tr>
<td>□ Halfway (≥50%)</td>
<td>□ Bed scour</td>
<td>RT bank 7 ft</td>
</tr>
<tr>
<td>□ Partially shaded (≥25%)</td>
<td>□ Bank failure</td>
<td>Width: Bottom 6 ft</td>
</tr>
<tr>
<td>□ Unshaded (&lt; 25%)</td>
<td>□ Bank scour</td>
<td>Top 7 ft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Channel Dynamics</th>
<th>Channel Dimensions (Facing Downstream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Downcutting</td>
<td>Height: LT bank 6 ft</td>
</tr>
<tr>
<td>□ Widening</td>
<td>RT bank 7 ft</td>
</tr>
<tr>
<td>□ Headcutting</td>
<td>Width: Bottom 6 ft</td>
</tr>
<tr>
<td>□ Aggrading</td>
<td>Top 7 ft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Channel Dynamics</th>
<th>Channel Dimensions (Facing Downstream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Bank failure</td>
<td>Height: LT bank 6 ft</td>
</tr>
<tr>
<td>□ Bank scour</td>
<td>RT bank 7 ft</td>
</tr>
<tr>
<td>□ Slope failure</td>
<td>Width: Bottom 6 ft</td>
</tr>
<tr>
<td>□ Channelized</td>
<td>Top 7 ft</td>
</tr>
</tbody>
</table>

### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

### Notes

(Insert biggest problems you see in survey reach)

**Reported to Authorities:** □ Yes □ No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>IN-STREAM HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERALL STREAM CONDITION</strong></td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability is less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td><strong>IN-STREAM</strong></td>
<td><strong>Greater than 70%</strong></td>
<td><strong>40-70%</strong></td>
<td><strong>20-40%</strong></td>
<td><strong>Less than 20%</strong></td>
</tr>
<tr>
<td><strong>HABITAT</strong></td>
<td><strong>of substrate</strong></td>
<td><strong>mix of stable habitat</strong></td>
<td><strong>mix of stable habitat</strong></td>
<td><strong>stable habitat</strong></td>
</tr>
<tr>
<td><strong>favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong></td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>score each bank, determine sides by facing downstream</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>Right Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>BANK EROSION</strong></td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Post downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>(facing downstream)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>Right Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
<tr>
<td><strong>Score each side</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>Right Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>OVERALL BUFFER AND FLOODPLAIN CONDITION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</strong></td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>Right Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
<td></td>
</tr>
<tr>
<td><strong>Score each side</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>Right Bank</strong></td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
</tr>
<tr>
<td><strong>Score each side</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCOACHMENT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e., fill material, land development, or man-made structures). Significant effect on floodplain function.</td>
</tr>
<tr>
<td><strong>Score each side</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Left Bank</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

Sub Total In-stream: 63 /80 + Buffer/Floodplain: 40 /80 = Total Survey Reach 93 /160
### Storm Water Outfalls

**WATERSHED/SUBSHED:** Clark's Brook  
**DATE:** 7/1/10  
**ASSESSED BY:** Friends

**SURVEY REACH ID:** CBA  
**TIME:** 11:15 AM  
**PHOTO ID:** (Camera-Pic #)  
**SITE ID (Condition-#):** OT-01  
**LAT:** 41° 04' 58.3"  
**LONG:** 72° 27' 31.1"  
**LMK:**  
**GPS:** (Unit ID)

<table>
<thead>
<tr>
<th>BANK:</th>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SHAPE:</th>
<th>DIMENSIONS:</th>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td></td>
<td>Concrete</td>
<td>Single</td>
<td>Diameter: 6</td>
<td>No</td>
</tr>
<tr>
<td>RT</td>
<td></td>
<td>Metal</td>
<td></td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Head</td>
<td></td>
<td>PVC/Plastic</td>
<td>Circular</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brick</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closed pipe</td>
<td>Circular</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open channel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Earthen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FLOW:**  
Option: None  
Option: Trickle  
Option: Moderate  
Option: Substantial  
Option: Other:

**ODOR:**  
Option: None  
Option: Gas  
Option: Sewage  
Option: Rancid/Sour  
Option: Sulfide  
Option: Paint  
Option: Other:

**DEPOSITS/STAINS:**  
Option: None  
Option: Oily  
Option: Flow Line  
Option: Paint  
Option: Other:

**VEGGIE DENSITY:**  
Option: None  
Option: Normal  
Option: Inhibited  
Option: Excessive  
Option: Other:

**PIPE BENTHIC GROWTH:**  
Option: None  
Option: Brown  
Option: Orange  
Option: Green  
Option: Other:

**POOL QUALITY:**  
Option: None pool  
Option: Good  
Option: Odors  
Option: Colors  
Option: Oils  
Option: Suds  
Option: Algae  
Option: Floatables  
Option: Other:

**COLOR:**  
Option: Clear  
Option: Brown  
Option: Grey  
Option: Yellow  
Option: Green  
Option: Orange  
Option: Red  
Option: Other:

**TURBIDITY:**  
Option: None  
Option: Slight Cloudiness  
Option: Cloudy  
Option: Opaque  

**FLOATABLES:**  
Option: None  
Option: Sewage (toilet paper, etc.)  
Option: Petroleum (oil sheen)  
Option: Other:

**OTHER CONCERNS:**  
Option: Excess Trash (paper/plastic bags)  
Option: Dumping (bulk)  
Option: Excessive Sedimentation  
Option: Needs Regular Maintenance  
Option: Bank Erosion  
Option: Other:

**POTENTIAL RESTORATION CANDIDATE**  
Option: Discharge investigation  
Option: Stream daylighting  
Option: Local stream repair/outfall stabilization  
Option: Storm water retrofit  
Option: Other:

If yes for daylighting:
Length of vegetative cover from outfall: __________ ft  
Type of existing vegetation: ________________________  
Slope: ______°

If yes for stormwater:
If stormwater currently controlled?  
Option: Yes  
Option: No  
Option: Not investigated  
Land Use description: ________________________________  
Area available: ________________________________

**OUTFALL SEVERITY:**  
(circle #)

**REPORTED TO AUTHORITIES:**  
Option: Yes  
Option: No

---

**Sketch/Notes:**
Storm Water Outfalls

<table>
<thead>
<tr>
<th>BANK:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ LT □ RT □ Head</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOW:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None □ Trickle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Closed pipe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MATERIAL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Concrete □ Metal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHAPE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Single</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Diameter:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDITION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ODOR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPOSITS/STAINS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGGIE DENSITY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PIPE BENTHIC GROWTH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POOL QUALITY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ No pool</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOR FLOWING ONLY</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COLOR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Clear □ Brown □ Grey □ Yellow □ Green □ Orange □ Red □ Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TURBIDITY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None □ Slight Cloudiness □ Cloudy □ Opaque</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOATABLES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None □ Sewage (toilet paper, etc.) □ Petroleum (oil sheen) □ Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER CONCERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Excess Trash (paper/plastic bags) □ Dumping (bulk) □ Excessive Sedimentation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Discharge investigation □ Stream daylighting □ Local stream repair/outfall stabilization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If yes for daylighting:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of vegetative cover from outfall: ______ ft Type of existing vegetation: ______ Slope: ______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If yes for stormwater:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is stormwater currently controlled?</td>
</tr>
<tr>
<td>□ Yes □ No □ Not investigated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTFALL SEVERITY: (circle #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

| 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. |

| OUTFALL does not have dry weather discharge, staining, or appearance of causing any erosion problems. |

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ YES □ NO</td>
</tr>
</tbody>
</table>
## Storm Water Outfalls

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Clarus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>CB 02</td>
</tr>
<tr>
<td>Time:</td>
<td>12:08 PM</td>
</tr>
<tr>
<td>Date:</td>
<td>7/20/09</td>
</tr>
<tr>
<td>Assessed By:</td>
<td>Friends</td>
</tr>
<tr>
<td>Site ID (Condition #):</td>
<td>OT - 03</td>
</tr>
<tr>
<td>Lat:</td>
<td>41° 50' 03.3&quot;</td>
</tr>
<tr>
<td>Long:</td>
<td>72° 27' 23.3&quot;</td>
</tr>
<tr>
<td>LMK:</td>
<td></td>
</tr>
<tr>
<td>GPS:</td>
<td>(Unit ID)</td>
</tr>
</tbody>
</table>

### Bank
- LT: RT: Head

### Flow
- None: Trickle
- Moderate: Substantial: Other:

### Type
- Closed Pipe
- Open Channel

### Material
- Concrete
- Metal
- PVC/Plastic
- Brick
- Other:

### Shape
- Single
- Circular
- Double
- Elliptical
- Triple
- Other:

### Dimensions
- Diameter: (in)
- Depth: (in)
- Width (Top): (in)
- (Bottom): (in)

### Condition
- None
- Chip/Cracked
- Peeling Paint
- Corrosion
- Other:

### Odor
- None
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

### Deposits/Stains
- None
- Oily
- Paint
- Flow Line
- Other:

### Veggie Density
- None
- Normal
- Inhibited
- Excessive
- Other:

### Pipe Benthic Growth
- None
- Brown
- Orange
- Green
- Other:

### Pool Quality
- No pool
- Good
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

### For Flowing Only
- Color:
  - Clear
  - Brown
  - Gray
  - Yellow
  - Green
  - Orange
  - Red
  - Other:
- Turbidity:
  - None
  - Slight Cloudiness
  - Cloudy
  - Opaque
- Floatables:
  - None
  - Sewage (toilet paper, etc.)
  - Petroleum (oil sheen)
  - Other:

### Other Concerns:
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

### Potential Restoration Candidate
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?
  - Yes
  - No
  - Not investigated
- Land Use description: __________
- Area available: __________
- 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 have a significant impact downstream.
- 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.

### Outfall Severity
- 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 have a significant impact downstream.
- 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.
- Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

### Sketch/Notes:
Severe Bank Erosion

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Clarks Brook</th>
<th>DATE:</th>
<th>7/12/03</th>
<th>ASSESSED BY:</th>
<th>Friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH:</td>
<td>C1302</td>
<td>TIME:</td>
<td>11:30 AM/PM</td>
<td>PHOTO ID (CAMERA-PIC #):</td>
<td>#1248</td>
</tr>
<tr>
<td>SITE ID: (Condition-#)</td>
<td>ER-01</td>
<td>START LAT:</td>
<td>40° 50'02.0&quot;</td>
<td>LONG:</td>
<td>72° 07'06.6&quot;</td>
</tr>
<tr>
<td>END LAT:</td>
<td>40° 50'02.0&quot;</td>
<td>LONG:</td>
<td>72° 07'06.6&quot;</td>
<td>LMK:</td>
<td></td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PROCESS:**
- [ ] Currently unknown
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition

**BANK OF CONCERN:**
- [ ] LT
- [ ] RT
- [ ] Both (looking downstream)

**LOCATION:**
- [ ] Meander bend
- [ ] Straight section
- [ ] Steep slope/valley wall
- [ ] Other:

**DIMENSIONS:**
- Length (if no GPS) LGT ft and/or RT ft
- Bank Ht LT ft and/or RT ft
- Bank Angle LT ° and/or RT °
- Wetted Width ft

**LAND OWNERSHIP:**
- [ ] Private
- [ ] Public
- [ ] Unknown

**LAND COVER:**
- [ ] Forest
- [ ] Field/Ag
- [ ] Developed:

**POTENTIAL RESTORATION CANDIDATE:**
- [ ] Grade control
- [ ] Bank stabilization
- [ ] Other:

**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 (circle #):**
- Channelized: [ ] 1

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe oufall, local scour, impaired riparian vegetation or adjacent use.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**NOTES/CROSS SECTION SKETCH:**

**REPORTED TO AUTHORITIES:**
- [ ] Yes
- [ ] No
Stream Crossing

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: 7/2/103</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID: CB09</td>
<td>Time: 12:16 AM/PM</td>
<td>Photo ID: (Camera Pic #) # 23</td>
</tr>
<tr>
<td>Site ID: (Condition #) SC A1</td>
<td>Lat 41° 52' 49&quot;</td>
<td>Long 72° 27' 22&quot;</td>
</tr>
<tr>
<td>Site ID: (Condition #) SC A1</td>
<td>M.K.</td>
<td>GPS (Unit ID)</td>
</tr>
</tbody>
</table>

### Type:
- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other: Parking lot

### Shape:
- [ ] Arch
- [ ] Box
- [x] Circular
- [ ] Elliptical
- [ ] Other:

### Bars:
- [ ] Single
- [ ] Double
- [x] Triple
- [ ] Other:

### Material:
- [ ] Concrete
- [ ] Metal
- [ ] Other:

### Alignment:
- [ ] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

### Dimensions:
- Barrell diameter: __2__ (ft)
- Height: ______ (ft)
- Culvert length: ___400__ (ft)
- Width: ______ (ft)
- Roadway elevation: ___13__ (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
- [x] Yes
- [ ] Unknown

### Extent of Physical Blockage:
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

### Cause:
- [ ] Drop too high
- [ ] Flow too shallow
- Other:

### Blockage Severity:
- [ ] Total
- [ ] Partial
- [ ] Temporary

### Notes/Sketch:

---

REPORTED TO AUTHORITIES [ ] YES [ ] NO
### Trash and Debris

**WATERSHED/SUBSHED:** Clark  
**DATE:** 7/2/10  
**ASSESSED BY:** Friends

**SURVEY REACH ID:** CB08  
**TIME:** 12:35 AM/PM  
**PHOTO ID:** (Camera-Pic #)  
**SITE ID:** (Condition-#) TR-01  
**LAT:** 41° 50' 07.5"  
**LONG:** 72° 27' 02.9"  
**LMK:**  
**GPS:** (Unit ID)

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SOURCE:</th>
<th>LOCATION:</th>
<th>LAND OWNERSHIP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Industrial</td>
<td>[ ] Plastic</td>
<td>[ ] Unknown</td>
<td>[ ] Stream</td>
<td>[ ] Public</td>
</tr>
<tr>
<td>[ ] Commercial</td>
<td>[ ] Tires</td>
<td>[ ] Flooding</td>
<td>[ ] Riparian Area</td>
<td>[ ] Unknown</td>
</tr>
<tr>
<td>[ ] Residential</td>
<td>[ ] Appliances</td>
<td>[ ] Illegal dump</td>
<td>[ ] Local outfall</td>
<td>[ ] Private</td>
</tr>
<tr>
<td>[ ] Automotive</td>
<td>[ ] Yard Waste</td>
<td>[ ] Local outfall</td>
<td>[ ] Local outfall</td>
<td>[ ] Commercial</td>
</tr>
<tr>
<td>[ ] Other: 55 gal drum</td>
<td>[ ] Appliance</td>
<td>[ ] Local outfall</td>
<td>[ ] Commercial</td>
<td>[ ] Other</td>
</tr>
</tbody>
</table>

### POTENTIAL RESTORATION CANDIDATE
- [ ] Stream cleanup  
- [ ] Stream adoption segment  
- [ ] Removal/prevention of dumping  

**EQUIPMENT NEEDED:**  
- [ ] Heavy equipment  
- [ ] Trash bags  
- [ ] Unknown  

**WHO CAN DO IT:**  
- [ ] Volunteers  
- [ ] Local Gov  
- [ ] Hazmat Team  
- [ ] Other

**DUMPSTER WITHIN 100 FT:**  
- [ ] Yes  
- [ ] No  
- [ ] Unknown

**AMOUNT (# Pickup truck loads):** 1

### CLEAN-UP POTENTIAL:
- [ ] Small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access

### POTENTIAL:
- [ ] 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:

**REPORTED TO AUTHORITIES:**  
- [ ] YES  
- [ ] NO
**Reach Level Assessment**

**Survey Reach ID:** CB03  
**WTRSHD/SUBSHD:** Clark's Brook  
**Date:** 7/2/08  
**Assessed By:** Friends

**Start**  
**Time:** 9:45 AM/PM  
**LMK:**  
**Lat:** 41° 50' 17"  
**Long:** 72° 27' 23.9"  
**Description:**

**End**  
**Time:** __:__ AM/PM  
**LMK:**  
**Lat:** __° __' __"  
**Long:** __° __' __"  
**Description:**

**Rain in Last 24 Hours**  
- [ ] Heavy rain  
- [ ] Steady rain  
- [ ] Intermittent  
- [ ] 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):**

**Base Flow as %**  
- [ ] 0-25%  
- [ ] 50%-75%  
- [ ] 75-100%

**Channel Width**  
- [ ] 25-50%  
- [ ] 75-100%

**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 in Stream**  
- [ ] Attached: none  
- [ ] some  
- [ ] lots  
- [ ] Floating: none  
- [ ] some  
- [ ] lots

**Wildlife in or Around Stream**  
- [ ] Fish  
- [ ] Beaver  
- [ ] Deer  
- [ ] Snails  
- [ ] Other: Striders

**Stream Shading (water surface)**  
- [ ] Mostly shaded (≥75% coverage)  
- [ ] Halfway (≥50%)  
- [ ] Partially shaded (≥25%)  
- [ ] Unshaded (< 25%)

**Channel Dynamics**  
- [ ] Downcutting  
- [ ] Widening  
- [ ] Headcutting  
- [ ] Aggrading  
- [ ] Sed. deposition  
- [ ] Bed scour  
- [ ] Bank failure  
- [ ] Bank scour  
- [ ] Slope failure  
- [ ] Channelized

**Channel Dimensions (FACING DOWNSTREAM)**  
- **Height:** LT bank __ (ft)  
- **Width:** Bottom __ (ft)  
- **Top:** __ (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:** (biggest problem you see in survey reach)  
5 4 3 2 1

**Reported to Authorities:** [ ] Yes [ ] No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>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),</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>Greater than 70% of the streambank surfaces 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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td>Greater than 90% of the streambank surfaces 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.</td>
<td>More than 90% of the streambank surfaces 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.</td>
<td>More than 90% of the streambank surfaces 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.</td>
</tr>
<tr>
<td></td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>Active downcutting; tail 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.</td>
</tr>
<tr>
<td></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
<tr>
<td></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
<tr>
<td>Overall Buffer and Floodplain Condition</td>
<td>Optimal</td>
<td>Suboptimal</td>
<td>Marginal</td>
<td>Poor</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------</td>
<td>------------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>Vegetated Buffer Width</td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clean-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floodplain Vegetation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floodplain Habitat</td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
</tr>
<tr>
<td>Floodplain Encroachment</td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: **57** /80 + Buffer/Floodplain: **53** /80 = Total Survey Reach **110** /160
Storm Water Outfalls

**WATERSHED/SUBSHED:** Clarks Brook

**SURVEY REACH ID:** CB03

**SITE ID (Condition-#):** OT-01

**DATE:** 2/12/08

**ASSESSED BY:** Friends

**TIME:** 12:55 AM/PM

**PHOTO ID:** (Camera-Pic #) 

**LAT:** 41° 50' 11.3" | **LONG:** 72° 27' 23.4" | **LMK:**

**GPS:** (Unit ID)

**BANK:** □ LT □ RT □ Head

**FLOW:** □ None □ Trickle □ Moderate □ Substantial □ Other:

**TYPE:** □ Closed pipe □ Open channel

**MATERIAL:** □ Concrete □ Metal □ PVC/Plastic □ Brick □ Other:

**SHAPE:** □ Single □ Circular □ Double □ Elliptical □ Triple □ Other:

**DIMENSIONS:** Diameter: _______ (in)

**SUBMERGED:** □ No □ Partially □ Fully

**SeVERITY:**:

**CONCERNs:**

**ORPFl OWING:** □ Color: □ Clear □ Brown □ Grey □ Yellow □ Green □ Orange □ Red □ Other:

**TURBIDITY:** □ None □ Slight Cloudiness □ Cloudy □ Opaque

**FLOATABLES:** □ None □ Sewage (toilet paper, etc.) □ Petroleum (oil sheen) □ Other:

**OTHER CONCERNS:** □ Excess Trash (paper/plastic bags) □ Dumping (bulk) □ Excessive Sedimentation □ Needs Regular Maintenance □ Bank Erosion □ Other:

**O U T F A L L S E V E R I T Y:**

**REPORTED TO AUTHORITIES:** □ Yes □ No

---

**POTENTIAL RESTORATION CANDIDATE**

□ Discharge investigation □ Stream daylighting □ Local stream repair/outfall 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 investigated

**Land Use description:**

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 stream; discharge appears to be having a significant impact downstream.

□ 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.

Outfall does not have dry weather discharge, staining; or appearance of causing any erosion problems.

5 4 3 2 1

**SKEW hkNOTES:**
**Storm Water Outfalls**

**WATERSHED/SUBSHED:** Clarkes Brook

**DATE:** 7/2/108

**ASSESSED BY:** Frends

**SURVEY REACH ID:** CB03

**TIME:** 1:05 AM/PM

**PHOTO ID:** (Camera-Pic #) #28

**SITE ID (Condition-#):** OT-02

**LAT:** 41° 50' 12.0" **LONG:** 72° 27' 17.2"

**LMK:**

**GPS:** (Unit ID)

---

**BANK:**
- [ ] LT
- [ ] RT
- □ Head

**FLOW:**
- [ ] None
- □ Trickle
- [ ] Moderate
- □ Substantial
- [ ] Other:

**TYPE:**
- □ Closed pipe

**MATERIAL:**
- □ Concrete
- □ Metal
- □ PVC/Plastic
- □ Brick
- □ Other:

**SHAPE:**
- □ Single
- □ Double
- □ Circular
- □ Elliptical
- □ Triple
- □ Other:

**DIMENSIONS:**
- Diameter: 18 (in)
- Depth:
- Width (Top):
- Width (Bottom):

**SUBMERGED:**
- [ ] No
- □ Partially
- [ ] Fully

**NOT APPLICABLE**

---

**BANK MATERIAL:**
- □ Concrete
- □ Metal
- □ Brick
- [ ] Double
- □ PVC/Plastic
- □ Other:

**SHAPE:**
- □ Single
- □ Double
- □ Elliptical
- □ Triple
- □ Other:

**DIMENSIONS:**
- Diameter: 18 (in)
- Depth:
- Width (Top):
- Width (Bottom):

**SUBMERGED:**
- □ No
- □ Partially
- □ Fully

---

**FLOWING ONLY**

**COLOR:**
- □ Clear
- □ Brown
- □ Grey
- □ Yellow
- □ Green
- □ Orange
- □ Red
- □ Other:

**TURBIDITY:**
- □ None
- □ Slight Cloudiness
- □ Cloudy
- □ Opaque

**FLOATABLES:**
- □ None
- □ Sewage (toilet paper, etc.)
- □ Petroleum (oil sheen)
- □ Other:

**OTHER CONCERNS:**
- □ Excess Trash (paper/plastic bags)
- □ Dumping (bulk)
- □ Excessive Sedimentation
- □ Needs Regular Maintenance
- □ Bank Erosion
- □ 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 GROWTH:**
- □ None
- □ Brown
- □ Orange
- □ Green
- □ Other:

**POOL QUALITY:**
- □ No pool
- □ Good
- □ Odors
- □ Colors
- □ Oils
- □ Suds
- □ Algae
- □ Floatables
- □ Other:

---

**CONDITION:**
- □ None
- □ Chip/Cracked
- □ Peeling Paint
- □ Corrosion
- □ Other:

---

**FOR FLOWING ONLY**

**FOR FLOWING ONLY**

**COLOR:**
- □ Clear
- □ Brown
- □ Grey
- □ Yellow
- □ Green
- □ Orange
- □ Red
- □ Other:

**TURBIDITY:**
- □ None
- □ Slight Cloudiness
- □ Cloudy
- □ Opaque

**FLOATABLES:**
- □ None
- □ Sewage (toilet paper, etc.)
- □ Petroleum (oil sheen)
- □ Other:

**OTHER CONCERNS:**
- □ Excess Trash (paper/plastic bags)
- □ Dumping (bulk)
- □ Excessive Sedimentation
- □ Needs Regular Maintenance
- □ Bank Erosion
- □ Other:

---

**POTENTIAL RESTORATION CANDIDATE**
- □ Discharge investigation
- □ Stream daylighting
- □ Local stream repair/outfall stabilization
- □ Storm water retrofit
- □ Other:

**If yes for daylighting:**
- Length of vegetable cover from outfall: _______ ft
- Type of existing vegetation: _______
- Slope: _______

**If yes for stormwater:**
- Is stormwater currently controlled? □ Yes □ No □ Not investigated
- Land Use description: _______
- Area available: _______

**OUTFALL SEVERITY:**
- □ 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 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 or localized.
- □ Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

---

**REPORTED TO AUTHORITIES:** □ Yes □ No
Severe Bank Erosion

<table>
<thead>
<tr>
<th>PROCESS:</th>
<th>Banks currently unknown</th>
<th>BANK OF CONCERN:</th>
<th>✓ LT</th>
<th>□ RT</th>
<th>□ Both (looking downstream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Downcutting</td>
<td>□ Bed scour</td>
<td>LOCATION:</td>
<td>✓ Meander bend</td>
<td>□ Straight section</td>
<td>□ Steep slope/valley wall</td>
</tr>
<tr>
<td>□ Widening</td>
<td>□ Bank failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Headcutting</td>
<td>□ Bank scour</td>
<td>DIMENSIONS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Aggrading</td>
<td>□ Slope failure</td>
<td>Length (if no GPS) LT 30 ft and/or RT _ _ ft</td>
<td>Bottom width _ _ ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Sed. deposition</td>
<td>□ Channelized</td>
<td>Bank Ht LT _ _ ft and/or RT _ _ ft</td>
<td>Top width _ _ ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bank Angle _ _ ° and/or RT _ _ °</td>
<td>Wetted Width _ _ ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| LAND OWNERSHIP: | □ Private | □ Public | □ Unknown | LAND COVER: | □ Forest | □ Field/Ag | □ Developed: | war 'nd pl. |

| POTENTIAL RESTORATION CANDIDATE: | □ Grade control | □ Bank stabilization |
| □ No | □ Other: | |

| THREAT TO PROPERTY/INFRASTRUCTURE: | □ No | □ Yes (Describe): |
| □ Other: | |

| EXISTING RIPARIAN WIDTH: | □ 25 ft | □ 25 - 50 ft | □ 50 - 75 ft | □ 75 - 100 ft | □ >100 ft |
| □ Other: | |

**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 infrastructure.
- Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.
- Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian 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 stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.
- Difficult access. Must cross wetland, 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 required.

| REPORTED TO AUTHORITIES | □ Yes | □ No |
**Stream Crossing**

**Watershed/Subshed:** Clarks Brook

**Date:** 7/2/08

**Survey Reach ID:** CB03

**Time:** 1:33 AM/PM

**Photo ID:** Camera Pic #1

**Photo ID:** # 31 (24,95)

**Site ID:** (Condition #) SC-01

**Lat:** 00°00'00" Long 00°00'00"

**Lmk:**

**Type:**
- Road Crossing
- Railroad Crossing
- Manmade Dam
- Beaver Dam
- Geological Formation
- Other: foot bridge

**Shape:**
- Arch
- Box
- Elliptical
- Circular
- Other:

**# Barrels:**
- Single
- Double
- Triple
- Other:

**Material:**
- Concrete
- Metal
- Other: Wood

**Alignment:**
- Flow-aligned
- Not flow-aligned
- Do not know

**Dimensions:**
- Barrel diameter: ________(ft)
- Height: ________(ft)

**Culvert Slope:**
- Flat
- Slight (2° - 5°)
- Obvious (>5°)

**Roadway Elevation:** ________(ft)

**Potential Restoration Candidate:**
- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- No
- Local stream repair
- Other: remove debris

**Is SC Acting as Grade Control:**
- No
- Yes
- Unknown

**Extent of Physical Blockage:**
- Total
- Partial
- Temporary
- Unknown

**Cause:**
- Drop too high Water Drop: ________(in)
- Flow too shallow Water Depth: ________(in)
- Other:

**Blockage Severity:** (circle #)
- 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.

**Notes/Sketch:**
Stream Crossing

**Type:** [ ] Road Crossing  [ ] Railroad Crossing  [ ] Manmade Dam  [ ] Beaver Dam  [ ] Geological Formation  [ ] Other:

**Dimensions:** (if variable, sketch)
- Barreldiameter: __________ (ft)
- Height: __________ (ft)

**Shape:**
- [ ] Arch  [ ] Bottomless  [ ] Box  [ ] Elliptical
- [ ] Circular  [ ] Other:

**Barrels:**
- [ ] Single  [ ] Double  [ ] Triple  [ ] Other:

**Condition:** (Evidence of...)
- [ ] Cracking/chipping/corrosion  [ ] Downstream scour hole
- [ ] Sediment deposition  [ ] Failing embankment  [ ] Other (describe):

**Alignment:**
- [ ] Flow-aligned  [ ] Not flow-aligned  [ ] Do not know

**Culvert slope:**
- [ ] Flat  [ ] Slight (2°—5°)  [ ] Obvious (>5°)

**Culvert length:** __________ (ft)

**Roadway elevation:** __________ (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  [ ] Unknown

**Extent of physical blockage:**
- [ ] Total  [ ] Partial  [ ] Temporary  [ ] Unknown

**Cause:**
- [ ] Drop too high  Water Drop: ______ (in)
- [ ] Flow too shallow  Water Depth: ______ (in)
- [ ] Other:

**Blockage severity:** (circle #)
- [ ] Total  (circle #)
- [ ] Partial  (circle #)
- [ ] Temporary  (circle #)
- [ ] Unknown  (circle #)

- 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.

**Notes/Sketch:**

**Reported to authorities**
- [ ] Yes  [ ] No
Stream Crossing

<table>
<thead>
<tr>
<th>Stream Crossing</th>
<th>SC</th>
</tr>
</thead>
</table>

**Watershed/Subshed:** Clarks Brook  
**Date:** 7/12/18  
**Assessed By:** Friends  
**Survey Reach ID:** CB03  
**Time:** 2:06 AM/PM  
**Photo ID:** (#33) Camera-Pic #2428  
**Site ID:** (Condition #) SC-08  
**Lat:** 41° 50' 20.2"  
**Long:** 72° 27' 04.2"  
**LMK:** GPS (Unit ID)  

**Type:**  
- [ ] Road Crossing  
- [ ] Railroad Crossing  
- [ ] Mannmade Dam  
- [ ] Beaver Dam  
- [ ] Geological Formation  
- [ ] Other:  

**Shape:**  
- [ ] Arch  
- [ ] Bottomless  
- [ ] Box  
- [ ] Elliptical  
- [ ] Circular  
- [ ] Other:  

**Barrels:**  
- [ ] Single  
- [ ] Double  
- [ ] Triple  
- [ ] Other:  

**Material:**  
- [ ] Concrete  
- [ ] Metal  
- [ ] Other:  

**Alignment:**  
- [ ] Flow-aligned  
- [ ] Not flow-aligned  
- [ ] Do not know  

**Dimensions:**  
- [ ] Barrel diameter: _______________ (ft)  
- [ ] Height: _______________ (ft)  
- [ ] Culvert length: _______________ (ft)  
- [ ] Width: _______________ (ft)  
- [ ] Roadway elevation: _______________ (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  
- [ ] Unknown  

**Extent of Physical Blockage:**  
- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown  

**Cause:**  
- [ ] Drop too high  
- [ ] Flow too shallow  
- [ ] Other:  

**Water Drop:** _______________ (in)  
**Water Depth:** _______________ (in)  

**Blockage Severity:** (circle #)  
- [ ] 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 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 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:**  
- [ ] Cobble substrate  

**Reported to Authorities:**  
- [ ] Yes  
- [ ] No
## Trash and Debris

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Clarks Brook</th>
<th>Date:</th>
<th>7/2/10</th>
<th>Assessed By:</th>
<th>Friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>CR-03</td>
<td>Time:</td>
<td>1:23 AM/PM</td>
<td>Photo ID: (Camera-Pic #)</td>
<td>#30 (d405)</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>TR-01</td>
<td>Lat:</td>
<td>41° 50’ 13.1”</td>
<td>Long:</td>
<td>72° 27’ 12.4”</td>
</tr>
<tr>
<td>Position:</td>
<td>TR-01</td>
<td>LMK:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type:</th>
<th>Material:</th>
<th>Source:</th>
<th>Location:</th>
<th>Land Ownership:</th>
<th>Potential Restoration Candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>Plastic</td>
<td>Unknown</td>
<td>Stream</td>
<td>Public</td>
<td>Yes</td>
</tr>
<tr>
<td>Commercial</td>
<td>Tires</td>
<td>Flooding</td>
<td>Riparian Area</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>Appliances</td>
<td>Illegal dump</td>
<td>Local outfall</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yard Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automotive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clean-Up Potential:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clean-Up Potential:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clean-Up Potential:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported to Authorities: Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Who can do it:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Who can do it:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Equipment Needed:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Equipment Needed:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
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</tbody>
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<tbody>
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<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported to Authorities: Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Who can do it:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
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<tr>
<td>Equipment Needed:</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
</tbody>
</table>
## Reach Level Assessment

**SURVEY REACH ID:** CB01  
**WHRSH/Subshd:** Olarco Brook  
**DATE:** 7/10/08  
**ASSESSED BY:**

<table>
<thead>
<tr>
<th>START</th>
<th>TIME:</th>
<th>10:34 AM/PM</th>
<th>LMK:</th>
<th>END</th>
<th>TIME:</th>
<th>12:02 AM/PM</th>
<th>LMK:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT</td>
<td>41° 50' 55.1&quot;</td>
<td>LONG</td>
<td>72° 02' 21.2&quot;</td>
<td></td>
<td>LAT</td>
<td>41° 50' 58.9&quot;</td>
<td>LONG</td>
</tr>
</tbody>
</table>

**DESCRIPTION:** Outlet to Sedge wetland

**SURVEY REACH ID:** CtWTRSHD/SUBSFID: j'DATE: 7/10/08  
**ASSESSED BY:**

**RAIN IN LAST 24 HOURS:**  
- □ Heavy rain  
- □ Steady rain  
- □ None  

**PRESENT CONDITIONS:**  
- □ Heavy rain  
- □ Steady rain  
- □ Intermittent  
- □ Clear  
- □ Trace  
- □ Overcast  
- □ Partly cloudy

**SURROUNDING LAND USE:**  
- □ Industrial  
- □ Commercial  
- □ Golf course  
- □ Park  
- □ Crop  
- □ Pasture  
- □ Other:  

**DESCRIPTION:** Road crossing, brushweeds, m-f rose

**AVERAGE CONDITIONS (check applicable):**

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>□ 0-25%</th>
<th>□ 50%-75%</th>
<th>□ 75-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANNEL WIDTH</td>
<td>□ 25-50%</td>
<td>□ 75-100%</td>
<td></td>
</tr>
</tbody>
</table>

**DOMINANT SUBSTRATE:**  
- □ Silt/clay (fine or slick)  
- □ Sand (gritty)  
- □ Gravel (0.1-2.5")  
- ![Cobble (2.5-10")](image)

**WATER CLARITY:**  
- □ Clear  
- □ Turbid (suspended matter)  
- □ Stained (clear, naturally colored)  
- □ Opaque (milky)  
- □ Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM:**  
- □ Attached:  
- □ None  
- □ Some  
- □ Lots

**WILDLIFE IN OR AROUND STREAM:**  
- □ Fish  
- □ Beaver  
- □ Deer  
- □ Snails  
- □ Other:  

**STREAM SHADING (water surface):**  
- □ Mostly shaded (75% coverage)  
- □ Halfway (50%)  
- □ Partially shaded (25%)  
- □ Unshaded (<25%)  

**CHANNEL DYNAMICS:**  
- □ Downcutting  
- □ Widening  
- □ Headcutting  
- □ Aggrading  
- □ Sed. deposition  
- □ Bed scour  
- □ Bank failure  
- □ Bank scour  
- □ Slope failure  
- □ Channelized

**CHANNEL HEIGHT:**  
- □ LT bank: 1 (ft)  
- □ RT bank: 1 (ft)  
- □ Bottom: 4 (ft)  
- □ Top: 5 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**NOTES:** (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES:** □ Yes □ No
<table>
<thead>
<tr>
<th><strong>OVERALL STREAM CONDITION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong> (May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epilithic colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong></td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>BANK EROSION</strong> (facing downstream)</td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; Isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>Active downcutting; tail 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OVERALL BUFFER AND FLOODPLAIN CONDITION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet: little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats; evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats; no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCROACHMENT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
</tr>
</tbody>
</table>

**Sub Total In-stream:** 72 / 80  + **Buffer/Floodplain:** 56 / 80 = **Total Survey Reach:** 128 / 160
Stream Crossing

**Watershed/Subshed:** Charles Brook  
**Date:** 7/10/2023  
**Assessed By:** Friends

**Survey Reach ID:** CB01  
**Time:** 11:20 AM/PM  
**Photo ID:** (Camera-Pic #) #5

**Site ID:** (Condition #) SC-01  
**Lat:** 41° 50' 47.9"  
**Long:** 72° 26' 56.3"

### Type of Crossing

- **Type:** Road Crossing  
- **Shape:** [ ] Arch  [ ] Bottomless  [ ] Box  [ ] Elliptical  [ ] Circular  [ ] Other
- **# Barrels:** [ ] Single  [ ] Double  [ ] Triple  [ ] Other
- **Material:** [ ] Concrete  [ ] Metal  [ ] Other
- **Alignment:** [ ] Flow-aligned  [ ] Not flow-aligned  [ ] Do not know
- **Condition:** (Evidence of...)  
  - [ ] Cracking/chipping/corrosion  
  - [ ] Sediment deposition  
  - [ ] Other (describe)
- **Culvert Slope:** [ ] Flat  [ ] Slight (2° - 5°)  [ ] Obvious (>5°)

### Dimensions

- **Barrel diameter:** 4 ft
- **Height:** (ft)
- **Culvert length:** 50 ft
- **Width:** (ft)
- **Roadway elevation:** 0-3.5 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  [ ] Unknown

### Extent of Physical Blockage:

- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown

### Cause:

- [ ] Drop too high  
- [ ] Flow too shallow  
- [ ] Other

### Blockage Severity (circle #)

- 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.

### Notes/Sketch:

- Reported to authorities [ ] Yes  [ ] No
**Stream Crossing**

**Watershed/Subshed:** Clark's Creek  
**Date:** 7/10/05  
**Assessed By:** Friends

**Survey Reach ID:** CB6  
**Time:** 12:52 AM (PM)  
**Photo ID:** (Camera-Pic #)

**Site ID:** (Condition-#) SC-0.2  
**Lat:** 41° 50' 53.9"  
**Long:** 72° 21' 58.16"  
**LMK:**  
**GPS (Unit ID):**

### Type:
- [ ] Road Crossing  
- [ ] Railroad Crossing  
- [ ] Mannmade Dam  
- [ ] Beaver Dam  
- [ ] Geological Formation  
- [ ] Other:

#### Shape:
- [ ] Arch  
- [ ] Bottomless  
- [ ] Box  
- [ ] Elliptical  
- [ ] Circular  
- [ ] Other:

#### For Road/Railroad Crossings Only

- [ ] Single  
- [ ] Double  
- [ ] Triple  
- [ ] Other:

#### Condition:
- [ ] Cracking/chipping/corrosion  
- [ ] Downstream scour hole  
- [ ] Sediment deposition  
- [ ] Failing embankment  
- [ ] Other (describe):

#### Material:
- [ ] Concrete  
- [ ] Metal  
- [ ] Other:

#### Alignment:
- [ ] Flow-aligned  
- [ ] Not flow-aligned  
- [ ] Do not know

#### Dimensions (if variable, sketch):
- **Barrel diameter:** 3 ft  
- **Height:** ___ ft  
- **Culvert length:** ___ ft  
- **Width:** ___ ft  
- **Roadway elevation:** 7 ft

### Potential Restoration Candidate
- [ ] Fish barrier removal  
- [ ] Culvert repair/replacement  
- [ ] Upstream storage retrofit  
- [ ] Local stream repair  
- [ ] Other:

### Is SC acting as grade control
- [ ] No  
- [ ] Yes  
- [ ] Unknown

### Extent of Physical Blockage:
- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown

#### Cause:
- [ ] Drop too high  
- [ ] Water Drop: ___ (in)
- [ ] Flow too shallow  
- [ ] Water Depth: ___ (in)
- [ ] Other:

### Blockage Severity:
- [5]  
- [4]  
- [3]  
- [2]  
- [1]

#### Notes/Sketch:

---

**Reported to authorities**

- [ ] Yes  
- [ ] No
### Storm Water Outfalls

**Watershed/Subshed:** OT

**Survey Reach ID:** CS 04

**Site ID (Condition #):** OT-01

**Date:** 7/10/08

**Assessed By:** Friends

<table>
<thead>
<tr>
<th>Bank:</th>
<th>Type:</th>
<th>Material:</th>
<th>Shape:</th>
<th>Dimensions:</th>
<th>Submerged:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>Open channel</td>
<td>Concrete</td>
<td>Single</td>
<td>Diameter: 12 (in)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Open channel</td>
<td>Concrete</td>
<td></td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td></td>
<td>Open channel</td>
<td>Concrete</td>
<td></td>
<td></td>
<td>Fully</td>
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</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>No pool</td>
</tr>
<tr>
<td>Moderate</td>
<td>Gas</td>
<td>Oily</td>
<td>Normal</td>
<td>Inhibited</td>
<td>Good</td>
</tr>
<tr>
<td>Substantial</td>
<td>Sewage</td>
<td>Oily</td>
<td>Inhibited</td>
<td>Excessive</td>
<td>Odors</td>
</tr>
<tr>
<td>Other:</td>
<td>Flow Line</td>
<td>Paint</td>
<td>Other: Rust</td>
<td>Other:</td>
<td>Other:</td>
</tr>
</tbody>
</table>

**For Flowing Only:**

- **Color:** Clear, Brown, Grey, Yellow, Green, Orange, Red, Other.
- **Turbidity:** None, Slight Cloudiness, Cloudy, Opaque.
- **Floatables:** None, Sewage (toilet paper, etc.), Petroleum (oil sheen), Other.

**Other Concerns:**

- Excess Trash (paper/plastic bags), Dumping (bulk), Excessive Sedimentation.
- Needs Regular Maintenance, Bank Erosion, Other.

**Potential Restoration Candidate:**

- Discharge investigation, Stream daylighting, Local stream repair/outfall stabilization, Storm water retrofit, Other.

If yes for daylighting:

- Length of vegetative cover from outfall: 54 ft, Type of existing vegetation: Knotweed, Slope: 45°.

If yes for stormwater:

- 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 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.
- Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

### Sketch/Notes:

**Reported to Authorities:** Yes, No.
**Reach Level Assessment**

**Survey Reach ID:** CB65  
**Wtrsh/Subsh:** Claris Brook  
**Date:** 7/10/23  
**Assessed By:** Friends

<table>
<thead>
<tr>
<th>START</th>
<th>TIME: __________ AM/PM</th>
<th>LMK: ________</th>
<th>END</th>
<th>TIME: __________ AM/PM</th>
<th>LMK: ________</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 0°0'0&quot;</td>
<td>LONG 0°0'0&quot;</td>
<td>DESCRIPTION: Underground</td>
<td>LAT 0°0'0&quot;</td>
<td>LONG 0°0'0&quot;</td>
<td>DESCRIPTION: Lawn 2</td>
</tr>
</tbody>
</table>

**Description:**
- **Rain in Last 24 Hours:**
  - ☐ Heavy rain
  - ☐ Steady rain
  - ☐ None
  - ☐ Intermittent

**Present Conditions:**
- ☐ Heavy rain
- ☐ Steady rain
- ☐ Intermittent
- ☐ Clear
- ☐ Trace
- ☐ Overcast
- ☐ Partly cloudy

**Surrounding Land Use:**
- ☐ Industrial
- ☐ Commercial
- ☐ Urban/Residential
- ☐ Suburban/Residential
- ☐ Forested
- ☐ Institutional
- ☐ Golf course
- ☐ Park
- ☐ Crop
- ☐ Pasture
- ☐ Other:

**Average Conditions (check applicable):**
- Base Flow as %
  - ☐ 0-25%
  - ☐ 50%-75%
  - ☐ 75-100%
- Channel Width
  - ☐ 25-50 %
  - ☐ 75-100%

**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 (inspended matter)
- ☐ Stained (clear, naturally colored)
- ☐ Opaque (milky)
- ☐ Other (chemicals, dyes)

**Aquatic Plants in Stream:**
- Attached:
  - ☐ none
  - ☐ some
  - ☐ lots
- Floating:
  - ☐ none
  - ☐ some
  - ☐ lots

**Wildlife in or Around Stream:**
- ☐ Fish
- ☐ Beaver
- ☐ Deer
- ☐ Snails
- ☐ Other:

**Stream Shading:**
- ☐ Mostly shaded (>75% coverage)
- ☐ Halfway (50%)
- ☐ Partially shaded (≥25%)
- ☐ Unshaded (<25%)

**Channel Dynamics:**
- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☐ Bank scour
- ☐ Slope failure
- ☐ Channelized
- ☐ Unknown

**Channel Height:**
- LT bank: ________ (ft)
- RT bank: ________ (ft)

**Channel Dimensions (Facing Downstream):**
- Width: Bottom: ________ (ft)
- Top: ________ (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:**
- Stream is entirely underground
- Superior propane has been tried to push diverted. Previous owners said to have raised land at least 4'

**Reported to Authorities:**
- ☐ Yes
- ☐ No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>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 now fail and not transient).</td>
<td>40-70% mix or 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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| In-stream Vegetation Protection | 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. |

| In-stream 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, impacted riparian vegetation or adjacent use. | Post 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. |

| In-stream 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. |

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

| 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. |

| Floodplain Habitat | Even mix of wetland and non-wetland habitats, 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. |

| Floodplain Encroachment | 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. |

Sub Total In-stream: 80 /80 Buffer/Floodplain: 80 /80 = Total Survey Reach 160 /160
**Reach Level Assessment**

**Survey Reach ID:** GBST0

**Wtrshd/Subshd:** Gages South Yuba

**Date:** 6/15/08

**Assessed By:**

---

**Start**

- Time: 11:07 AM/PM
- LMK:
- LAT 41° 51' 28.5" N
- LONG 120° 25' 31.7"
- Description:

**End**

- Time: 11:50 AM/PM
- LMK:
- LAT 41° 51' 16.4" N
- LONG 120° 25' 04.3"
- Description:

---

**Rain in Last 24 Hours**

- None
- Heavy rain
- Steady rain

**Present Conditions**

- None
- Heavy rain
- Steady rain
- Intermittent
- Clear
- Trace
- Overcast
- Partly cloudy

**Surrounding Land Use**

- Industrial
- Commercial
- Golf course
- Park
- Urban/Residential
- Suburban/Res
- Forested
- Institutional
- Other:

---

**Average Conditions** (check applicable)

**Base Flow as %**

- 0-25%
- 25-50%
- 50%-75%
- 75-100%

**Channel Width**

- 25-50%
- 75-100%

**Dominant Substrate**

- Silt/clay (fine or slick)
- Sand (gritty)
- Gravel (0.1-2.5")
- Cobble (2.5-10")
- Boulder (>10")
- Bedrock

**Water Clarity**

- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opaque (milky)
- Other (chemicals, dyes)

**Aquatic Plants**

- Attached: none
- Floating: none

**Wildlife in or around stream**

- Evidence of:
  - Fish
  - Beaver
  - Deer
  - Snails
  - Other:

**Stream Shading**

- Mostly shaded (≥75% coverage)
- Halfway (≥50%)
- Partially shaded (≥25%)
- Unshaded (< 25%)

**Channel Dynamics**

- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**Channel Dimensions**

- Facing Downstream
  - Height: LT bank 3 (ft)
  - Width: Bottom 2 (ft)
  - Top 12 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

---

**Notes:** (biggest problem you see in survey reach)

---

**Reported to Authorities**

- Yes
- No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>IN-STREAM HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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)</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| VEGETATIVE PROTECTION | Score each bank, determine sides by facing downstream | Greater than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetation disturbance 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 stature height remaining. | Less than 50% of the streambank surfaces covered by vegetation; disruption evident; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stature height remaining. |

| BANK EROSION | Grade and width stable; evidence of bank failure present; little potential for future problems. | 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. |

| 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. |

## OVERALL BUFFER AND FLOODPLAIN CONDITION

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<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
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<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

| 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 |

| FLOODPLAIN HABITAT | Predominant floodplain vegetation type is mature forest | Predominant floodplain vegetation type is young forest | Predominant floodplain vegetation type is shrub or old field |

| FLOODPLAIN ENCROACHMENT | 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 affecting floodplain function. | Moderate floodplain encroachment in the form of fill material, 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. |

Sub Total In-stream: 80 + Buffer/Floodplain: 80 = Total Survey Reach 160
Reach Level Assessment

SURVEY REACH ID: GBS-20
WTRSHD/SUBSHD: Base S Trib
DATE: 6/15/2023
ASSESSED BY:

START TIME: 11:50 AM/PM
LAT 41° 51' 16.6"  LONG 70° 26' 114.3"
END TIME: 12:45 AM/PM
LAT 41° 51' 17.0"  LONG 70° 24' 53.2"

DESCRIPTION:

RAIN IN LAST 24 HOURS □ Heavy rain □ Steady rain
□ None □ Intermittent □ Trace

SURROUNDING LAND USE: □ Industrial □ Commercial
□ Golf course □ Park
□ Urban/Residential □ Suburban/Res □ Forested □ Institutional
□ Crop □ Pasture □ Other:

WATER CLARITY □ Clear □ Turbid (suspended matter)
□ Stained (clear, naturally colored) □ Opaque (milky)
□ Other (chemicals, dyes)

AQUATIC PLANTS
Attached: □ none □ some □ lots
Floating: □ none □ some □ lots

WILDLIFE IN OR AROUND STREAM
□ Fish □ Beaver □ Deer
□ Snails □ Other:

STREAM SHADING (water surface)
□ Mostly shaded (>75% coverage)
□ Halfway (50%)
□ Partially shaded (25%)
□ Unshaded (< 25%)

CHANNEL DYNAMICS
□ Downcutting □ Widening
□ Headcutting □ Bank scour
□ Aggrading □ Bank failure
□ Sed. deposition □ Slope failure
□ Channelized □ Unknown

CHANNEL HEIGHT: LT bank
Height: 2.5 (ft)
RT bank Width: 2.5 (ft)
Top 12 (ft)

REACH ACCESSIBILITY
Good: Open area in public ownership, sufficient room to stockpile materials, easy 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.

NOTES: (biggest problem you see in survey reach)

REPORTED TO AUTHORITIES □ Yes □ No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)</th>
<th>Optimal</th>
<th>Suboptimal</th>
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<td>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).</td>
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<tr>
<th>BANK EROSION (facing downstream)</th>
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<th>Suboptimal</th>
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<tr>
<td>Banks stable, evidence of erosion or bank failure absent or minimal; little potential for future problems. (&lt;5% of bank affected.)</td>
<td>Grade and width stable; isolated areas of bank failure/erosion likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; evident threat to property or infrastructure.</td>
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</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN CONNECTION</th>
<th>Optimal</th>
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<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
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</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
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<thead>
<tr>
<th>FLOODPLAIN VEGETATION</th>
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<th>Poor</th>
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<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
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<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>FLOODPLAIN HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN ENCROACHMENT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, some effect on floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures), significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: ____ /80 + Buffer/Floodplain: ____ /80 = Total Survey Reach ____ /160
### Storm Water Outfalls

**OT**

<table>
<thead>
<tr>
<th>Bank:</th>
<th>Type:</th>
<th>Material:</th>
<th>Shape:</th>
<th>Dimensions:</th>
<th>Submerged:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT RT Head</td>
<td>Closed pipe</td>
<td>Concrete Metal</td>
<td>Single</td>
<td>Diameter: 18 in</td>
<td>No</td>
</tr>
<tr>
<td>None</td>
<td>Open channel</td>
<td>Concrete Earthen</td>
<td>Trapezoid</td>
<td>Depth:</td>
<td>Partially</td>
</tr>
<tr>
<td>Moderate</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Width (Top):</td>
<td>Full</td>
</tr>
<tr>
<td>Substantial</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Width (Bottom):</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Flow:**
- None
- Trickle
- Moderate
- Other:

**Condition:**
- None
- Chip/Cracked
- Peeling Paint
- Corrosion
- Other:

**OR:**
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

**Deposits/Stains:**
- None
- Oily
- Flow Line
- Paint
- Other:

**Veggie Density:**
- None
- Normal
- Inhibited
- Excessive
- Other:

**Pipe Benthic Growth:**
- None
- Brown
- Orange
- Green
- Other:

**Pool Quality:**
- None
- No pool
- Good
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

**For Flowing Only**
- Color:
  - Clear
  - Brown
  - Grey
  - Yellow
  - Green
  - Orange
  - Red
  - Other:
- Turbidity:
  - None
  - Slight Cloudiness
  - Cloudy
  - Opaque
- Floatables:
  - None
  - Sewage (toilet paper, etc.)
  - Petroleum (oil sheen)
  - Other:
- Other Concerns:
  - Excess Trash (paper/plastic bags)
  - Dumping (bulk)
  - Excessive Sedimentation
  - Needs Regular Maintenance
  - Bank Erosion
  - Other: D.S. stream in tube

**Potential Restoration Candidate**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- No
- Storm water retrofit
- 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? Yes
- No
- Not investigated

**Area available:**

**Outfall Severity:**
- 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 the receiving stream; discharge appears to be having a significant impact downstream.
- 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

**Reported to authorities:** Yes No
<table>
<thead>
<tr>
<th>BANK:</th>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SHAPE:</th>
<th>DIMENSIONS:</th>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>Closed</td>
<td>Concrete</td>
<td>Single</td>
<td>Diameter: 24 in</td>
<td>No</td>
</tr>
<tr>
<td>RT</td>
<td>pipe</td>
<td>Metal</td>
<td></td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>PVC/Plastic</td>
<td>Circular</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td></td>
<td>channel</td>
<td>Brick</td>
<td>Double</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td>Elliptical</td>
<td></td>
<td>NOT APPLICABLE</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Triple</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Other</td>
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<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>FLOW:</th>
<th>CONDITION:</th>
<th>ODOR:</th>
<th>DEPOSITS/STAINS:</th>
<th>VEGGIE DENSITY:</th>
<th>PIPE BENTHIC GROWTH:</th>
<th>POOL QUALITY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Trickle</td>
<td>Moderate</td>
<td>Gas</td>
<td>Oily</td>
<td>Normal</td>
<td>Brown</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Sewage</td>
<td>Flow Line</td>
<td>Inhibited</td>
<td>Orange</td>
<td>Odors</td>
</tr>
<tr>
<td></td>
<td>Substantial</td>
<td>Rancid/Sour</td>
<td>Paint</td>
<td>Excessive</td>
<td>Green</td>
<td>Colors</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Sulfide</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Oils</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOR FLOWING ONLY</th>
<th>COLOR:</th>
<th>TURBIDITY:</th>
<th>FLOATABLES:</th>
<th>OTHER CONCERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>Excess Trash</td>
</tr>
<tr>
<td>Brown</td>
<td>No</td>
<td>Slight Cloudiness</td>
<td>Sewage (toilet paper, etc.)</td>
<td>Dumping (bulk)</td>
</tr>
<tr>
<td>Grey</td>
<td>Yes</td>
<td>Cloudy</td>
<td>Petroleum: (oil sheen)</td>
<td>Excessive Sedimentation</td>
</tr>
<tr>
<td>Yellow</td>
<td>No</td>
<td>Opaque</td>
<td>Other:</td>
<td>Needs Regular Maintenance</td>
</tr>
<tr>
<td>Green</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Bank Erosion</td>
</tr>
<tr>
<td>Orange</td>
<td>No</td>
<td></td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td>Red</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>Discharge investigation</th>
<th>Stream daylighting</th>
<th>Local stream repair/outfall stabilization</th>
<th>Storm water retrofit</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Other</td>
</tr>
</tbody>
</table>

If yes for daylighting:
- Length of vegetative cover from outfall: [ft] Type of existing vegetation: [in] Slope: [°]

If yes for stormwater:
- Is stormwater currently controlled? [Yes No Not investigated]
- Land Use description:
- Area available: [Area available]

<table>
<thead>
<tr>
<th>OUTFALL SEVERITY:</th>
<th>[5 4 3 2 1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTLET</td>
<td>Site ID (Condition-#)</td>
<td>OT-03</td>
</tr>
<tr>
<td>PHOTO ID</td>
<td>(Camera-Pic #:)</td>
<td>#1935</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANNEL MODIFICATION</td>
<td>NOTES:</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>CM</td>
<td><img src="image" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

**BASE FLOW CHANNEL**
- Definition low flow channel? [ ] Yes [ ] No
- % of channel bottom: 100 %

**ADJACENT STREAM CORRIDOR**
- Available width: LT 20 (ft) RT 100+ (ft)
- Utilities Present?: [ ] Yes [ ] No
- Fill in floodplain?: [ ] Yes [ ] No

**POTENTIAL RESTORATION CANDIDATE**
- Structural repair
- Base flow channel creation
- Natural channel design
- Can't tell
- De-channelization
- Fish barrier removal
- Bioengineering

**CHANNEL MODIFICATION SEVERITY**

<table>
<thead>
<tr>
<th>Channel Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>A long section of concrete stream (&gt;500 ft) where water is very shallow (&lt;1') deep with no natural sediments present in the channel.</td>
</tr>
<tr>
<td>Rip Rap</td>
<td>A moderate length (&gt; 200'), but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.</td>
</tr>
<tr>
<td>Earthen</td>
<td>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.</td>
</tr>
</tbody>
</table>

**DIMENSIONS:**
- Height: 6 (ft)
- Bottom Width: 5 (ft)
- Top Width: 15 (ft)
- Length: See GPS coord (ft)
### Storm Water Outfalls

<table>
<thead>
<tr>
<th>Bank:</th>
<th>Type:</th>
<th>Material:</th>
<th>Shape:</th>
<th>Dimensions:</th>
<th>Submerged:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left: Head</td>
<td>X: Closed pipe</td>
<td>X: Concrete</td>
<td>□: Single</td>
<td>Diameter: 76 (in)</td>
<td>□: No</td>
</tr>
<tr>
<td>Right:</td>
<td>□: Open channel</td>
<td>□: Concrete</td>
<td>□: Trapezoid</td>
<td>Depth: (in)</td>
<td>□: Partially</td>
</tr>
</tbody>
</table>

### Flow: None

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>X: No</td>
<td>□: None</td>
<td>X: None</td>
<td>□: None</td>
<td>□: None</td>
</tr>
</tbody>
</table>

### Deposits/Stains:

- □: None
- □: Oily
- X: Flow Line
- □: Paint
- □: Other

### Veggie Density:

- □: None
- □: Normal
- □: Inhibited
- □: Excessive
- □: Other

### Pipe Benthic Growth:

- □: None
- □: Brown
- □: Orange
- □: Green
- □: Other

### Pool Quality:

- □: Good
- □: Odors
- □: Colors
- □: Oils
- □: Suds
- □: Algae
- □: Floatables
- □: Other

### Flowing Only:

- □: Clear
- □: Brown
- □: Grey
- □: Yellow
- □: Green
- □: Orange
- □: Red
- □: Other

### Turbidity:

- □: None
- □: Slight Cloudiness
- □: Cloudy
- □: Opaque

### Floatables:

- □: None
- □: Sewage (toilet paper, etc.)
- □: Petroleum (oil sheen)
- □: Other

### Other Concerns:

- □: Excess Trash (paper/plastic bags)
- □: Dumping (bulk)
- □: Excessive Sedimentation
- □: Needs Regular Maintenance
- □: Bank Erosion
- □: Other

### Potential Restoration Candidate:

- □: Discharge investigation
- □: Stream daylighting
- □: Local stream repair/outfall stabilization
- □: Storm water retrofit
- □: 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?  
□: Yes  X: No  □: Not investigated

Land Use description: _______

Area available: _______

**Outfall Severity:** (circle #)

- □: No  X: Substantial
- □: Moderate
- □: None

- □: 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 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.
- □: Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

[Diagram of outfall location with annotations]

**Reported to authorities:** □: Yes  □: No
Stream Crossing

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>George Blu South Trib</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>6785-10Z</td>
</tr>
<tr>
<td>Time:</td>
<td>12:40 AM/PM</td>
</tr>
<tr>
<td>Photo ID:</td>
<td>(Camera Pic #)0830-99</td>
</tr>
<tr>
<td>Site ID:</td>
<td>SC-01</td>
</tr>
<tr>
<td>Lat:</td>
<td>41° 51' 27.0&quot;</td>
</tr>
<tr>
<td>Long:</td>
<td>72° 24' 41.8&quot;</td>
</tr>
<tr>
<td>LMK:</td>
<td></td>
</tr>
<tr>
<td>GPS (Unit ID):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape:</td>
<td>Arch</td>
<td>Bottomless</td>
<td>Box</td>
<td>Elliptical</td>
<td>Circular</td>
<td>Box</td>
</tr>
<tr>
<td># Barrels:</td>
<td>Single</td>
<td>Double</td>
<td>Triple</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material:</td>
<td>Concrete</td>
<td>Metal</td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment:</td>
<td>Flow-aligned</td>
<td>Not flow-aligned</td>
<td>Do not know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions:</td>
<td>(if variable, sketch) Barrel diameter:</td>
<td>Height:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Road/ Railroad Crossings Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition: (Evidence of...)</td>
<td>Cracking/chipping/corrosion</td>
<td>Downstream scour hole</td>
<td>Sediment deposition</td>
<td>Failing embankment</td>
<td>Other (describe):</td>
<td></td>
</tr>
<tr>
<td>Culvert Slope:</td>
<td>Flat</td>
<td>Slight (2° – 5°)</td>
<td>Obvious (&gt;5°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culvert length:</td>
<td>( &gt;200 ) (ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width:</td>
<td>( ) (ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadway elevation:</td>
<td>( ) (ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Restoration Candidate:</th>
<th>Fish barrier removal</th>
<th>Culvert repair/replacement</th>
<th>Upstream storage retrofit</th>
<th>Local stream repair</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is SC Acting as Grade Control:</td>
<td>No</td>
<td>Yes</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Extent of Physical Blockage: | Total | Partial | Temporary | Unknown |
| Cause: | Drop too high | Water Drop: \( \) (in) |
| | Flow too shallow | Water Depth: \( \) (in) |
| Blockage Severity: (circle #) | 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. |

| Notes/Sketch: | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | | | | | |
**Reach Level Assessment**

**SURVEY REACH ID:** GRST-03  
**DATE:** 6/5/08  
**ASSESSED BY:** DEB

**START**  
**TIME:** 11:30 AM/PM  
**LMK:**  
**LAT:** 41° 51' 14.2"  
**LONG:** 72° 25' 04.2"  
**DESCRIPTION:** CONF. OF GRST < 01 07 805

**END**  
**TIME:**  
**LMK:**  
**LAT:** 41° 51' 14.4"  
**LONG:** 72° 25' 44.4"  
**DESCRIPTION:** SC-01

---

**RAIN IN LAST 24 HOURS**  
- □ Heavy rain  
- □ Steady rain  
- □ None  
- □ Intermittent  
- □ Trace  
- □ Overcast  
- □ Clear  
- □ Partly cloudy

**SURROUNDING LAND USE**  
- □ Industrial  
- □ Commercial  
- □ Urban/Residential  
- □ Suburban/Residential  
- □ Forested  
- □ Institutional  
- □ Golf course  
- □ Park  
- □ Crop  
- □ Pasture  
- □ Other:

**DESCRIPTION**  
- □ Heavy rain  
- □ Steady rain  
- □ Intermittent  
- □ Trace  
- □ Overcast  
- □ Clear  
- □ Partly cloudy

---

**BASE FLOW AS %**  
- □ 0-25%  
- □ 25-50%  
- □ 50-75%  
- □ 75-100%

**CHANNEL WIDTH**  
- □ 0-25%  
- □ 25-50%  
- □ 50-75%  
- □ 75-100%

**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 IN STREAM**  
- □ Attached: □ none □ some □ lots  
- □ Floating: □ none □ some □ lots

**WILDLIFE IN OR AROUND STREAM**  
- □ Fish  
- □ Beaver  
- □ Deer  
- □ Snails  
- □ Other:

**STREAM SHADING**  
- □ Mostly shaded (≥75% coverage)  
- □ Halfway (≥50%)  
- □ Partially shaded (≥25%)  
- □ Unshaded (<25%)

**CHANNEL DYNAMICS**  
- □ Downcutting  
- □ Widening  
- □ Headcutting  
- □ Aggrading  
- □ Sed. deposition  
- □ Bed scour  
- □ Bank failure  
- □ Bank scour  
- □ Slope failure  
- □ Channelized

**CHANNEL DIMENSIONS**  
- □ Height: LT bank  
- □ Width: Bottom  
- □ Top  
- □ (ft)

**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.

**NOTES:** (biggest problem you see in survey reach)

---

**REACH SKETCH AND SITE IMPACT TRACKING**

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.

---

**REPORTED TO AUTHORITIES** □ Yes □ No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 or not transient).</td>
<td>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 new fall, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
<tr>
<td><strong>IN-STREAM</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong> (score each bank, determine sides by facing downstream)</td>
<td>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.</td>
<td>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.</td>
<td>50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or directly cropped vegetation common; less than one-half of the potential plant stubble height remaining.</td>
<td>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.</td>
</tr>
<tr>
<td>Left Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td>Right Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>BANK EROSION</strong> (facing downstream)</td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, improved riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
</tr>
<tr>
<td>Left Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td>Right Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
<tr>
<td><strong>LEFT BANK</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td><strong>RIGHT BANK</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td>Left Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td>Right Bank</td>
<td>10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCROACHMENT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function.</td>
</tr>
<tr>
<td><strong>LEFT BANK</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td><strong>RIGHT BANK</strong></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

**Sub Total In-stream:** /80 + **Buffer/Floodplain:** /80 = **Total Survey Reach** /160
<table>
<thead>
<tr>
<th>Type:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape:</td>
<td>Arch</td>
<td>Bottomless</td>
<td>Box</td>
<td>Elliptical</td>
<td>Circular</td>
<td>Other:</td>
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<tr>
<td># Barrels:</td>
<td>Single</td>
<td>Double</td>
<td>Triple</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material:</td>
<td>Concrete</td>
<td>Metal</td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment:</td>
<td>Flow-aligned</td>
<td>Not flow-aligned</td>
<td>Do not know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions: (if variable, sketch)</td>
<td>Barrel diameter:</td>
<td>Height:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culvert length:</td>
<td>Width:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culvert slope:</td>
<td>Flat</td>
<td>Slight (2°—5°)</td>
<td>Obvious (&gt;5°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadway elevation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Restoration Candidate:</th>
<th>Fish barrier removal</th>
<th>Culvert repair/replacement</th>
<th>Upstream storage retrofit</th>
<th>Local stream repair</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is SC acting as Grade Control:</th>
<th>No</th>
<th>Yes</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extent of Physical Blockage:</th>
<th>Total</th>
<th>Partial</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Cause: | Drop too high | Water Drop: 48 (in) |
|---|---|
| Flow too shallow | Water Depth: |
| Other: |

| Blockage Severity: (circle #) |
|---|---|---|---|
| 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. |

<table>
<thead>
<tr>
<th>Notes/Sketch:</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Diagram of stream crossing]</td>
</tr>
</tbody>
</table>

REPORTED TO AUTHORITIES: Yes No
**Reach Level Assessment**

**Date:** 6/5/10

**Survey Reach ID:** RCH-432

**Wtrshd/Subshd:** Be South Trib

<table>
<thead>
<tr>
<th><strong>START</strong></th>
<th><strong>TIME:</strong> 2:25 AM/PM</th>
<th><strong>LMK:</strong></th>
<th><strong>END</strong></th>
<th><strong>TIME:</strong> 3:25 AM/PM</th>
<th><strong>LMK:</strong></th>
<th><strong>GPS ID:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 41° 51' 14.1&quot;</td>
<td>LONG 72° 25' 05.5&quot;</td>
<td></td>
<td>LAT 41° 51' 07.9&quot;</td>
<td>LONG 72° 25' 05.6&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:**

- Simple plan 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.

**Rain in Last 24 Hours:**
- None
- Intermittent
- Steady rain
- Heavy rain

**Surrounding Land Use:**
- Industrial
- Commercial
- Golf course
- Park
- Crop
- Pasture
- Other

**Average Conditions**

<table>
<thead>
<tr>
<th><strong>Baseline Flow as %</strong></th>
<th>0-25%</th>
<th>50%-75%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel Width</strong></td>
<td>25-50%</td>
<td>75-100%</td>
</tr>
</tbody>
</table>

**Dominant Substrate:**
- Silt/clay (fine or slick)
- Cobble (2.5-10"
- Boulder (>10"
- Gravel (0.1-2.5"
- Bedrock

**Water Clarity:**
- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opaque (milky)
- Other (chemicals, dyes)

**Aquatic Plants in Stream:**
- Attached: none
- Floating: none

**Wildlife in or Around Stream:**
- Fish
- Beaver
- Deer
- Snails
- Other

**Stream Shading:**
- Mostly shaded (>75% coverage)
- Halfway (>50%)
- Partially shaded (>25%)
- Unshaded (<25%)

**Channel Dynamics:**
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sediment deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:**

- (biggest problem you see in survey reach)

**Reported to Authorities:** Yes No
<table>
<thead>
<tr>
<th>Overall Stream Condition</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Stream Habitat (May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epiflora colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat end at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td>Vegetative Protection (score each bank, determine sides by facing downstream)</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>Bank Erosion (facing downstream)</td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
</tr>
<tr>
<td>Floodplain Connection</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Buffer and Floodplain Condition</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetated Buffer Width</td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td>Floodplain Vegetation</td>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
</tr>
<tr>
<td>Floodplain Habitat</td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
</tr>
<tr>
<td>Floodplain Encroachment</td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or man-made structures, but not affecting floodplain function</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or man-made structures, but not affecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or man-made structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
</tr>
</tbody>
</table>

Sub Total In-stream: ____/80 + Buffer/Floodplain: ____/80 - Total Survey Reach ____/100
### Storm Water Outfalls

**WATERSHED/SUBSHED:** Creek Branch South Trib

**DATE:** 6/15/2023

**ASSESSSED BY:**

**SURVEY REACH ID:** CSB-South Trib

**TIME:** 2:00 AM/PM

**PHOTO ID:** (Camera-Pic #) 1# 1838

**SITE ID** (Condition-#): OT-

**LAT:** 41° 51' 16" **LONG:** 72° 29' 05"

**LMK:**

**GPS:** (Unit ID)

---

**BANK:**
- LT [ ]
- RT [ ]
- Head [ ]

**FLOW:**
- None [ ]
- Trickle [ ]
- Moderate [ ]
- Substantial [ ]
- Other [ ]

**TYPE:**
- Closed pipe [ ]
- Other [ ]

**MATERIAL:**
- Concrete [ ]
- Metal [ ]
- PVC/Plastic [ ]
- Brick [ ]
- Other [ ]

**SHAPE:**
- Single [ ]
- Circular [ ]
- Double [ ]
- Trapezoid [ ]
- Other [ ]

**DIMENSIONS:**
- Diameter: (in)

**SUBMERGED:**
- No [ ]
- Partially [ ]
- Fully [ ]

---

**CONDITION:**
- None [ ]

**ORIGIN:**
- Gas [ ]
- Sewage [ ]
- Rancid/Sour [ ]
- Sulphide [ ]
- Other [ ]

**DEPOSITS/STAINS:**
- None [ ]
- Oily [ ]
- Flow Line [ ]
- Paint [ ]
- Other [ ]

**VEGIE DENSITY:**
- None [ ]
- Normal [ ]
- Inhibited [ ]
- Excessive [ ]
- Other [ ]

**PIPE BENTHIC GROWTH:**
- None [ ]

**POOL QUALITY:**
- No pool [ ]

**COLOR:**
- Clear [ ]
- Brown [ ]
- Grey [ ]
- Yellow [ ]
- Green [ ]
- Orange [ ]
- Red [ ]
- Other [ ]

**TURBIDITY:**
- None [ ]
- Slight Cloudiness [ ]
- Cloudy [ ]
- Opaque [ ]

**FLOATABLES:**
- None [ ]
- Sewage (toilet paper, etc.) [ ]
- Petroleum (oil sheen) [ ]
- Other [ ]

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) [ ]
- Dumping (bulk) [ ]
- Excessive Sedimentation [ ]
- Bank Erosion [ ]
- Other [ ]

---

**POTENTIAL RESTORATION CANDIDATE**
- Discharge investigation [ ]
- Stream daylighting [ ]
- Local stream repair/outfall stabilization [ ]

**FOR FLOWING ONLY**

**SLOPE:**
- Storm water retrofit [ ]
- Other [ ]

**Length of vegetative cover from outfall:** ft

**Type of existing vegetation:**

**Slope:**

---

If yes for daylighting:

**If yes for stormwater:**

Is stormwater currently controlled?
- Yes [ ]
- No [ ]
- Not investigated [ ]

**Land Use description:**

**Area available:**

---

**OUTFALL SEVERITY**
- 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 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.**

**Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.**

---

**REPORTED TO AUTHORITIES:**
- Yes [ ]
- No [ ]
Stream Crossing

WATERSHED/SUBSHED: [Redacted]  DATE: 6/15/18  ASSESSED BY: [Redacted]

SURVEY REACH ID: GREST-04A  TIME: 2:25 AM/PM  PHOTO ID: (Camera-Pic #)/[Redacted] # 1811

SITE ID: (Condition #) SC-2  LAT 41°51'00"  "LONG 70°25'08" W  LMK__  GPS (Unit ID)

TYPE: [ ] Road Crossing  [ ] Railroad Crossing  [ ] Manmade Dam  [ ] Beaver Dam  [ ] Geological Formation  [ ] Other:

FOR ROAD/RAILROAD CROSSINGS ONLY

SHAPE: [ ] Arch  [ ] Bottomless  [ ] Box  [ ] Elliptical  [ ] Circular  [ ] Other:

# BARRELS: [ ] Single  [ ] Double  [ ] Triple  [ ] Other:

MATERIAL: [ ] Concrete  [ ] Metal  [ ] Other:

ALIGNMENT: [ ] Flow-aligned  [ ] Not flow-aligned  [ ] Do not know

DIMENSIONS: (if variable, sketch)

Barrel diameter: ______ (ft)  Height: ______ (ft)

Culvert length: ______ (ft)  Width: ______ (ft)

Roadway elevation: ______ (ft)

CONDITION: (Evidence of...)

[ ] Cracking/chipping/corrosion  [ ] Downstream scour hole  [ ] Sediment deposition  [ ] Failing embankment  [ ] Other (describe):

CULVERT SLOPE:

[ ] Flat  [ ] Slight (2° – 5°)  [ ] Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE

[ ] Fish barrier removal  [ ] Culvert repair/replacement  [ ] Upstream storage retrofit  [ ] Local stream repair  [ ] Other:

IS SC ACTING AS GRADE CONTROL

[ ] No  [ ] Yes  [ ] Unknown

EXTENT OF PHYSICAL BLOCKAGE:

[ ] Total  [ ] Partial  [ ] Temporary  [ ] Unknown

If yes for fish barrier

CAUSE:

[ ] Drop too high  [ ] Water Drop: ______ (in)  [ ] Flow too shallow  [ ] Water Depth: ______ (in)  [ ] Other:

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.

BLOCKAGE SEVERITY: (circle #)

5 4 3 2 1

NOTES/SKETCH:

REPORTED TO AUTHORITIES [ ] YES  [ ] NO
Reach Level Assessment

<table>
<thead>
<tr>
<th>SURVEY REACH ID:</th>
<th>WMID/ SUBSHD:</th>
<th>DATE:</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6/15/08</td>
<td>DBB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>START</th>
<th>TIME: 2:26 AM/PM</th>
<th>LMK:</th>
<th>END</th>
<th>TIME: AM/PM</th>
<th>LMK:</th>
<th>GPS ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 41°51'01&quot;</td>
<td>LONG 92°25'05.5&quot;</td>
<td></td>
<td>LAT 41°51'06&quot;</td>
<td>LONG 92°25'084&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td></td>
<td></td>
<td>DESCRIPTION:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RAIN IN LAST 24 HOURS: □ Heavy rain □ Steady rain
□ None □ Intermittent □ Trace
□ Clear □ Trace □ Overcast □ Partly cloudy

PRESENT CONDITIONS: □ Heavy rain □ Steady rain □ Intermittent
□ Clear □ Trace □ Overcast □ Partly cloudy

SURROUNDING LAND USE: □ Industrial □ Commercial □ Golf course □ Park
□ Urban/Residential □ Suburban/Res □ Forested □ Institutional
□ Crop □ Pasture □ Other:

AVERAGE CONDITIONS (check applicable)

BASE FLOW AS % □ 0-25% □ 25-50% □ 50-75% □ 75-100%

CHANNEL WIDTH □ 0-25% □ 25-50% □ 50-75% □ 75-100%

DOMINANT SUBSTRATE □ Silt/clay (fine or slick) □ Cobble (2.5—10")
□ Sand (gritty) □ Boulder (>10")
□ Gravel (0.1-2.5") □ Bedrock

WATER CLARITY □ Clear □ Turbid (suspended matter)
□ Stained (clear, naturally colored) □ Opaque (milky)
□ Other (chemicals, dyes)

AQUATIC PLANTS IN STREAM □ Attached: □ none □ some □ lots
□ Floating: □ none □ some □ lots

WILDLIFE IN OR AROUND STREAM □ Evidence of □ Fish □ Beaver □ Deer
□ Snails □ Other

STREAM SHADING (water surface) □ Mostly shaded (>75% coverage)
□ Halfway (>50%)
□ Partially shaded (>25%)
□ Unshaded (<25%)

CHANNEL DYNAMICS □ Downcutting □ Widening □ Headcutting
□ Aggrading □ Sed. deposition □ Bed scour
□ Bank failure □ Bank scour □ Slope failure
□ Channeling □ Sed. deposition

CHANNEL HEIGHT (from facing downstream) □ LT bank 3 (ft) □ RT bank 2 (ft)
□ Bottom 1 (ft) □ Top 2 (ft)

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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

NOTES: (biggest problem you see in survey reach)

REPORTED TO AUTHORITIES □ Yes □ No
### Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient);</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

| 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 stable habitat 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 stable habitat 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 stable height. |
| | 20 19 18 17 16 | 15 14 13 12 11 | 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; tail 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. |
| | 20 19 18 17 16 | 15 14 13 12 11 | 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 |

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

| 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-stream:** ___ /80 + **Buffer/Floodplain:** ___ /80 = **Total Survey Reach** ___ /160
**Impacted Buffer**

**Watershed/Subshed:** Galena St. South Trib

**Date:** 6/5/2016

**Survey Reach:** CRST-045

**Time:** 2:30 AM/PM

**PHOTO ID:** (Camera-Pic #)

**Site ID:** (Condition #)

<table>
<thead>
<tr>
<th>Start Lat</th>
<th>Start Long</th>
<th>LMK</th>
</tr>
</thead>
<tbody>
<tr>
<td>41° 51' 37.9&quot;</td>
<td>72° 25' 05.5&quot;</td>
<td>LMK</td>
</tr>
</tbody>
</table>

**End Lat** | **End Long** | **LMK** |
|------------|-------------|--------|

**Impacted Bank:**

- LT
- RT
- Both

**Reason Inadequate:**

- [ ] Lack of vegetation
- [ ] Too narrow
- [ ] Widespread invasive plants
- [ ] Recently planted
- [ ] Other:

**Land Use:**

<table>
<thead>
<tr>
<th>(Facing downstream)</th>
<th>LT Bank</th>
<th>Institutional</th>
<th>Golf Course</th>
<th>Park</th>
<th>Other Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dominant Land Cover:**

<table>
<thead>
<tr>
<th>LT Bank</th>
<th>RT Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paved</td>
<td></td>
</tr>
<tr>
<td>Bare ground</td>
<td></td>
</tr>
<tr>
<td>Turf/lawn</td>
<td></td>
</tr>
<tr>
<td>Tall grass</td>
<td></td>
</tr>
<tr>
<td>Shrub/scrub</td>
<td>None</td>
</tr>
<tr>
<td>Trees</td>
<td>Other</td>
</tr>
</tbody>
</table>

**Invasive Plants:**

- [ ] None
- [ ] Rare
- [x] Partial coverage
- [ ] Extensive coverage
- [ ] unknown

**Stream Shade Provided?**

- [ ] None
- [ ] Partial
- [ ] Full

**Wetlands Present?**

- [x] Yes
- [ ] Unknown

**Potential Restoration Candidate**

- [ ] Active reforestation
- [ ] Greenway design
- [ ] Natural regeneration
- [ ] Invasives removal
- [ ] Other:

**Restorable Area**

**Length (ft):** 300

**Width (ft):** 30

**Reforestation Potential:**

- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

**Potential Conflicts with Reforestation**

- [ ] Widespread invasive plants
- [ ] Potential contamination
- [ ] Lack of sun
- [ ] Poor/unsafe access to site
- [ ] Existing impervious cover
- [ ] Severe animal impacts (deer, beaver)
- [ ] Other: Structure, properties

**Notes:**

---

[Diagram of Impacted Buffer with labels for streams, wetlands, and specific locations marked with "own-chip".]
### Stream Crossing

**Watershed/Subshed:** Creek Brook South Trib  
**Date:** 6/15/2023  
**Survey Reach ID:** 645  
**Time:** 3:15 AM/PM  
**Photo ID:** (Camera-Pic #) (unit)  
**Site ID:** (Condition #:) SC-01  
**Lat:** 41°51'03.089"  
**Long:** 72°25'08.9"  
**LMK**  
**GPS (Unit ID):**  
**Assessed By:**  

### Type:  
- [ ] Road Crossing  
- [ ] Railroad Crossing  
- [ ] Manmade Dam  
- [ ] Beaver Dam  
- [ ] Geological Formation  
- [ ] Other:  

### Shape:  
- [ ] Arch  
- [ ] Bottomless  
- [ ] Box  
- [ ] Elliptical  
- [ ] Circular  
- [ ] Other:  

### Condition:  
- [ ] Cracking/chipping/corrosion  
- [ ] Sediment deposition  
- [ ] Other (describe):  

### Barrels:  
- [ ] Single  
- [ ] Double  
- [ ] Triple  
- [ ] Other:  

### Material:  
- [ ] Concrete  
- [ ] Metal  
- [ ] Other:  

### Alignment:  
- [ ] Flow-aligned  
- [ ] Not flow-aligned  
- [ ] Do not know  

### Dimensions:  
- [ ] Barrel diameter:  
- [ ] Height:  
- [ ] Culvert length:  
- [ ] Width:  
- [ ] Roadway elevation:  

### Potential Restoration Candidate:  
- [x] Fish barrier removal  
- [ ] Culvert repair/replacement  
- [ ] Upstream storage retrofit  
- [ ] No  
- [ ] Local stream repair  
- [ ] Other:  

### Is SC acting as grade control:  
- [ ] No  
- [ ] Yes  
- [ ] Unknown  

### Extent of Physical Blockage:  
- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown  

#### Cause:  
- [ ] Drop too high  
- [ ] Water Drop: (in)  
- [ ] Flow too shallow  
- [ ] Water Depth: (in)  
- [ ] Other:  

#### Blockage Severity:  
- [ ] 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 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 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:  

[Diagram of Loehr Rd and SC-1]
## Reach Level Assessment

**Survey Reach ID:** GBST-9A  
**Wtrshd/Subshd:** Long  
**Date:** 6/5/20X4  
**Assessed by:** DB  
**GPS ID:**

**Start Time:** AM/PM  
**LMK:**  
**End Time:** AM/PM  
**LMK:**  
**Description:**

### Rain in Last 24 Hours
- [ ] Heavy rain  
- [ ] Steady rain  
- [ ] None  
- [ ] Intermittent  
- [ ] Trace  
- [ ] Clear  
- [ ] Overcast  
- [ ] Partly cloudy  

### Surrounding Land Use
- [ ] Industrial  
- [ ] Commercial  
- [ ] Golf course  
- [ ] Park  
- [ ] Crop  
- [ ] Pasture  
- [ ] Other:

### Aquatic Plants in Stream
- [ ] Attached: none  
- [ ] Attached: some  
- [ ] Attached: lots  
- [ ] Floating: none  
- [ ] Floating: some  
- [ ] Floating: lots  

### Wildlife in or Around Stream
- [ ] Fish  
- [ ] Beaver  
- [ ] Deer  
- [ ] Snails  
- [ ] Other:

### Stream Shading (Water Surface)
- [ ] Mostly shaded (>75% coverage)  
- [ ] Halfway (50%)  
- [ ] Partially shaded (25%)  
- [ ] Unshaded (<25%)  

### Channel Dynamics
- [ ] Downcutting  
- [ ] Widening  
- [ ] Headcutting  
- [ ] Aggrading  
- [ ] Sed. deposition  
- [ ] Bed scour  
- [ ] Bank failure  
- [ ] Bank scour  
- [ ] Slope failure  
- [ ] Channelized  
- [ ] Unknown

### Channel Dimensions (Facing Downstream)
- [ ] Height: LT bank  
- [ ] Height: RT bank  
- [ ] Width: Bottom  
- [ ] Top  

### Reach Accessibility
- [ ] Good: Open area in public ownership, sufficient room to stockpile materials, easy stream access for heavy equipment using existing roads or trails.  
- [ ] Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscapes. 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.  

### Average Conditions (Check applicable)
- [ ] Base Flow as %  
- [ ] Channel Width  
- [ ] Dominant Substrate  
- [ ] Water Clarity

### Present Conditions
- [ ] Heavy rain  
- [ ] Steady rain  
- [ ] Intermittent  
- [ ] Trace  
- [ ] Clear  
- [ ] Overcast  
- [ ] Partly cloudy  

### Rain in Last 24 Hours
- [ ] Heavy rain  
- [ ] Steady rain  
- [ ] None  
- [ ] Intermittent  
- [ ] Trace  
- [ ] Clear  
- [ ] Overcast  
- [ ] Partly cloudy  

### Surrounding Land Use
- [ ] Industrial  
- [ ] Commercial  
- [ ] Golf course  
- [ ] Park  
- [ ] Crop  
- [ ] Pasture  
- [ ] Other:

### Aquatic Plants in Stream
- [ ] Attached: none  
- [ ] Attached: some  
- [ ] Attached: lots  
- [ ] Floating: none  
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- [ ] Floating: lots  

### Wildlife in or Around Stream
- [ ] Fish  
- [ ] Beaver  
- [ ] Deer  
- [ ] Snails  
- [ ] Other:

### Stream Shading (Water Surface)
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### Channel Dynamics
- [ ] Downcutting  
- [ ] Widening  
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- [ ] Aggrading  
- [ ] Sed. deposition  
- [ ] Bed scour  
- [ ] Bank failure  
- [ ] Bank scour  
- [ ] Slope failure  
- [ ] Channelized  
- [ ] Unknown

### Channel Dimensions (Facing Downstream)
- [ ] Height: LT bank  
- [ ] Height: RT bank  
- [ ] Width: Bottom  
- [ ] Top  

### Reach Sketch and Site Impact Tracking

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.

### Survey Reach Information
**Description:**

**Rain in Last 24 Hours**
- [ ] Heavy rain  
- [ ] Steady rain  
- [ ] None  
- [ ] Intermittent  
- [ ] Trace  
- [ ] Clear  
- [ ] Overcast  
- [ ] Partly cloudy  

**Surrounding Land Use**
- [ ] Industrial  
- [ ] Commercial  
- [ ] Golf course  
- [ ] Park  
- [ ] Crop  
- [ ] Pasture  
- [ ] Other:

**Aquatic Plants in Stream**
- [ ] Attached: none  
- [ ] Attached: some  
- [ ] Attached: lots  
- [ ] Floating: none  
- [ ] Floating: some  
- [ ] Floating: lots  

**Wildlife in or Around Stream**
- [ ] Fish  
- [ ] Beaver  
- [ ] Deer  
- [ ] Snails  
- [ ] Other:

**Stream Shading (Water Surface)**
- [ ] Mostly shaded (>75% coverage)  
- [ ] Halfway (50%)  
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**Channel Dynamics**
- [ ] Downcutting  
- [ ] Widening  
- [ ] Headcutting  
- [ ] Aggrading  
- [ ] Sed. deposition  
- [ ] Bed scour  
- [ ] Bank failure  
- [ ] Bank scour  
- [ ] Slope failure  
- [ ] Channelized  
- [ ] Unknown

**Channel Dimensions (Facing Downstream)**
- [ ] Height: LT bank  
- [ ] Height: RT bank  
- [ ] Width: Bottom  
- [ ] Top  

**Reach Accessibility**
- [ ] Good: Open area in public ownership, sufficient room to stockpile materials, easy stream access for heavy equipment using existing roads or trails.  
- [ ] Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscapes. 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.

**Notes:** (biggest problem you see in survey reach)

**Reported to Authorities**
- [ ] Yes  
- [ ] No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>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).</td>
<td>40-70% mix of stable habitat; well-suitied 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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| 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. |

| Bank Erosion | | | | |
| (facing downstream) | Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. | 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; tail 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. |

| 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. |

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Predominant floodplain vegetation type is mature forest</th>
<th>Predominant floodplain vegetation type is shrub or old field</th>
<th>Predominant floodplain vegetation type is turf or crop land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

| 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 |

| Floodplain Encroachement | 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. |

Sub Total In-stream: ____ /80 + Buffer/Floodplain: ____ /80 = Total Survey Reach ____ /100
Stream Crossing

**Watershed/Subshed:** Gyes Blk 5 Trib  
**Date:** 6/15/10  
**Assessed By:**  

**Survey Reach ID:** GBst 9A  
**Time:** AM/PM  
**Photo ID:** (Camera-Pic #)  
**Site ID:** (Condition-#) SC-1  
**Lat:** 41° 51' 02.6", **Long:** 72° 25' 10.2"  
**LMK:**  

**Type:** Road Crossing  
**Railroad Crossing**  
**Manmade Dam**  
**Beaver Dam**  
**Geological Formation**  
**Other:**

| **Shape:** |  
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Arch | Bottomless | Box | Elliptical | Circular | Other. | Material: | Concrete | Metal | Other: | Plastic | Alignment: | Flow-aligned | Not flow-aligned | Do not know |  
| Barrels: | Single | Double | Triple | Other: |  
| Width: |  
| Depth: |  
| Length: |  
| Elevation: |  

**Condition:**  
- Cracking/chipping/corrosion  
- Sediment deposition  
- Other (describe):  

**Culvert slope:**  
- Flat  
- Slight (2° - 5°)  
- Obvious (>5°)  

**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

**Extent of physical blockage:**  
- Total  
- Partial  
- Temporary  
- Unknown

**Cause:**  
- Drop too high  
- Water drop: ___ (in)  
- Flow too shallow  
- Water depth: ___ (in)  
- Other:

**Blockage severity:** (circle #)
- 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.

**Notes/Sketch:**

---

**Reported to authorities:** Yes No
**Stream Crossing**

**Watershed/Subshed:** Genesee Brk 5 Trib

**Site ID:** SC-2

**Surveys Reach ID:** 685.4' N

**Photo ID:** (Camera Pic #)

**Date:** 6/5/08

**Assessed By:** MLD

<table>
<thead>
<tr>
<th><strong>Survey Reach ID:</strong> 685.4' N</th>
<th><strong>Time:</strong> AM/PM</th>
<th><strong>Photo ID:</strong> (Camera Pic #)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Watershed/Subshed:</strong> Genesee Brk 5 Trib</td>
<td><strong>Site ID:</strong> SC-2</td>
<td><strong>Lat:</strong> 41° 51' 00&quot;N <strong>Long:</strong> 72° 25' 10.7&quot;W</td>
</tr>
</tbody>
</table>

**Type:**
- Road Crossing
- Railroad Crossing
- Manmade Dam
- Beaver Dam
- Geological Formation
- Other

**Shape:**
- Arch
- Box
- Circular
- Elliptical
- Other

**Condition:**
- Evidence of...
- Cracking/chipping/corrosion
- Downstream scour hole
- Sediment deposition
- Failing embankment
- 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

**Extent of Physical Blockage:**
- Total
- Partial
- Temporary
- Unknown

- If yes for fish barrier
  - Drop too high
  - Flow too shallow
  - Other

**Cause:**
- Water Drop: ____ (in)
- Water Depth: ____ (in)

**Blockage Severity:**
- circle #

**Notes/Sketch:**

**Reported to Authorities:** Yes No
### Reach Level Assessment

<table>
<thead>
<tr>
<th>SURVEY REACH ID</th>
<th>WTRSHD/SUBSHD</th>
<th>DATE</th>
<th>ASSESSED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### START
- **Time:** 2:45 AM/PM
- **LMK:**
- **LAT:** 41° 50' 58.7"
- **LONG:** 72° 05' 11.5"
- **DESCRIPTION:**

#### END
- **Time:** 5:32 AM/PM
- **LMK:**
- **LAT:** 41° 50' 48.3"
- **LONG:** 72° 05' 21.1"
- **DESCRIPTION:**

### Rain in Last 24 Hours
- None
- Heavy rain
- Steady rain

### Present Conditions
- None
- Overcast
- Partly cloudy
- Trace
- Intermittent
- Steady rain
- Heavy rain

### Surrounding Land Use
- Industrial
- Commercial
- Golf course
- Park
- Urban/Residential
- Suburban/Residential
- Forested
- Institutional
- Crop
- Pasture
- Other

### Average Conditions (check applicable)

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>CHANNEL WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- 0-25%
- 25-50%
- 50-75%
- 75-100%

#### Dominant Substrate
- Silty/clay (fine or slick)
- Cobble (2.5 -10")
- Boulder (>10")
- Gravel (0.1-2.5")
- Bed rock

#### Water Clarity
- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opague (milky)
- Other (chemicals, dyes)

#### Aquatic Plants
- Attached: None
- Floating: None

#### Wildlife in or Around Stream
- (Evidence of)
- Fish
- Beaver
- Deer
- Snails
- Other

#### Stream Shading (water surface)
- Mostly shaded (≥75% coverage)
- Halfway (50%)
- Partially shaded (25%)
- Unshaded (<25%)

#### Channel Dynamics
- Downcutting
- Widening
- Headcutting
- Aggrading
- Erodion
- Sed. deposition
- Channelized

#### Channel Dimensions (Facing Downstream)
- Height: LT bank
- Width: Bottom
- Top

#### Reach Sketch and Site Impact Tracking
- 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.

#### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

### Notes: (biggest problem you see in survey reach)

### Reported to Authorities
- Yes
- No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>IN-STREAM HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

### 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. |

### BANK EROSION

| (facing downstream) | Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. | 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; tail 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. |

### FLOODPLAIN CONNECTION

| | 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. | High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched. |

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking, lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

### FLOODPLAIN VEGETATION

| Predominant floodplain vegetation type: mature forest | Predominant floodplain vegetation type: shrub or old field | Predominant floodplain vegetation type: turf or crop land |

### FLOODPLAIN HABITAT

| Even mix of wetland and non-wetland habitats, evidence of standing/ponded water | Either all wetland or all non-wetland habitat, no evidence of standing/ponded water | Either all wetland or all non-wetland habitat, no evidence of standing/ponded water |

### FLOODPLAIN ENCROACHMENT

| 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 affecting 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 |

Sub Total In-stream: 80 + Buffer/Floodplain: 80 = Total Survey Reach: 160
Gorges Blk South Trib
6/5/08 DBB ER
GB5T-091B 4:00 DBCarmin 1852
ETC-01 41°05'53.8" 72°25'12.0"
other severe erosion 41°05'50.1" 72°25'09.7"
Bank Scour/Failure
Bank of concern: outside corner of wedge
length 2 sections 80' each
Bottom width = 8'
Top w = 25'
width w = 3'
Forest
Bank stabilization, grade control
No threat to property
scour height = 7' max
existing riparian width = 100' +
erosion severity = 4
Access = 1
Stream Crossing

**Watershed/Subshed:** Cross Creek South Trib

**DATE:** 6/5/2023

**Assessed By:**

**Survey Reach ID:** CRST-A

**TIME:** 4:30 AM/PM

**Photo ID:** (Camera Pic #)

**Site ID:** (Condition #) SC-O1

**Lat:** 45° 56' 50" Long 70° 26' 10"

**LMK:**

**GPS (Unit ID):**

---

**Type:**

- [√] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**Shape:**

- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [√] Circular
- [ ] Other:

**# Barrels:**

- [ ] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**Material:**

- [√] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**

- [√] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)

- Barrel diameter: [ ] (ft)
- Height: [ ] (ft)

- Culvert length: [ ] (ft)
- Width: [ ] (ft)

- Roadway elevation: [ ] (ft)

---

**Potential Restoration Candidate**

- [ ] Fish barrier removal
- [√] Culvert repair/replacement
- [ ] Upstream storage retrofit

- [ ] Local stream repair
- [ ] Other:

**Is SC Acting as Grade Control**

- [ ] No
- [ ] Yes
- [ ] Unknown

---

**Extent of Physical Blockage:**

- [√] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

- **If yes for fish barrier**

- **Cause:**

  - [√] Drop too high
  - [ ] Flow too shallow
  - [ ] Other:

  - **Water Drop:** [ ] (in)

- **Blockage Severity:** (circle #)

  - [ ] 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 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.**

**Notes/Sketch:**

- [ ] Natural debris

---

**Reported to Authorities:**

- [ ] Yes
- [ ] No
SC Gages Brook South Trib

GB37.09B 4:15 pm 6/5/06  cascn. 57.5 ft
SC-02 Lat 41°51'44.5" Long 72°25'09.1"

Type: Road crossing
Shape: Box
Barrel: one
Material: concrete
Alignment: flat

Dimensions:
Diameter: 24 in
Culvert length: 100 ft
Headway elevation: 20 ft

Condition: Chipping
Culvert slope: 2°50'

Restoration Candidate: No
Blockage severity: 4
Water Drop: 40 ft
**Reach Level Assessment**

**SURVEY REACH ID:** G820  
**WTRSHD/SUBSHD:** Gages  
**DATE:** 6/5/08  
**ASSESSED BY:**

<table>
<thead>
<tr>
<th>StartTime</th>
<th>Time:</th>
<th>LMK:</th>
<th>EndTime</th>
<th>Time:</th>
<th>LMK:</th>
<th>GPS ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 AM</td>
<td>09:00 AM</td>
<td></td>
<td>10:32 AM</td>
<td>10:32 AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAT 41° 51' 25.1&quot;</td>
<td>LONG 72° 25' 37.1&quot;</td>
<td></td>
<td>LAT 41° 51' 25.6&quot;</td>
<td>LONG 72° 25' 29.1&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION:**

**RAIN IN LAST 24 HOURS**  
□ Heavy rain  
□ Steady rain  
□ None  
□ Intermittent  
□ Trace  
□ Overcast  
□ Partly cloudy

**PRESENT CONDITIONS**  
□ Heavy rain  
□ Steady rain  
□ Intermittent  
□ Clear  
□ Trace  
□ Overcast  
□ Partly cloudy

**SURROUNDING LAND USE:**  
□ Industrial  
□ Commercial  
□ Golf course  
□ Park  
□ Urban/Residential  
□ Suburban/Res  
□ Forested  
□ Institutional  
□ Crop  
□ Pasture  
□ Other:

**AVERAGE CONDITIONS**  
(check applicable)

<table>
<thead>
<tr>
<th>Base Flow as %</th>
<th>Channel Width</th>
<th>Dominant Substrate</th>
<th>Water Clarity</th>
<th>Aquatic Plants in Stream</th>
<th>Wildlife in or Around Stream</th>
<th>Stream Shading</th>
<th>Channel Dynamics</th>
<th>Channel Dimensions (FACING DOWNSTREAM)</th>
<th>Reach Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 0-25%</td>
<td>□ 25-50%</td>
<td>□ Silt/clay (fine or slick)</td>
<td>□ Clear</td>
<td>□ Attached: (Evidence of) Fish Snails</td>
<td>□ Most shaded (≥75% coverage)</td>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Downcutting</td>
<td>□ Height: LT bank 1 (ft) RT bank 1 (ft) Width: Bottom 10 (ft) Top 0.25 (ft)</td>
<td></td>
</tr>
<tr>
<td>□ 25-50%</td>
<td>□ 75-100%</td>
<td>□ Sand (gritty)</td>
<td>□ Turbid (suspended matter)</td>
<td>□ Floating:</td>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Widening</td>
<td>□ Height: LT bank 1 (ft) RT bank 1 (ft) Width: Bottom 10 (ft) Top 0.25 (ft)</td>
<td></td>
</tr>
<tr>
<td>□ 75-100%</td>
<td>□</td>
<td>□ Gravel (0.1-2.5&quot;)</td>
<td>□ Opaque (milky)</td>
<td>□ Attached:</td>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Widening</td>
<td>□ Height: LT bank 1 (ft) RT bank 1 (ft) Width: Bottom 10 (ft) Top 0.25 (ft)</td>
<td></td>
</tr>
</tbody>
</table>

**REACH SKETCH AND SITE IMPACT TRACKING**

Simple plan view 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.

**CHANNEL DYNAMICS**

□ Downcutting  
□ Widening  
□ Headcutting  
□ Bed scour  
□ Bank failure  
□ Bank scour  
□ Slope failure  
□ Channelized

□ Unknown

**CHANNEL DIMENSIONS (FACING DOWNSTREAM)**

<table>
<thead>
<tr>
<th>Height: LT bank</th>
<th>Width: Bottom</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (ft)</td>
<td>10 (ft)</td>
<td>0.25 (ft)</td>
</tr>
</tbody>
</table>

**REACH ACCESSIBILITY**

Good: Open area in public ownership, sufficient room for 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.

**NOTES:** (biggest problem you see in survey reach)

□ Consider making pre tributary part of G820?  
□ Reported to authorities □ Yes □ No
### Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrates favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transplanted).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Lessthan 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| 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 extend; 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. |

| 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. |

| 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. |

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

| 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 |

| 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 |

| Floodplain Encroachment | Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting 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 |

**Sub Total In-stream:** 80 / 80  +  **Buffer/Floodplain:** 80 / 80  =  **Total Survey Reach** 160
### Trash and Debris

**WATERSHED/SUBSHED:** Gages  
**DATE:** 6/5/10  
**ASSESSED BY:**

**SURVEY REACH ID:** GB-81  
**TIME:** 9:32 AM/PM  
**PHOTO ID:** (Camera-Plc #) "D"  
**SITE ID:** (Condition-) TR-Cy  

**SOURCE:**  
- [ ] Unknown  
- [ ] Flooding  
- [ ] Illegal dump  
- [ ] Local outfall

**LOCATION:**  
- [ ] Stream  
- [ ] Riparian Area  
- [ ] Lt bank  
- [ ] Rt bank

**LAND OWNERSHIP:**  
- [ ] Public  
- [ ] Private  
- [ ] Unknown

**AMOUNT (# Pickup truck loads):** 3

**POTENTIAL RESTORATION CANDIDATE:**  
- [ ] Stream cleanup  
- [ ] Stream adoption segment  
- [ ] Removal/prevention of dumping

**EQUIPMENT NEEDED:**  
- [ ] Heavy equipment  
- [ ] Trash bags  
- [ ] Unknown

**WHO CAN DO IT:**  
- [ ] Volunteers  
- [ ] Local Gov  
- [ ] Hazmat Team  
- [ ] Other

**DUMPSTER WITHIN 100 FT:**  
- [ ] Yes  
- [ ] No  
- [ ] Unknown

**CLEAN-UP POTENTIAL:**  
- [ ] A small amount of trash, or bulk items, in a small area 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 drums or indications of hazardous materials

**NOTES:**

- Reported to Authorities: [ ] Yes  

**Entered as:**  
- Industrial  
- Residential  
- Trash and Debris  
- Yard Waste  
- Other:

**If yes for trash or debris removal:**  
- [ ] Yes  
- [ ] No  
- [ ] Unknown

**REPORTED TO AUTHORITIES:**  
- [ ] Yes  
- [ ] No
<table>
<thead>
<tr>
<th>MATERIAL:</th>
<th>Type:</th>
<th>Does channel have perennial flow?</th>
<th>Is there evidence of sediment deposition?</th>
<th>Is vegetation growing in channel?</th>
<th>Is channel connected to floodplain?</th>
<th>BASE FLOW CHANNEL</th>
<th>ADJACENT STREAM CORRIDOR</th>
<th>POTENTIAL RESTORATION CANDIDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Defined low flow channel?</td>
<td>Available width</td>
<td>Structural repair</td>
</tr>
<tr>
<td>Gabion</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>% of channel bottom</td>
<td>LT</td>
<td>Natural channel design</td>
</tr>
<tr>
<td>Rip Rap</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>%</td>
<td>RT</td>
<td>Can't tell</td>
</tr>
<tr>
<td>Earthen</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>%</td>
<td>Sum</td>
<td>De-channelization</td>
</tr>
<tr>
<td>Other:</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>%</td>
<td>Total</td>
<td>Fish barrier removal</td>
</tr>
</tbody>
</table>

**DIMENSIONS:**
- Height: 7 (ft)
- Bottom Width: 14 (ft)
- Top Width: 32 (ft)
- Length: 200 (ft)

**BASE FLOW CHANNEL**
- Depth of flow: 12 in (in)
- Defined low flow channel: % Yes % No
- % of channel bottom: 84%

**ADJACENT STREAM CORRIDOR**
- Utilities Present: % Yes % No
- Fill in floodplain: % Yes % No

**POTENTIAL RESTORATION CANDIDATE**
- Structural repair
- Base flow channel creation
- Natural channel design
- Can't tell
- De-channelization
- Fish barrier removal
- Bioengineering

**CHANNELIZATION SEVERITY:**
- 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 (>200'), but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed 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.

**NOTES:**
- 5
- 4
- 3
- 2
- 1
### Storm Water Outfalls

**Watershed/Subshed:**

**Survey Reach ID:** GB-01

**Site ID (Condition-2):** OT-02

**Date:** 6/5/08

**Time:** 10:30 AM/PM

**Photo ID:** (Camera-Pic #) 2

**Area Available:**

**Potential Restoration Candidate**

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- Other:

**Length of vegetative cover from outfall:**

**Type of existing vegetation:**

**Slope:**

**If yes for daylighting:**

**If yes for stormwater:**

**Is stormwater currently controlled?**

**Land Use Description:** Transportation (Dr 84)

**Area Available:**

**Potential for Outfall:**

**Severity:**

- 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 contains 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.
- Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

**Sketch/Notes:**

- "GB data shows GBST is the location of this ditch. In reality, GBST & GB01 confluent near other end of GB-01"
<table>
<thead>
<tr>
<th><strong>OUTFALL SEVERITY:</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(circle #)</td>
<td></td>
</tr>
</tbody>
</table>

**SKETCH/NOTES:**

(Hand-drawn sketch of a stream with annotations)
Severe Bank Erosion

Site ID: Gv-01

Survey Reach: 68-01

Start Lat: 41° 51' 24.5"

End Lat: 41° 51' 25.6"

Process: □ Currently unknown □ Downcutting □ Widening □ Headcutting □ Aggrading □ Sed. deposition □ Bank failure □ Bank scour □ Slope failure □ Channelized

Location: □ Meander bend □ Straight section □ Steep slope/valley wall □ Other

Dimensions:
- Length (if no GPS) LT _ ft and/or RT __ ft
- Bank Ht LT _ ft and/or RT __ ft
- Bank Angle LT _ ° and/or RT __ °
- Bottom width G-15 ft
- Top width 10-20 ft
- Wetted Width 6-12 ft

Potential Restoration Candidate: □ Grade control □ Bank stabilization □ Other

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:
- 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.
- Pet downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.
- Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian 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 stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.
- Difficult access. Must cross wetland, 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 required.

Notes/Cross Section Sketch:

Reported to authorities □ Yes □ No
Severe Bank Erosion

**WATERSHED/SUBSHED:** Google Earth

**DATE:** 6/5/08

**ASSESSED BY:** DFR

**SURVEY REACH:** CB-04

**TIME:** 10:10 AM/PM

**PHOTO ID (CAMERA-PIC #):** DBwal15

**SITE ID:** (Condition #)

**START LAT:** YL 51° 22' 0"  **LONG:** 72° 25' 32"  **LMK**  **GPS:** (Unit ID)

**END LAT:**  **" LONG:**  **" LMK

**PROCESS:**
- [ ] Currently unknown
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition
- [ ] Bed scour
- [ ] Bank failure
- [ ] Slope failure
- [ ] Channelized

**BANK OF CONCERN:**
- [ ] LT
- [ ] RT
- [ ] Both (looking downstream)

**LOCATION:**
- [x] Meander bend
- [ ] Straight section
- [ ] Steep slope/valley wall
- [ ] Other:

**DIMENSIONS:**
- [x] Length (if no GPS) LT 150 ft and/or RT 150 ft
- [ ] Bottom width 10 ft
- [ ] Top width 25 ft
- [ ] Wetted Width 10 ft

**LAND OWNERSHIP:**
- [x] Private
- [ ] Public
- [ ] Unknown

**LAND COVER:**
- [x] Forest
- [ ] Field/Ag
- [ ] Developed

**POTENTIAL RESTORATION CANDIDATE:**
- [x] Grade control
- [ ] Bank stabilization
- [ ] Other:

**THREAT TO PROPERTY/INFRASTRUCTURE:**
- [x] No
- [ ] Yes (Describe):

**EXISTING RIPARIAN WIDTH:**
- [ ] 25 ft
- [ ] 25 - 50 ft
- [ ] 50 - 75 ft
- [ ] 75 - 100 ft
- [x] > 100 ft

**EROSION SEVERITY (circle #):**
- [ ] 5
- [ ] 4
- [ ] 3
- [ ] 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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**REPORTED TO AUTHORITIES:**
- [ ] Yes
- [ ] No
Reach Level Assessment

SURVEY REACH ID: SE-02  WTRSHD/SUBSHD:  Dates: 6/3/08  ASSESSED BY: 1PM (AL)
START TIME: 10:30 AM/PM  LMK:  END TIME:  LMK:  GPS ID:
LAT 41° 51' 26.1"  LONG 12° 25' 29.4"  DESCRIPTION: FOOTBRIDGE & TAC
LAT 41° 51' 32.9"  LONG 12° 25' 24.2"  DESCRIPTION: BRAYSE JENICE

RAIN IN LAST 24 HOURS  □ Heavy rain  □ Steady rain
□ Intermittent  □ Trace
PRESENT CONDITIONS  □ Heavy rain  □ Steady rain  □ Intermittent
□ Trace  □ Overcast  □ Partly cloudy
SURROUNDING LAND USE: □ Industrial  □ Commercial
□ Golf course  □ Park  □ Urban/Residential  □ Suburban/Res
□ Crop  □ Pasture  □ Other: WETLAND
□ Snails  □ Other: COMM RH
STREAM SHADING (water surface)  □ Mostly shaded (≥75% coverage)
□ Halfway (≥50%)
□ Partially shaded (≥25%)
□ Unshaded (< 25%)
CHANNEL DYNAMICS  □ Downcutting
□ Widening  □ Bed scour
□ Headcutting  □ Bank failure
□ Aggrading  □ Bank scour
□ Sed. deposition  □ Slope failure
□ Channelized
CHANNEL HEIGHT (FACING DOWNSTREAM)  Height: LT bank □ 2 (ft)
□ RT bank 2 (ft)
□ Width: Bottom 6 (ft)
□ Top 10 (ft)

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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

NOTES: (biggest problem you see in survey reach)
REPORTED TO AUTHORITIES  □ YES  □ NO
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th><strong>IN-STREAM HABITAT</strong></th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| **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. |

| **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. |

| **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. |

| **OVERALL BUFFER AND FLOODPLAIN CONDITION** | | | | |
| | | | | |
| **VEGETATED BUFFER WIDTH** | 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. |

| **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 |

| **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 |

| **FLOODPLAIN ENCROACHMENT** | | | | |
| 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 |

Sub Total In-stream: ____/80 + Buffer/Floodplain: ____/80 - Total Survey Reach ____/160
**Trash and Debris**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE:</td>
<td>Residential</td>
</tr>
<tr>
<td>MATERIAL:</td>
<td>Plastic, Tires, Appliances, Automotive</td>
</tr>
<tr>
<td>SOURCE:</td>
<td>Unknown, Flooding, Illegal dump, Local outfall</td>
</tr>
<tr>
<td>LOCATION:</td>
<td>Stream, Riparian Area, Lt bank, Rt bank</td>
</tr>
<tr>
<td>LAND OWNERSHIP:</td>
<td>Public, Unknown, Private</td>
</tr>
<tr>
<td>AMOUNT (# Pickup truck loads):</td>
<td>1 load</td>
</tr>
<tr>
<td>POTENTIAL RESTORATION CANDIDATE</td>
<td>Yes</td>
</tr>
<tr>
<td>WHO CAN DO IT:</td>
<td>Volunteers</td>
</tr>
<tr>
<td>DUMPSTER WITHIN 100 FT:</td>
<td>Yes, No, Unknown</td>
</tr>
<tr>
<td>REPORTED TO AUTHORITIES</td>
<td>Yes, No, Unknown</td>
</tr>
</tbody>
</table>

**Notes:**

- 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.

**Potential Clean-Up Potential:**

- A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access.

**Potential Clean-Up Potential:**

- 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 drums or indications of hazardous materials.
Reach Level Assessment

**Survey Reach ID:** Wtrshd/Subshd: [Blank]

**Start**
- Time: 12:15 AM/PM
- LMK: [Blank]
- Lat: 41° 51' 32.9"
- Long: 72° 25' 24.2"
- Description: [Blank]

**End**
- Time: 1:22 AM/PM
- LMK: [Blank]
- Lat: 41° 51' 32.7"
- Long: 75° 25' 12.9"
- Description: [Blank]

**Rain in last 24 hours:** [Blank]
- Heavy rain
- Steady rain
- None
- Intermittent
- Trace
- Overcast
- Intermittent

**Surrounding land use:**
- Industrial
- Commercial
- Golf course
- Park
- Urban/Residential
- Suburban/Residential
- Forested
- Institutional
- Crop
- Pasture
- Other:

**Average Conditions (check applicable):**
- **Base flow as %**
  - 0-25%
  - 50%-75%
  - 75-100%
- **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 in stream**
  - Attached: none
  - Floating: none
- **Wildlife in or around stream**
  - Fish
  - Beaver
  - Deer
  - Snails
  - Other:
- **Stream shading (water surface)**
  - Mostly shaded (>75% coverage)
  - Halfway (50%)
  - Partially shaded (25%)
  - Unshaded (<25%)
- **Channel dynamics**
  - Downcutting
  - Widening
  - Headcutting
  - Aggrading
  - Bed scour
  - Bank failure
  - Bank scour
  - Sed. deposition
  - Channelized
- **Channel dimensions**
  - Height: LT bank 2.75 (ft)
  - RT bank 2.0 (ft)
  - Width: Bottom 5.9 (ft)
  - Top 11 (ft)

**Reach sketch and site impact tracking**
- Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, UC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow.

**Notes:** (biggest problem you see in survey reach)

**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.
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**Reported to authorities:** [Blank] Yes [Blank] No
OVERALL STREAM CONDITION

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<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
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| 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 |

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| FLOODPLAIN ENCROACHMENT | 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 fill material, 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 |

Sub Total In-stream: 180 + Buffer/Floodplain: 180 - Total Survey Reach 100
Severe Bank Erosion

**Watershed/Subshed:**

**Survey Reach:**

**Site ID:** (Condition-#)

**Start LAT**

**End LAT**

**Latitude:**

**Longitude:**

**LMK:**

**Process:**

- [ ] Currently unknown
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition

**Bank of Concern:**

- [ ] LT
- [ ] RT
- [ ] Both (looking downstream)

**Location:**

- [ ] Meander bend
- [ ] Straight section
- [ ] Steep slope/valley wall
- [ ] Other:

**Dimensions:**

- Length (if no GPS) LT ft and/or RT 100 ft
- Bottom width ft
- Bank Ht LT ft and/or RT 3 ft
- Top width ft
- Bank Angle LT ° and/or RT 67 °
- Wetted Width ft

**Land Ownership:**

- [ ] Private
- [ ] Public
- [ ] Unknown

**Land Cover:**

- [ ] Forest
- [ ] Field/Ag
- [ ] Developed

**Potential Restoration Candidate:**

- [ ] Grade control
- [ ] Bank stabilization
- [ ] Other:

**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 (circle #):**

- [ ] 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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**Notes/Cross Section Sketch:**

**Reported to Authorities:**

- [ ] Yes
- [ ] No
### Storm Water Outfalls

**Watershed/Subshed:** OT

**Survey Reach ID:** 63.03

**Time:** 12:55 AM/PM

**Photo ID:** (Camera Pic #) 1715

**Site ID:** OT-

**Date:** 6/3/05

**Assessed By:**

---

**Bank:**
- Head

**Flow:**
- None
- Trickle
- Moderate
- Substantial
- Other:

**Type:**
- Open channel

**Material:**
- Concrete
- Other:

**Shape:**
- Circular
- Elliptical
- Triple
- Other:

**Dimensions:**
- Diameter: ___ in

**Submerged:**
- No
- Partially
- Fully

---

**Condition:**
- None
- Other:

**Type:**
- Concrete
- Other:

**Deposit/Stains:**
- None
- Normal
- Other:

**Vegetation Density:**
- None
- Normal
- Other:

**Pipe Benthic Growth:**
- None
- Other:

**Pool Quality:**
- No pool
- Other:

---

**Potential Restoration Candidate:**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- Other:

**If yes for daylighting:**
- Length of vegetation cover from outfall: ___ ft
- Type of existing vegetation:
- Slope:

**If yes for stormwater:**
- Is stormwater currently controlled?
  - Yes
  - No
  - Not investigated
  - Land Use description:
  - Area available:

**Outfall Severity:**
- 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 have a significant impact downstream.
- 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

---

**Sketch/Notes:**

---

**Reported to authorities:** Yes No
**Stream Crossing**

**Watershed/Subshed:** BR

**Survey Reach ID:** GB03A

**Time:** 06:AM

**Photo ID:** (Camera Pic #)

**Site ID:** (Condition #)

**Lat:** 41° 14' 32.7"

**Long:** 75° 25' 17.9"

**LMK GPS (Unit ID):**

**Type:**
- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**Shape:**
- [x] Arch
- [x] Box
- [ ] Elliptical
- [ ] Other:

**# Barrels:**
- [ ] Single
- [ ] Double
- [x] Triple
- [ ] Other:

**Material:**
- [ ] Concrete
- [x] Metal
- [ ] Other:

**Alignment:**
- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Condition:** (Evidence of...)
- [ ] Cracking/chipping/corrosion
- [ ] Downstream scour hole
- [ ] Sediment deposition
- [ ] Failing embankment
- [ ] Other (describe):

**Culvert Slope:**
- [ ] Flat
- [ ] Slight (2°—5°)
- [ ] Obvious (>5°)

**For Road/Railroad Crossings Only**

**Dimensions:** (if variable, sketch)
- Barrel diameter: 7 ft (ft)
- Height: 4 ft (ft)

**Culvert length:** 75–100 ft

**Width:** 7 (ft)

**Roadway elevation:** 14 (ft)

**Potential Restoration Candidate**
- [ ] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit
- [ ] No
- [x] Local stream repair
- [ ] Other: [Blank]

**Is SC acting as grade control**
- [ ] No
- [x] Yes
- [ ] Unknown

**Extent of Physical Blockage:**
- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**
- [ ] Drop too high
- [ ] Water Drop: ___ in
- [x] Flow too shallow
- [ ] Water Depth: L5 in
- [ ] Other:

**Blockage Severity:** (circle #)

- 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.

**Notes/Sketch:**

[Sketch of stream crossing conditions]

**Reported to authorities**
- [ ] Yes
- [ ] No
**Reach Level Assessment**

<table>
<thead>
<tr>
<th>SURVEY REACH ID: 65-058</th>
<th>WTRSHD/SUBSHD:</th>
<th>DATE: 6/3/08</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>START TIME: 3:13 PM LMK:</td>
<td>END TIME: 6:06 PM LMK:</td>
<td>GPS ID:</td>
<td></td>
</tr>
<tr>
<td>LAT 41° 51' 33.7&quot; LONG 22° 25' 09.9&quot;</td>
<td>LAT 41° 51' 37.5&quot; LONG 22° 25' 14.5&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION: SC-01 (GR-03A)</td>
<td>DESCRIPTION: SC-01 (GR-3B)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RAIN IN LAST 24 HOURS**
- □ Heavy rain
- □ Steady rain
- □ None

**PRESENT CONDITIONS**
- □ Heavy rain
- □ Steady rain
- □ Intermittent rain
- □ Clear
- □ Trace
- □ Overcast
- □ Partly cloudy

**SURROUNDING LAND USE**
- □ Industrial
- □ Commercial
- © Golf course
- © Park
- □ Urban/Residential
- □ Suburban/Residential
- □ Forested
- □ Institutional
- □ Pasture
- □ Other

**AVERAGE CONDITIONS (check applicable)**

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>0-25%</th>
<th>□ 25-50%</th>
<th>□ 50%-75%</th>
<th>□ 75-100%</th>
</tr>
</thead>
</table>

**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 IN STREAM**
- □ Attached: □ none □ some □ lots
- □ Floating: □ none □ some □ lots

**WILDLIFE IN OR AROUND STREAM**
- □ Fish
- □ Beaver
- □ Deer
- □ Snails
- □ Other

**STREAM SHADING (water surface)**
- □ Mostly shaded (≥75% coverage)
- □ Halfway (≥50%)
- □ Partially shaded (≥25%)
- □ Unshaded (< 25%)

**CHANNEL DYNAMICS**
- □ Downcutting
- □ Widening
- □ Headcutting
- □ Aggrading
- □ Sed. deposition
- □ Bed scour
- □ Bank failure
- □ Bank scour
- □ Slope failure
- □ Channelized
- □ Unknown

**CHANNEL HEIGHT**
- □ LT bank: 2.5 (ft)
- □ RT bank: 1.5 (ft)

**CHANNEL WIDTH**
- □ Bottom: 4.0 (ft)
- □ Top: 12.0 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**REPORTED TO AUTHORITIES**
- □ Yes □ No

**NOTES:** (biggest problem you see in survey reach)

Channelization, impacted buffer + trash.
### Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetative Protection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(score each bank, determine sides by facing downstream)</td>
<td>More than 90% of the streambank surfaces and immediate riparian zone 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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion (facing downstream)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing a significant amount of sediment to stream; obvious threat to property or infrastructure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 4 3</td>
<td>2 1 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

Sub Total In-stream: 80 Buffer/Floodplain: 80 = Total Survey Reach 160
Storm Water Outfalls

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>DATE: 6/3/108</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>TIME: 3:40 AM/PM</td>
<td>PHOTO ID: (Camera-Pic #)</td>
</tr>
<tr>
<td>SITE ID (Condition-#): OT-0Z</td>
<td>LAT: 41° 51' 58.4&quot; N LONG: 76° 24' 19.1&quot;</td>
<td>LMK</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK:</th>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SHAPE:</th>
<th>DIMENSIONS:</th>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Alt</td>
<td>□ Closed pipe</td>
<td>□ Concrete □ Metal □ PVC/Plastic □ Brick □ Other:</td>
<td>□ Single □ Circular □ Double □ Elliptical □ Triple □ Other:</td>
<td>□ No □ Partially □ Fully</td>
<td>□ Not Applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOW:</th>
<th>CONDITION:</th>
<th>ODOR:</th>
<th>DEPOSITS/STAINS:</th>
<th>VEGGIE DENSITY:</th>
<th>PIPE BENTHIC GROWTH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None □ Trickle □ Moderate □ Substantial □ Other:</td>
<td>□ None □ Chip/Cracked □ Peeling Paint □ Corrosion □ Other:</td>
<td>□ No □ Gas □ Sewage □ Rancid/Sour □ Sulfide □ Other:</td>
<td>□ None □ Oily □ Flow Line □ Paint □ Other:</td>
<td>□ None □ Normal □ Inhibited □ Excessive □ Other:</td>
<td>□ None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOR FLOWING ONLY</th>
<th>COLOR:</th>
<th>TURBIDITY:</th>
<th>FLOATABLES:</th>
<th>OTHER CONCERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Clear □ Brown □ Grey □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ None □ Slight Cloudiness □ Cloudy □ Opaque</td>
<td>□ None □ Sewage (toilet paper, etc.) □ Petroleum (oil sheen) □ Other:</td>
<td>□ Excess Trash (paper/plastic bags) □ Dumping (bulk) □ Excessive Sedimentation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>DISCHARGE INVESTIGATION</th>
<th>STREAM DAYLIGHTING</th>
<th>LOCAL STREAM REPAIR/OUTFALL STABILIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ no □ Discharge investigation □ Stream daylighting □ Local stream repair/outfall stabilization</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 investigated
Land Use description: ____________
Area available: ____________________

<table>
<thead>
<tr>
<th>OUTFALL SEVERITY:</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(circle #)</td>
<td>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.</td>
</tr>
</tbody>
</table>

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

<table>
<thead>
<tr>
<th>Sketch/Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported to authorities: □ Yes □ No</td>
</tr>
</tbody>
</table>

---

Report to Authorities: Yes No
Storm Water Outfalls

OT

WATERSHED/SUBSHED: Grapes

SURVEY REACH ID: G5-035

SITE ID (Condition #): OT-01

BANK:
- LT [ ] RT [ ] Head
- None [ ] Moderate [ ] Substantial [ ] Other: Wet
- Open channel [ ] Concrete [ ] Earthen [ ] Other:

TYPE:
- Closed pipe [X] None [ ] Gas [ ] Sewage [ ] Rancid/Sour [ ] Sulphide [ ] Other:

MATERIAL:
- Concrete [X] Metal [ ] PVC/Plastic [ ] Brick [ ] Other:

SHAPE:
- Single [ ] Circular [ ] Double [ ] Elliptical [ ] Triple [ ] Other:

DIMENSIONS:
- Diameter: 12 (in)
- Depth: ___ (in)
- Width (Top): ___ (in)
- (Bottom): ___ (in)

SUBMERGED:
- No [X] Partially [ ] Fully [ ] Not Applicable

FLOW:
- None [X] Trickle [ ] Moderate [ ] Substantial [ ] Other: Wet
- Open channel [ ] Concrete [ ] Earthen [ ] Other:

CONDITION:
- None [X] Chip/Cracked [ ] Peeling Paint [ ] Corrosion [ ] Other:
- Gas [ ] Sewage [ ] Oily [ ] Flow Line [ ] Paint [ ] Other:

VEGETATION:
- None [X] Normal [ ] Inhibited [ ] Excessive [ ] Other:

COLOR:
- Clear [ ] Brown [ ] Grey [ ] Yellow [ ] Green [ ] Orange [ ] Red [ ] Other:

TURBIDITY:
- None [X] Slight Cloudiness [ ] Cloudy [ ] Opaque [ ] Other:

FLOATABLES:
- None [X] Sewage (toilet paper, etc.) [ ] Petroleum (oil sheen) [ ] Other:

OTHER CONCERNS:
- Excess Trash (paper/plastic bags) [ ] Dumping (bulk) [ ] Excessive Sedimentation [ ] Needs Regular Maintenance [ ] Bank Erosion [ ] Other:

PIECE BENTHIC GROWTH:
- None [X] Brown [ ] Orange [ ] Green [ ] Other: Moss

POOL QUALITY:
- None [X] Good [ ] Odors [ ] Colors [ ] Oils [ ] Suds [ ] Algae [ ] Floatables [ ] Other:

PIPE BENTHIC GROWTH:
- None [X] Brown [ ] Orange [ ] Green [ ] Other:

COLOR:
- Clear [ ] Brown [ ] Grey [ ] Yellow [ ] Green [ ] Orange [ ] Red [ ] Other:

TURBIDITY:
- None [X] Slight Cloudiness [ ] Cloudy [ ] Opaque [ ] Other:

FLOATABLES:
- None [X] Sewage (toilet paper, etc.) [ ] Petroleum (oil sheen) [ ] Other:

OTHER CONCERNS:
- Excess Trash (paper/plastic bags) [ ] Dumping (bulk) [ ] Excessive Sedimentation [ ] Needs Regular Maintenance [ ] Bank Erosion [ ] Other:

POTENTIAL RESTORATION CANDIDATE
- Discharge investigation [ ] Stream daylighting [ ] Local stream repair/outfall stabilization [ ]
- Storm water retrofit [ ] 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?
- Yes [ ] No [X] Not investigated

Land Use Description: Industrial parking lot

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 stream; discharge appears to be having a significant impact downstream.
- 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

COLLAPSED PIPE:

5 4 3 2 1

REPORTED TO AUTHORITIES: [ ] YES [X] NO

Sketch/Notes:
**Storm Water Outfalls**

**Watershed/Subshed:**

**Survey Reach ID:** 2B - 3b  
**Time:** 3:40 AM/PM  
**Photo ID:** (Camera-Pic #) 1725 #

**Site ID (Condition-#): OT-3**  
**Lat:** 41° 51' 35.2"  
**Long:** 72° 25' 16.3"  
**LMK:**  
**GPS:** (Unit ID)

**Bank:**
- [ ] LT  
- [x] RT  
- [ ] Head

**Flow:**
- [x] None  
- [ ] Trickle  
- [ ] Moderate  
- [ ] Substantial  
- [ ] Other:

**Type:**
- [ ] Closed pipe  
- [ ] Open channel

**Material:**
- [x] Concrete  
- [ ] Metal  
- [ ] PVC/Plastic  
- [ ] Brick  
- [ ] Other:

**Shape:**
- [ ] Single  
- [ ] Circular  
- [ ] Elliptical  
- [ ] Double  
- [ ] Triple  
- [ ] Other:

**Dimensions:**
- **Depth:** (in)  
- **Width (Top):** (in)
- **(Bottom):** (in)

**Submerged:**
- [ ] No  
- [ ] Partially  
- [ ] Fully  
- [ ] NOT APPLICABLE

**Condition:**
- [x] None  
- [ ] Chip/Cracked  
- [ ] Peeling Paint  
- [ ] Corrosion  
- [ ] Other:

**Type:**
- [ ] Concrete  
- [ ] Earthen  
- [ ] Other:

**Deposits/Stains:**
- [x] None  
- [ ] Gas  
- [ ] Sewage  
- [ ] Rancid/Sour  
- [ ] Sulfide  
- [ ] Other:

**Vegetation Density:**
- [x] None  
- [x] Oily  
- [ ] Flow Line  
- [ ] Paint  
- [ ] Other:

**Odor:**
- [x] None  
- [ ] Gas  
- [ ] Sewage  
- [ ] Rancid/Sour  
- [ ] Sulfide  
- [ ] Other:

**Pipe Benthic Growth:**
- [x] None  
- [ ] Brown  
- [ ] Orange  
- [ ] Green  
- [ ] Other:

**Pool Quality:**
- [x] No pool  
- [ ] Good  
- [ ] Odors  
- [ ] Colors  
- [ ] Oils  
- [ ] Suds  
- [ ] Algae  
- [ ] Floatables  
- [ ] Other:

**For Flowing Only**
- [ ] Color:
  - [x] Clear  
  - [ ] Brown  
  - [ ] Grey  
  - [ ] Yellow  
  - [x] Green  
  - [ ] Orange  
  - [ ] Red  
  - [ ] Other:

- [ ] Turbidity:
  - [x] None  
  - [ ] Slight Cloudiness  
  - [x] Cloudy  
  - [ ] Opaque  
- [ ] Floatables:
  - [ ] None  
  - [ ] Sewage (toilet paper, etc.)  
  - [ ] Petroleum (oil sheen)  
  - [ ] Other:

**Other Concerns:**
- [ ] Excess Trash (paper/plastic bags)  
- [ ] Dumping (bulk)  
- [x] Excessive Sedimentation  
- [ ] Needs Regular Maintenance  
- [ ] Bank Erosion  
- [ ] Other:

**Potential Restoration Candidate**
- [x] Discharge investigation  
- [ ] Stream daylighting  
- [ ] Local stream repair/outfall stabilization  
- [ ] Storm water retrofit  
- [ ] 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?  
  - [ ] Yes  
  - [ ] No  
  - [ ] Not investigated  
  - Land Use description:  
  - 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 stream; discharge appears to be having a significant impact downstream.  
  - 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 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.

- [ ] Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

---

**Reported to Authorities:**
- [ ] Yes  
- [ ] No
<table>
<thead>
<tr>
<th>Site ID:</th>
<th>IB-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed/Subshed:</td>
<td>Gaggs Brook</td>
</tr>
<tr>
<td>Survey Reach:</td>
<td>03B-03B</td>
</tr>
<tr>
<td>Date:</td>
<td>6/8/108</td>
</tr>
<tr>
<td>Assessed By:</td>
<td>DB</td>
</tr>
</tbody>
</table>

### Impacted Bank
- **LT Bank**
- **RT Bank**
- **Both**

### Reason Inadequate:
- Lack of vegetation
- Too narrow
- Widespread invasive plants
- Recently planted
- Other: Retaining wall not from RT Bank

### Land Use:
- Private
- Institutional
- Golf Course
- Park
- Other: Industrial

### Dominant Land Cover:
- LT Bank
- RT Bank

### Invasive Plants:
- None
- Rare
- Partial coverage
- Extensive coverage
- Unknown

### Stream Shade Provided?
- No
- Partial
- Full

### Wetlands Present?
- No
- Yes
- Unknown

### Potential Restoration Candidate
- Low Quality Candidate
- Active reforestation
- Greenway design
- Natural regeneration
- Invasives removal
- Other: Fish

### Restorable Area
- LT Bank
- RT Bank

### Reforestation Potential:
- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

### Potential Conflicts with Reforestation
- Widespread invasive plants
- Potential contamination
- Lack of sun
- Poor/unsafe access to site
- Existing impervious cover
- Severe animal impacts (deer, beaver)
- Other:

### Notes:
- Typical section
- Existing wall
- Facing up (facing U/S)
### Stream Crossing

**Watershed/Subshed:**

**Survey Reach ID:** C-B-3

**Site ID:** SC-1

**Date:** 6/13/2023

**Assessed By:** [Name]

**Site ID:** (Condition #)

**Lat:** 41° 57' 37.8"

**Long:** 72° 25' 14.5"

**LMK:***

**GPS (Unit ID):***

---

**Type:**

- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other

**Shape:**

- [x] Arch
- [ ] Box
- [ ] Elliptical
- [ ] Circular
- [ ] Other:

**# Barrels:**

- [ ] Single
- [ ] Double
- [x] Triple
- [ ] Other:

**Material:**

- [x] Concrete
- [ ] Metal
- [ ] Not flow-aligned
- [ ] Flow-aligned
- [ ] Other:

**Alignment:**

- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:**

- [ ] Barrel diameter: [__] (ft)
- [ ] Height: [__] (ft)
- [ ] Culvert length: [__] (ft)
- [ ] Width: [__] (ft)
- [ ] Roadway elevation: [__] (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
- [ ] Unknown

---

**Extent of Physical Blockage:**

- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**

- [ ] Drop too high
- [ ] Water Drop: [__] (in)
- [ ] Flow too shallow
- [ ] Water Depth: [__] (in)
- [ ] Other:

**Blockage Severity:** (circle #)

- [ ] 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.

---

**Notes/Sketch:**

[Sketch of fish barrier and related elements]
### Reach Level Assessment

**Survey Reach ID:** GB 4  
**Wtrshed/Subshd:** Gages Brook  
**Date:** 6/14/10  
**Assessed By:**  
**START**  
**Time:** 7:10 AM  
**LMK:**  
**LAT:** 41° 55' 58.0"  
**LONG:** 72° 20' 48.0"  
**DESCRIPTION:**  

**END**  
**Time:** 7:45 AM  
**LMK:**  
**LAT:** 41° 51' 43.5"  
**LONG:** 72° 25' 11.1"  
**DESCRIPTION:**  

<table>
<thead>
<tr>
<th>Rain in Last 24 Hours</th>
<th>Base Flow as %</th>
<th>Present Conditions</th>
<th>Channel Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ None</td>
<td>□ 0-25%</td>
<td>□ Heavy rain</td>
<td>□ 25-50%</td>
</tr>
<tr>
<td>□ Intermittent</td>
<td>□ 50-75%</td>
<td>□ Steady rain</td>
<td>□ 75-100%</td>
</tr>
<tr>
<td>□ Trace</td>
<td>□ 75-100%</td>
<td>□ Intermittent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dominant Substrate</th>
<th>Channel Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Silt/clay (fine or slick)</td>
<td>□ 25-50%</td>
</tr>
<tr>
<td>□ Sand (gritty)</td>
<td>□ 75-100%</td>
</tr>
<tr>
<td>□ Gravel (0.1-2.5&quot;)</td>
<td>\untick</td>
</tr>
<tr>
<td>□ Bed rock</td>
<td>\untick</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water Clarity</th>
<th>Aquatic Plants in Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Clear</td>
<td>Attached: (\checkmark) none □ some □ lots</td>
</tr>
<tr>
<td>□ Turbid</td>
<td>Floating: (\checkmark) none □ some □ lots</td>
</tr>
<tr>
<td>□ Stained</td>
<td>(clear, naturally colored)</td>
</tr>
<tr>
<td>□ Opaque</td>
<td>(milky)</td>
</tr>
<tr>
<td>□ Other</td>
<td>(chemicals, dyes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aerial Plant</th>
<th>Attached: (\checkmark) none □ some □ lots</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ none</td>
<td>□ some □ lots</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wildlife in or Around Stream</th>
<th>Aerial Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Fish</td>
<td>Attached: (\checkmark) none □ some □ lots</td>
</tr>
<tr>
<td>□ Beaver</td>
<td>Floating: (\checkmark) none □ some □ lots</td>
</tr>
<tr>
<td>□ Deer</td>
<td>□ none □ some □ lots</td>
</tr>
<tr>
<td>□ Snails</td>
<td>□ none □ some □ lots</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stream Shading (water surface)</th>
<th>Channel Dynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Mostly shaded (≥75% coverage)</td>
<td>□ Downcutting</td>
</tr>
<tr>
<td>□ Halfway (≥50%)</td>
<td>□ Widening</td>
</tr>
<tr>
<td>□ Partially shaded (≥25%)</td>
<td>□ Headcutting</td>
</tr>
<tr>
<td>□ Unshaded (&lt; 25%)</td>
<td>□ Aggrading</td>
</tr>
<tr>
<td>□ Evidence of</td>
<td>□ Sed. deposition</td>
</tr>
<tr>
<td>□ Other:</td>
<td>□ Channelized</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Channel Dymamics</th>
<th>Channel Dimensions (Facing Downstream)</th>
</tr>
</thead>
</table>
| □ Downcutting | Height: LT bank ⬇️ 2 (ft)  
| □ Widening | RT bank 3 (ft)  
| □ Headcutting | Width: Bottom 10 (ft)  
| □ Aggrading | Top 18 (ft)  
| □ Sed. deposition |  |
| □ Channelized |  |

<table>
<thead>
<tr>
<th>REACH ACCESSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
</tr>
<tr>
<td>Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES: (biggest problem you see in survey reach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 4 3 2 1</td>
</tr>
</tbody>
</table>

**REACH AND SITE IMPACT TRACKING**  
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.
# Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for optimal 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

| Vegetative Protection | 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. | 70-80% 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. |
| | | | | |
| | | 20 19 18 17 16 | 15 14 13 12 11 | 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. | 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; tail 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. |
| | | | | |
| | | | | |
| | | | | |

| 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. |
| | | | | |
| | | | | |

<table>
<thead>
<tr>
<th>Overall Buffer and Floodplain Condition</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetated Buffer Width</td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
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</tbody>
</table>

| 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 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| 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 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Floodplain Encroachment | 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 |
| | | | | |
| | | | | |
| | | | | |

Sub Total In-stream: 80 + Buffer/Floodplain: 80 = Total Survey Reach /160
Storm Water Outfalls

OTT

WATERSHED/SUBSHED: GB-04 GASSYS BK

SURVEY REACH ID: GB-04 TIME: 7:10 AM/PM

SITE ID (Condition-#): OT-01

PHOTO ID: (Camera-Pic #) 1728 1720

LAT 41° 50' 54.5" LONG 172° 54' 5.6"

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.

OUTFALL SEVERITY: (circle #) 5

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.

OUTFALL does not have dry weather discharge; staining or appearance of causing any erosion problems.

REPORTED TO AUTHORITIES: YES NO

Land Use Description: ENDERS RD/ROADWAY

Area available: ON EMERGMENT OR WASHOUT RETURN

Reported to authorities: YES NO

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 investigated

Land Use Description: ENDERS RD/ROADWAY

Area available: ON EMERGMENT OR WASHOUT RETURN

Reported to authorities: YES NO

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 investigated

Land Use Description: ENDERS RD/ROADWAY

Area available: ON EMERGMENT OR WASHOUT RETURN

Reported to authorities: YES NO
### Storm Water Outfalls

**WATERSHED/SUBSHED:**

**SURVEY REACH ID:** 2B 4
**DATE:** 6/1/08
**ASSESSED BY:**

**SITE ID (Condition-#): OT-2**
**LAT:** 41° 57' 39.2"
**LONG:** 76° 25' '10.2"
**LMK:**
**GPS: (Unit ID)**

**BANK:**
- LT
- RT
- Head

**FLOW:**
- None
- Trickle
- Moderate
- Substantial
- Other:

**TYPE:**
- Closed pipe
- Open channel

**MATERIAL:**
- Concrete
- Metal
- PVC/Plastic
- Brick
- Other:

**SHAPE:**
- Single
- Circular
- Double
- Elliptical
- Triple
- Other:

**DIMENSIONS:**
- Diameter: ___ (in)
- Depth: ___ (in)
- Width (Top): ___ (in)
- "(Bottom): ___ (in)

**SUBMERGED:**
- No
- Partially
- Fully

**CONDITION:**
- None
- Chip/Cracked
- Peeling Paint
- Corrosion
- Other:

**FLOW:**
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

**DEPOSITS/STAINS:**
- None
- Oily
- Flow Line
- Paint
- Other:

**VEGGIE DENSITY:**
- None
- Normal
- Inhibited
- Excessive
- Other:

**PIPE BENTHIC GROWTH:**
- None
- Brown
- Orange
- Green
- Other:

**POOL QUALITY:**
- No pool
- Good
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

**FOR FLOWING ONLY**
- Color:
  - Clear
  - Brown
  - Grey
  - Yellow
  - Green
  - Orange
  - Red
  - Other:

- Turbidity:
  - None
  - Slight Cloudiness
  - Cloudy
  - Opaque

- Floatables:
  - None
  - Sewage (toilet paper, etc.)
  - Petroleum (oils sheen)
  - Other:

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

**POTENTIAL RESTORATION CANDIDATE**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Yes
- No
- Not investigated

**OUTFALL SEVERITY:**
- 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.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**REPORTED TO AUTHORITIES:**
- Yes
- No

---

**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 investigated

- Land Use description: ___
- Area available: ___

---

**OUTFALL SEVERITY:**
- 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 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.**

**Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.**

---

**REPORTED TO AUTHORITIES:**
- Yes
- No
### Storm Water Outfalls

**OT**

**Watershed/Subshed:** OT-23  
**Date:** 6/1/08  
**Assessed By:** TEP

**Survey Reach ID:** GTS 04  
**Time:** 7:30 AM/PM  
**Photo ID:** (Camera-Pic #)  
**Site ID (Condition-#:)**: OT-23  
**LAT:** 41° 10.6'  
**LONG:** 71° 23.1'  
**LMK:**  
**GPS:** (Unit ID)

### Site Information

- **Bank:**  
  - Left:
  - Right:
  - Head:

- **Flow:**  
  - None
  - Trickle
  - Moderate
  - Substantial
  - Other:

- **Condition:**  
  - None
  - Chip/Cracked
  - Peeling Paint
  - Corrosion
  - Other:

- **Odor:**  
  - No
  - Gas
  - Sewage
  - Rancid/Sour
  - Sulfide
  - Other:

- **Deposits/Stains:**  
  - None
  - Oil
  - Flow Line
  - Paint
  - Other:

- **Veggie Density:**  
  - None
  - Normal
  - Inhibited
  - Excessive
  - Other:

- **Pipe Benthic Growth:**  
  - None
  - Brown
  - Orange
  - Green
  - Other:

- **Pool Quality:**  
  - No pool
  - Good
  - Odors
  - Colors
  - Oils
  - Suds
  - Algae
  - Floatables
  - Other:

### Potential Restoration Candidate

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization

**Other Concerns:**  
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Other:

**Sketch/Notes:**

- Dry weather discharge
- Other:

### Potential Restoration Candidate Details

- **Severities:**  
  - 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 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.
  - Outfall does not have dry weather discharge; staining, or appearance of causing any erosion problems.

- **Flow:**  
  - For flowing only
  - Color:
    - Clear
    - Brown
    - Grey
    - Yellow
    - Green
    - Orange
    - Red
    - Other:
  - 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
  - Needs Regular Maintenance
  - Other:

- **Slope:**

- **Land Use Description:** Industrial/Road

- **Reported to Authorities:**
  - Yes
  - No
Storm Water Outfalls

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 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.

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

Potential Restoration Candidate

Discharge investigation  Stream daylighting  Local stream repair/outfall stabilization

No  Storm water retrofit  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?

Yes  No  Not investigated

Land Use description: Industrial

Area available:

Reported to authorities: Yes  No
**Storm Water Outfalls**

**WATERSHED/SUBSHED:** CB

**DATE:** 6/4/10

**ASSESSED BY:**

**SURVEY REACH ID:** CB-04

**TIME:** 7:45 AM

**PHOTO ID:** (Camera Pic #) 1751-1759

**SITE ID (Condition #):** OT-1

**LAT:** 41° 51' 43.7"N **LONG:** 77° 25' 11.1"W  **LMK**

**GPS:** (Unit ID)  

---

**BANK:**
- LT ✓ RT ◯ Head

**FLOW:**
- None ◯ Moderate ◯ Substantial ◯ Other:

**TYPE:**
- Closed pipe

**MATERIAL:**
- Concrete ◯ Metal ◯ PVC/Plastic ◯ Brick ◯ Other:

**SHAPE:**
- Single ◯ Circular ◯ Double ◯ Elliptical ◯ Triple ◯ Other:

**DIMENSIONS:**
- Diameter: 42 (in)

**DEPOT/STAINS:**
- None ◯ Gas ◯ Sewage ◯ Rancid/Sour ◯ Sulphide ◯ Other:

**VEGIE DENSITY:**
- None ◯ Normal ◯ Inhibited ◯ Excessive ◯ Other:

**PIPE BENTHIC GROWTH:**
- None ◯ Brown ◯ Orange ◯ Green ◯ Other:

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**POTENTIAL RESTORATION CANDIDATE**
- Discharge investigation ◯ Stream daylighting ◯ Local stream repair/outfall stabilization

- Storm water retrofit ◯ 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? Yes ◯ No ◯ Not investigated  
  Land Use description: __________________________  
  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 stream; discharge appears to be having a significant impact downstream.
  - 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.
  - Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**CONDITION:**
- None ◯ Chip/CRacked ◯ Peeling Paint ◯ Corrosion ◯ Other:

**ODOR:**
- None ◯ Gas ◯ Sewage ◯ Rancid/Sour ◯ Sulphide ◯ Other:

**VEGETATION DENSITY:**
- None ◯ Normal ◯ Inhibited ◯ Excessive ◯ Other:

**PILOT QUALITY:**
- No pool ◯ Good ◯ Odors ◯ Colors ◯ Oils ◯ Suds ◯ Algae ◯ Floatables ◯ Other:

---

**REPORTED TO AUTHORITIES:** Yes ◯ No

---

**FOR FLOWING ONLY:**
- Color:
  - Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

---

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

---

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

---

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

---

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:

---

**FLOW:**
- Closed ◯ Partially ◯ Fully

---

**COLOR:**
- Clear ◯ Brown ◯ Grey ◯ Yellow ◯ Green ◯ Orange ◯ Red ◯ Other:

**TURBIDITY:**
- None ◯ Slight Cloudiness ◯ Cloudy ◯ Opaque

**FLOATABLES:**
- None ◯ Sewage (toilet paper, etc.) ◯ Petroleum (oil sheen) ◯ Other:

---

**OTHER CONCERNS:**
- Excess Trash (paper/plastic bags) ◯ Dumping (bulk) ◯ Excessive Sedimentation ◯ Needs Regular Maintenance ◯ Bank Erosion ◯ Other:
WATERSHED/SUBSHED: OT-4

BANK: LT RT Head

FLOW: None Trickle Substantial Other:

CONDITION: None Chip/Cracked Peeling Paint Corrosion Other:

ODOR: No Gas Sewage Rancid/Sour Sulfide Other:

DEPOSITS/STAINS: None Oily Flow Line Paint Other:

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 CONCERNS: Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation Needs Regular Maintenance Bank Erosion Other:

POTENTIAL RESTORATION CANDIDATE

Discharge investigation Stream daylighting Local stream repair/outfall stabilization

Storm water retrofit 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?

Yes No Not investigated

Land Use description:

Area available:

OUTFALL SEVERITY:

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 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.

Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

EXCESS TRASH: Yes No

REPORTED TO AUTHORITIES: Yes No

Sketch/Notes:
### Stream Crossing

**WATERSHED/SUBSHED:** CR

**SURVEY REACH ID:** GB-04

**TIME:** 7:45 AM/PM

**PHOTO ID:** (Camera Pic #) DR # 1738

**SITE ID:** (Condition #) SC-01

**LATT 41° 5' 43.8" LONG 72° 25' 11.1"

**DATE:** 6/4/10

**ASSESSED BY:**

**REPORTED TO AUTHORITIES:**

---

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
<td>Arch</td>
<td>Box</td>
<td>Circular</td>
<td>Elliptical</td>
<td>Single</td>
<td>Double</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>Flow-aligned</td>
<td>Not flow-aligned</td>
<td>Do not know</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOR ROAD/RAILROAD CROSSINGS ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td># BARRELS</td>
</tr>
<tr>
<td>MATERIAL</td>
</tr>
<tr>
<td>ALIGNMENT</td>
</tr>
</tbody>
</table>

| CONDITION | Crack/chipping/corrosion | Sediment deposition | Downstream scour hole | Failing embankment |

<table>
<thead>
<tr>
<th>CULVERT SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>Barrel diameter: 70 in (ft)</th>
<th>Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culvert length: 50 ft (ft)</td>
<td>Width:</td>
<td></td>
</tr>
<tr>
<td>Roadway elevation: 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**POTENTIAL RESTORATION CANDIDATE**

- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit

**IS SC ACTING AS GRADE CONTROL**

- No
- Yes
- Unknown

**EXTENT OF PHYSICAL BLOCKAGE**

- Total
- Partial
- Unknown

**CAUSE**

- Drop too high
- Water Drop: 

- Flow too shallow
- Water Depth: 6-12 in

**BLOCKAGE SEVERITY**

- 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.

**NOTES/SKETCH:**

- Water weatherted 
- Flow shallow, stream deeper

---

**REPORTED TO AUTHORITIES**

- Yes
- No
**Reach Level Assessment**

<table>
<thead>
<tr>
<th>Survey Reach ID: GB-06A</th>
<th>WTRSHD/Subshd:</th>
<th>Date: 1/14/23</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
</table>

**Start**
- **Time:** 9:00 AM/PM
- **LMK:**
- **Lat:** 41° 51' 43.8"
- **Long:** 72° 25' 11.2"
- **Description:**

**End**
- **Time:** 9:30 AM/PM
- **LMK:**
- **Lat:** 41° 51' 49.4"
- **Long:** 72° 25' 07.2"
- **Description:**

**Rain in Last 24 Hours**
- ☐ Heavy rain
- ☐ Steady rain
- ☐ None
- ☐ Trace

**Present Conditions**
- ☐ Heavy rain
- ☐ Steady rain
- ☐ Intermittent
- ☐ Trace

**Surrounding Land Use**
- ☐ Industrial
- ☐ Commercial
- ☐ Golf course
- ☐ Park
- ☐ Urban/Residential
- ☐ Suburban/Res
- ☐ Forested
- ☐ Institutional
- ☐ Crop
- ☐ Pasture
- ☐ Other:

**Average Conditions (Check applicable)**

<table>
<thead>
<tr>
<th>Base Flow as %</th>
<th>0-25%</th>
<th>25-50%</th>
<th>50%-75%</th>
<th>&gt;75%</th>
</tr>
</thead>
</table>

**Channel Width**
- ☐ 25-50%
- ☐ 75-100%

**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)

**Aquatice Plants in Stream**
- Attached: ☐ none
- ☐ some
- ☐ lots
- Floating: ☐ none
- ☐ some
- ☐ lots

**Wildlife In or Around Stream**
- ☐ Fish
- ☐ Beaver
- ☐ Deer
- ☐ Snails
- ☐ Other:

**Stream Shading**
- Mostly shaded (>75% coverage)
- Halfway (50%)
- Partially shaded (>25%)
- Unshaded (<25%)

**Channel Dynamics**
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- ☐ Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**Channel Dimensions (Facing downstream)**
- **Height:**
  - LT bank: 3.5 (ft)
  - RT bank: 3.5 (ft)
- **Width:**
  - Bottom: 7 (ft)
  - Top: 15 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:** (biggest problem you see in survey reach)

**Reported to authorities:** ☐ Yes ☐ No
# Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epiphytial colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and all stage to allow full colonization potential (i.e., logs/snags that are not now flot and not transient).</td>
<td>40-70% mix of stable habitat; well-suit for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fail, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetation Protection</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(score each bank, determine sides by facing downstream)</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Left Bank</th>
<th>Right Bank</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(facing downstream)</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Buffer and Floodplain Condition</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Buffer Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td></td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td></td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 80 + Buffer/Floodplain: 80 = Total Survey Reach: 160
**Storm Water Outfalls**

**WATERSHED/SUBSHED:** GASTS BK

**SURVEY REACH ID:** 66-CDON

**TIME:** 15 AM/PM

**PHOTO ID:** Camera-Pic #1

**SITE ID (Condition):** OT-

**LAT** ° ' " **LONG** ° ' " **LMK**

**DATE:** 6/14/107

**ASSESSED BY:**

**PHOTO ID:** Camera-Pic #1

**SITE ID (Condition):** OT-

<table>
<thead>
<tr>
<th>BANK</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed pipe</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHAPE</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>Diameter: 12 (in)</td>
</tr>
</tbody>
</table>

**FLOW:**

- None
- Trickle
- Moderate
- Substantial
- Other:

<table>
<thead>
<tr>
<th>DEPOSITS/STAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

**CONDITION:**

- None
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

<table>
<thead>
<tr>
<th>ODOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPOSITS/STAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPOSITS/STAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

**PIPE BENTHIC GROWTH:**

- None

**COLOR:**

- Clear
- Brown
- Grey
- Yellow
- Green
- Orange
- Red
- Other:

**TURBIDITY:**

- None
- Slight Cloudiness
- Cloudy
- Opaque

**FLOATABLES:**

- None
- Sewage (toilet paper, etc.)
- Petroleum (oil sheen)
- Other:

**COLOR:**

- Clear
- Brown
- Grey
- Yellow
- Orange
- Red
- Other:

<table>
<thead>
<tr>
<th>OTHER CONCERNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess Trash (paper/plastic bags)</td>
</tr>
</tbody>
</table>

**POOL QUALITY:**

- No pool
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

**PIECE:**

- None

<table>
<thead>
<tr>
<th>OTHER CONCERNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs Regular Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER CONCERNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Erosion</td>
</tr>
</tbody>
</table>

**OUTFALL SEVERITY:**

- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**REPORTED TO AUTHORITIES:**

- Yes
- No
### Reach Level Assessment

**Survey Reach ID:** [Redacted]

**Wtrshd/Subshd:** [Redacted]

**Date:** 6/14/06

**Assessed By:**

<table>
<thead>
<tr>
<th>Start Time</th>
<th>LMK:</th>
<th>Lat</th>
<th>Long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:12 AM/PM</td>
<td>[Redacted]</td>
<td>[Redacted]</td>
<td>[Redacted]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End Time</th>
<th>LMK:</th>
<th>Lat</th>
<th>Long</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:45 AM/PM</td>
<td>[Redacted]</td>
<td>[Redacted]</td>
<td>[Redacted]</td>
</tr>
</tbody>
</table>

**Description:** [Redacted]

**Rain in Last 24 Hours:**
- [ ] Heavy rain
- [ ] Steady rain
- [ ] Intermittent
- [ ] Trace
- [ ] None

**Present Conditions:**
- [ ] Heavy rain
- [ ] Steady rain
- [ ] Intermittent
- [ ] 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):**

<table>
<thead>
<tr>
<th>Base Flow As %</th>
<th>Channel Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] 0-25%</td>
<td>[ ] 25-50 %</td>
</tr>
<tr>
<td>[ ] 50% - 75%</td>
<td>[ ] 75-100%</td>
</tr>
</tbody>
</table>

**Dominant Substrate:**
- [ ] Silt/clay (fine or stick)
- [ ] Sand (gritty)
- [ ] Gravel (0.1-2.5")
- [ ] Cobble (2.5 -10")
- [ ] Boulder (>10")
- [ ] Bed rock

**Water Clarity:**
- [ ] Clear
- [ ] Turbid (suspended matter)
- [ ] Stained (clear, naturally colored)
- [ ] Opaque (milky)
- [ ] Other (chemicals, dyes)

**Aquatic Plants in Stream:**
- [ ] Attached: none
- [ ] Attached: some
- [ ] Attached: lots
- [ ] Floating: none
- [ ] Floating: some
- [ ] Floating: lots

**Wildlife in or Around Stream:**
- [ ] Fish
- [ ] Beaver
- [ ] Deer
- [ ] Snails
- [ ] Other:

**Stream Shading (water surface):**
- [ ] Mostly shaded (≥75% coverage)
- [ ] Halfway (50%)
- [ ] Partially shaded (≥25%)
- [ ] Unshaded (<25%)

**Channel Dynamics:**
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition
- [ ] Bed scour
- [ ] Bank failure
- [ ] Bank scour
- [ ] Slope failure
- [ ] Channelized
- [ ] Unknown

**Channel Dimensions (Facing Downstream):**
- Height: LT bank 2.5 (ft)
- RT bank 2.5 (ft)
- Width: Bottom 3.5 (ft)
- Top 2 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

<table>
<thead>
<tr>
<th>Notes: (biggest problem you see in survey reach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 4 3 2 1</td>
</tr>
</tbody>
</table>

**Reach Sketch and Site Impact Tracking:**

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (CT, ER, IB, SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow.

**Notes:**

Reported to authorities: [ ] Yes [ ] No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for optimal 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td><strong>20 19 18 17 16</strong></td>
<td><strong>15 14 13 12 11</strong></td>
<td><strong>10 9 8 7 6</strong></td>
<td><strong>5 4 3 2 1 0</strong></td>
</tr>
</tbody>
</table>

| 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; vegetation 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. | Graded 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** |

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Left Bank 10 9</strong></td>
<td><strong>8 7 6</strong></td>
<td><strong>5 4 3</strong></td>
<td><strong>2 1 0</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Right Bank 10 9</strong></td>
<td><strong>8 7 6</strong></td>
<td><strong>5 4 3</strong></td>
<td><strong>2 1 0</strong></td>
</tr>
</tbody>
</table>

| 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 Encroachement | 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 ____/100
Storm Water Outfalls

**WATERSHED/SUBSHED:** [GAGES]  
**DATE:** 6/14/10  
**ASSESS BY:** DRB

**SURVEY REACH ID:** 48-058  
**TIME:** AM/PM  
**PHOTO ID:** (Camera-Pic #) #1768

**SITE ID (Condition-#):** OT-01  
**LAT**: 51° 57' 46.7", **LONG**: 72° 25' 06.3"  
**LMK**:  
**GPS: (Unit ID):**

**BANK:**  
- LT [ ]  
- RT [ ]  
- Head [ ]

**FLOW:**  
- None [ ]  
- Trickle [X]  
- Moderate [ ]  
- Substantial [ ]  
- Other: [ ] [ ]

**TYPE:**  
- Closed pipe [X]  
- Open channel [ ]  
- Other: [ ]

**MATERIAL:**  
- Concrete [ ]  
- Metal [ ]  
- PVC/Plastic [ ]  
- Brick [ ]  
- Other: [ ]

**SHAPE:**  
- Single [ ]  
- Circular [ ]  
- Double [ ]  
- Elliptical [ ]  
- Triple [ ]  
- Other: [ ]

**DIMENSIONS:**  
- Diameter: [ ] (in)

**SUBMERGED:**  
- No [X]  
- Partially [ ]  
- Fully [ ]

**CONDITION:**  
- None [X]  
- Gas [ ]  
- Sewage [ ]  
- Rancid/Sour [ ]  
- Sulfide [ ]  
- Other: [ ]

**ODOR:**  
- None [X]  
- Gas [ ]  
- Sewage [ ]  
- Rancid/Sour [ ]  
- Sulfide [ ]  
- Other: [ ]

**DEPOSITS/STAINS:**  
- None [X]  
- Oily [ ]  
- Flow Line [ ]  
- Paint [ ]  
- Other: [ ]

**VEGGIE DENSITY:**  
- None [X]  
- Normal [ ]  
- Inhibited [ ]  
- Excessive [ ]  
- Other: [ ]

**PIPE BENTHIC GROWTH:**  
- None [X]  
- Normal [ ]  
- Inhibited [ ]  
- Excessive [ ]  
- Other: [ ]

**POOL QUALITY:**  
- No pool [X]  
- Good [ ]  
- Odors [ ]  
- Colors [ ]  
- Oils [ ]  
- Other: [ ]

**COLOR:**  
- Clear [ ]  
- Brown [ ]  
- Grey [X]  
- Yellow [ ]  
- Green [ ]  
- Orange [ ]  
- Red [ ]  
- Other: [ ]

**TURBIDITY:**  
- None [ ]  
- Slight Cloudiness [ ]  
- Cloudy [ ]  
- Opaque [ ]

**FLOATABLES:**  
- None [ ]  
- Sewage (toilet paper, etc.) [ ]  
- Petroleum (oil sheen) [ ]  
- Other: [ ]

**EXCESS TRASH (PAPER/PLASTIC BAGS):** [ ]  
**DUMPING (BULK):** [X]  
**EXCESSIVE SEDIMENTATION:** [ ]

**FOR FLOWING ONLY**

**OVERALL CONDITION:**  
- Very Good [ ]  
- Good [X]  
- Fair [ ]  
- Poor [ ]  
- Very Poor [ ]

**OUTFALL SEVERITY:**  
- None [ ]  
- Small [ ]  
- Medium [X]  
- Large [ ]  
- Other: [ ]

**POSSIBLE RESTORATION CANDIDATE:**  
- None [ ]  
- Local [X]  
- Other: [ ]

**POTENTIAL RESTORATION CANDIDATE**

- Discharge investigation [ ]  
- Stream daylighting [X]  
- Local stream repair/outfall stabilization [ ]

- Storm water retrofit [ ]  
- 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?** [X] Yes [ ] No  
**Not investigated:** [ ]

**Land Use description:** Commercial/Industrial (Small Cx)

**Area available:**

**OIL DISCHARGE FROM PIPELINE**

**OUTFALL SEVERITY:**

- Light [ ]  
- Moderate [ ]  
- Heavy [ ]

**Excess Trash:** [ ]  
**Sewage:** [ ]  
**Petroleum:** [ ]

**Other:** [ ]

**OUTFALL SEVERITY:**

- None [ ]  
- Small [X]  
- Medium [ ]  
- Large [ ]  
- Other: [ ]

**OIL DISCHARGE FROM PIPELINE**

**OUTFALL SEVERITY:**

- Light [ ]  
- Moderate [ ]  
- Heavy [ ]

**Excess Trash:** [ ]  
**Sewage:** [ ]  
**Petroleum:** [ ]

**Other:** [ ]

**REPORTED TO AUTHORITIES:** [ ] Yes [X] No

**REPORTING:**

- Green [ ]  
- Black [ ]

**SITE ID (Condition-#):** OT-01  
**LAT**: 51° 57' 46.7", **LONG**: 72° 25' 06.3"  
**LMK**:  
**GPS: (Unit ID):**

**BANK:**  
- LT [ ]  
- RT [ ]  
- Head [ ]

**FLOW:**  
- None [ ]  
- Trickle [X]  
- Moderate [ ]  
- Substantial [ ]  
- Other: [ ] [ ]

**TYPE:**  
- Closed pipe [X]  
- Open channel [ ]  
- Other: [ ]

**MATERIAL:**  
- Concrete [ ]  
- Metal [ ]  
- PVC/Plastic [ ]  
- Brick [ ]  
- Other: [ ]

**SHAPE:**  
- Single [ ]  
- Circular [ ]  
- Double [ ]  
- Elliptical [ ]  
- Triple [ ]  
- Other: [ ]

**DIMENSIONS:**  
- Diameter: [ ] (in)

**SUBMERGED:**  
- No [X]  
- Partially [ ]  
- Fully [ ]

**CONDITION:**  
- None [X]  
- Gas [ ]  
- Sewage [ ]  
- Rancid/Sour [ ]  
- Sulfide [ ]  
- Other: [ ]

**ODOR:**  
- None [X]  
- Gas [ ]  
- Sewage [ ]  
- Rancid/Sour [ ]  
- Sulfide [ ]  
- Other: [ ]

**DEPOSITS/STAINS:**  
- None [X]  
- Oily [ ]  
- Flow Line [ ]  
- Paint [ ]  
- Other: [ ]

**VEGGIE DENSITY:**  
- None [X]  
- Normal [ ]  
- Inhibited [ ]  
- Excessive [ ]  
- Other: [ ]

**PIPE BENTHIC GROWTH:**  
- None [X]  
- Normal [ ]  
- Inhibited [ ]  
- Excessive [ ]  
- Other: [ ]

**POOL QUALITY:**  
- No pool [X]  
- Good [ ]  
- Odors [ ]  
- Colors [ ]  
- Oils [ ]  
- Other: [ ]

**COLOR:**  
- Clear [ ]  
- Brown [ ]  
- Grey [X]  
- Yellow [ ]  
- Green [ ]  
- Orange [ ]  
- Red [ ]  
- Other: [ ]

**TURBIDITY:**  
- None [ ]  
- Slight Cloudiness [ ]  
- Cloudy [ ]  
- Opaque [ ]

**FLOATABLES:**  
- None [ ]  
- Sewage (toilet paper, etc.) [ ]  
- Petroleum (oil sheen) [ ]  
- Other: [ ]

**EXCESS TRASH (PAPER/PLASTIC BAGS):** [ ]  
**DUMPING (BULK):** [X]  
**EXCESSIVE SEDIMENTATION:** [ ]

**FOR FLOWING ONLY**

**OVERALL CONDITION:**  
- Very Good [ ]  
- Good [X]  
- Fair [ ]  
- Poor [ ]  
- Very Poor [ ]

**OUTFALL SEVERITY:**

- None [ ]  
- Small [ ]  
- Medium [X]  
- Large [ ]  
- Other: [ ]

**OIL DISCHARGE FROM PIPELINE**

**OUTFALL SEVERITY:**

- Light [ ]  
- Moderate [ ]  
- Heavy [ ]

**Excess Trash:** [ ]  
**Sewage:** [ ]  
**Petroleum:** [ ]

**Other:** [ ]

**OUTFALL SEVERITY:**

- None [ ]  
- Small [X]  
- Medium [ ]  
- Large [ ]  
- Other: [ ]

**OIL DISCHARGE FROM PIPELINE**

**OUTFALL SEVERITY:**

- Light [ ]  
- Moderate [ ]  
- Heavy [ ]

**Excess Trash:** [ ]  
**Sewage:** [ ]  
**Petroleum:** [ ]

**Other:** [ ]

**REPORTED TO AUTHORITIES:** [ ] Yes [X] No

**REPORTING:**

- Green [ ]  
- Black [ ]
**Severe Bank Erosion**

**Watershed/Subshed:** Gaines TK

**Survey Reach:** GB-053

**Date:** 6/1/208

**Assessed By:** DEB

**Site ID:**

- **Start Lat:** 41° 51' 46.7"
- **End Lat:** 41° 51' 49.2"
- **Start Long:** 72° 45' 25.4"
- **End Long:** 72° 45' 26.9"

**Process:**
- Currently unknown
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Channelized

**Bank of Concern:**
- Left (L)
- Right (R)
- Both (looking downstream)

**Location:**
- Meander bend
- Straight section
- Steep slope/valley wall
- Other:

**Dimensions:**
- Length (if no GPS) LT ft and/or RT ft
- Bank Ht LT ft and/or RT ft
- Bank Angle LT ° and/or RT °
- Wetted Width 3.5 ft

**Land Ownership:**
- Private
- Public
- Unknown

**LAND COVER:**
- Forest
- Field/Ag
- Developed:

**Potential Restoration Candidate:**
- Grade control
- Bank stabilization
- Other:

**Threat to Property/Infrastructure:**
- No
- Yes (Describe):

**Existing Riparian Width:**
- <25 ft
- 25-50 ft
- 50-75 ft
- 75-100 ft
- >100 ft

**Erosion Sev. (Circle #):**
- 5
- 4
- 3
- 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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**Notes/Cross Section Sketch:**

- Note: Property owner appears to be a software company. Workers constructing solar panels nearby. Owner may be amenable to being a restoration project partner (e.g., could also swap in riparian restoration.)

**Survey Reach:**

- **Photo ID:**
  - Camera/Pic #:
  - Monod #:
  - GPS: (Unit ID)

**Potential Restoration Candidate:**
- Grade control
- Bank stabilization
- Other:

**Threat to Property/Infrastructure:**
- No
- Yes (Describe):

**Existing Riparian Width:**
- <25 ft
- 25-50 ft
- 50-75 ft
- 75-100 ft
- >100 ft

**Erosion Sev. (Circle #):**
- 5
- 4
- 3
- 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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**Notes/Cross Section Sketch:**

- Note: Property owner appears to be a software company. Workers constructing solar panels nearby. Owner may be amenable to being a restoration project partner (e.g., could also swap in riparian restoration.)
Stream Crossing

WATERSHED/SUBSHELD: (Condition) SC. DATE: ASSESSED BY:

SURVEY REACH ID: GP. TIME: 9:15 AM/PM PHOTO ID: (Camera-Pic #) C123, # 178.

SITE ID: (Condition) SC. LAT: 41° 51' 47.1" LONG: 72° 02' 26.2" LMK GPS (Unit ID)

TYPE: Road Crossing Railroad Crossing Manmade Dam Beaver Dam Geological Formation Other:

FOR ROAD/RAILROAD CROSSINGS ONLY

SHAPE: Arch Box Elliptical Circular Other:

# BARRELS: Single Double Triple Other:

MATERIAL: Concrete Metal Other:

ALIGNMENT: Flow-aligned Not flow-aligned Do not know

DIMENSIONS: (if variable, sketch)
Barrel diameter: 3 ft Height: 3 ft

Culvert length: 50 ft Width: 3 ft

Roadway elevation: 7 ft

POTENTIAL RESTORATION CANDIDATE
Fish barrier removal Culvert repair/replacement Upstream storage retrofit

LOCAL stream repair Other:

IS SC ACTING AS GRADE CONTROL
No Yes Unknown

EXTENT OF PHYSICAL BLOCKAGE:

If yes for fish barrier

CAUSE:

Drop too high Water Drop: 5 - 4 in
Flow too shallow Water Depth: 3 in Other:

A structure such as a dam or road culvert on a 3rd order or greater river 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.

BLOCKAGE SEVERITY: (circle #)

5 4 3 2 1

NOTES/SKETCH:

REPORTED TO AUTHORITIES Yes No
# Stream Crossing Form

**Watershed/Subshed:**

**Survey Reach ID:**

**Time:**

**Photo ID:**

**DATE:**

**ASSESS BY:**

**SITE ID:**

**LAT:**

**LONG:**

**LMK:**

**GPS (Unit ID):**

### Type:
- [ ] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

### Shape:
- [ ] Arch
- [ ] Box
- [ ] Bottomless
- [ ] Circular
- [ ] Elliptical
- [ ] Other:

### Barrels:
- [ ] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

### Material:
- [ ] Concrete
- [ ] Metal
- [ ] Other:

### Alignment:
- [ ] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

### Dimensions (if variable, sketch):
- [ ] Barrel diameter:
- [ ] Height:

### 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

### Extent of Physical Blockage:
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

#### If yes for fish barrier:
- [ ] Drop too high Water Drop: \( z \) (in)
- [ ] Flow too shallow Water Depth: \( e \) (in)
- [ ] Other:

### Blockage Severity:
- [ ] 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 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 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:

*Old Road 4th*
### Reach Level Assessment

**SURVEY REACH ID:** RCH-6  
**WTRSHD/SUBSHD:** Gowen  
**DATE:** 6/14/18  
**ASSESSED BY:**  

**START TIME:** 3:00 AM/PM  
**LMK:**  
**LAT:** 41° 51' 51.5"  
**LONG:** 72° 25' 01.5"  
**DESCRIPTION:**  

**END TIME:** 3:35 AM/PM  
**LMK:**  
**LAT:** 41° 51' 51.9"  
**LONG:** 72° 20' 30"  
**DESCRIPTION:**  

---

**RAIN IN LAST 24 HOURS**  
- □ Heavy rain  
- □ Steady rain  
- □ None

**PRESENT CONDITIONS**  
- □ Heavy rain  
- □ Steady rain  
- □ Intermittent rain

---

**SURROUNDING LAND USE**  
- □ Industrial  
- □ Commercial  
- □ Golf course

**DOMINANT SUBSTRATE**  
- □ Silt/clay (fine or slick)  
- □ Sand (gritty)  
- □ Gravel (0.1-2.5")

**WATER CLARITY**  
- □ Clear  
- □ Turbid (suspended matter)  
- □ Stained (clear, naturally colored)  
- □ Opaque (milky)

**AQUATIC PLANTS IN STREAM**  
- □ Attached: none  
- □ Floating: none

**WILDLIFE IN OR AROUND STREAM**  
- □ Fish  
- □ Beaver  
- □ Snails

**STREAM SHADING**  
- □ Mostly shaded (≥75% coverage)  
- □ Halfway (≥50%)  
- □ Partially shaded (≥25%)  
- □ Unshaded (<25%)

**CHANNEL DYNAMICS**  
- □ Downcutting  
- □ Widening  
- □ Headcutting

**CHANNEL HEIGHT**  
- □ LT bank: 3 ft  
- □ RT bank: 3 ft  
- □ Top: 10 ft

**STREAM DIMENSIONS (FACING DOWNSTREAM)**  
- □ Width: Bottom: 6 ft

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**NOTES:** (biggest problem you see in survey reach)

---

**REPORTED TO AUTHORITIES**  
- □ Yes  
- □ No
## OVERALL STREAM CONDITION

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<td>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).</td>
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<td>13 12</td>
<td>11 10</td>
<td>9 8 7 6</td>
</tr>
</tbody>
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## VEGETATIVE PROTECTION

<table>
<thead>
<tr>
<th>Bank Erosion (facing downstream)</th>
<th>Optimal</th>
<th>Suboptimal</th>
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<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>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.</td>
<td>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.</td>
<td>Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to less than 20% of the potential substratum.</td>
<td></td>
</tr>
<tr>
<td>20 19 18 17 16</td>
<td>15 14</td>
<td>13 12</td>
<td>11 10</td>
<td>9 8 7 6</td>
</tr>
</tbody>
</table>

## FLOODPLAIN CONNECTION

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
<tr>
<td>20 19 18 17 16</td>
<td>15 14</td>
<td>13 12</td>
<td>11 10</td>
<td>9 8 7 6</td>
</tr>
</tbody>
</table>

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td>20 19 18 17 16</td>
<td>15 14</td>
<td>13 12</td>
<td>11 10</td>
<td>9 8 7 6</td>
</tr>
</tbody>
</table>

## FLOODPLAIN ENCROACHMENT

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or man-made structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or man-made structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or man-made structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
<tr>
<td>20 19 18 17 16</td>
<td>15 14</td>
<td>13 12</td>
<td>11 10</td>
<td>9 8 7 6</td>
</tr>
<tr>
<td>WATERSHED/SUBSHED:</td>
<td>OT</td>
<td>DATE:</td>
<td>6/4/108</td>
<td>ASSESSED BY:</td>
</tr>
<tr>
<td>------------------</td>
<td>----</td>
<td>-------</td>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td>SURVEY REACH ID:</td>
<td>2B-06</td>
<td>TIME:</td>
<td>11:00 AM/PM</td>
<td>PHOTO ID:</td>
</tr>
<tr>
<td>SITE ID (Condition-#):</td>
<td>OT-02</td>
<td>LAT:</td>
<td>41° 51' 51.7&quot;</td>
<td>LONG:</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SITE INFORMATION**

- **BANK:**
  - [ ] LT □ RT □ Head
- **FLOW:**
  - [ ] None □ Trickle □ Moderate □ Substantial □ Other:
  - [ ] Closed pipe
  - [ ] Open channel
- **CONDITION:**
  - [ ] None □ Chip/Cracked □ Peeling Paint □ Corrosion □ Other:
- **ODOR:**
  - [ ] No □ Gas □ Sewage □ Rancid/Sour □ Sulfide □ Other:
- **DEPOSITS/STAINS:**
  - [ ] None □ Oily □ Flow Line □ Paint □ Other:
  - [ ] Sand/sediment □ Other:
- **VEGGIE DENSITY:**
  - [ ] None □ Normal □ Inhibited □ Excessive □ Other:
- **PIPE BENTHIC GROWTH:**
  - [ ] None □ Brown □ Orange □ Green □ Other:
- **COLOR:**
  - [ ] Clear □ Brown □ Grey □ Yellow □ Green □ Orange □ Red □ Other:
- **TURBIDITY:**
  - [ ] None □ Slight Cloudiness □ Cloudy □ Opaque
- **FLOATABLES:**
  - [ ] None □ Sewage (toilet paper, etc.) □ Petroleum (oil sheen) □ Other:
- **OTHER CONCERNS:**
  - [ ] Excess Trash (paper/plastic bags) □ Dumping (bulk) □ Excessive Sedimentation □ Needs Regular Maintenance □ Bank Erosion □ Other:

**POTENTIAL RESTORATION CANDIDATE**

- [ ] Discharge investigation □ Stream daylighting □ Local stream repair/outfall stabilization
  - [ ] No □ Storm water retrofit □ Other:

If yes for daylighting:
- Length of vegetative cover from outfall: ______ ft
- Type of existing vegetation: __________ Type: __________ Slope: ______°

If yes for stormwater:
- Is stormwater currently controlled? □ Yes □ No □ Not investigated
- Land Use description: ____________________________
- Area available: ____________________________

**OUTFALL SEVERITY:**

- [ ] 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 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 and localized.

**OUTFALL SEVERITY:**

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**REPORTED TO AUTHORITIES:** □ Yes □ No

**REPORTED TO AUTHORITIES:** □ Yes □ No

**REPORTED TO AUTHORITIES:** □ Yes □ No

**REPORTED TO AUTHORITIES:** □ Yes □ No
Storm Water Outfalls

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>OT-01</th>
<th>DATE: 6/9/2018</th>
<th>ASSESSED BY: DIGB</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>GB-06</td>
<td>TIME: 3:00 AM/PM</td>
<td>PHOTO ID: (Camera-Pic #) 1776</td>
</tr>
<tr>
<td>SITE ID (Condition #):</td>
<td>OT-01</td>
<td>LAT 41°51'51.7&quot; LONG 72°25'02.5&quot;</td>
<td>LMK ___</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bank:**
- LT: Right Head
- RT: Left Head

**Flow:**
- None
- Trickle
- Moderate
- Substantial
- Other:

**Type:**
- Closed pipe
- Open channel
- Other:

**Material:**
- Concrete
- Metal
- PVC/Plastic
- Brick
- Other:

**Shape:**
- Single
- Double
- Circular
- Elliptical
- Triple
- Other:

**Dimensions:**
- Diameter: 15 (in)
- Depth: ___ (in)
- Width: (Top): ___ (in)
- (Bottom): ___ (in)

**Submerged:**
- No
- Partially
- Fully
- Not Applicable

**Condition:**
- None
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

**Deposit/Stains:**
- None
- Oily
- Flow Line
- Paint
- Other:

**Vegetation Density:**
- None
- Normal
- Inhibited
- Excessive
- Other:

**Pipe Benthic Growth:**
- None
- Gas
- None
- Brown
- Orange
- Green
- Other:

**Pool Quality:**
- None
- Odors
- Colors
- Oils
- Sewage
- Other:

**Other Concerns:**
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

**Potential Restoration Candidate:**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?
  - Yes
  - No
  - Not investigated

**Outfall Severity:**
- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**
- Road & outfall appearance have been recently reconstructed.

**Reported to Authorities:**
- Yes
- No
### Potential Restoration Candidate

- **If yes for daylighting:**
  - Discharge investigation
  - Stream daylighting
  - Local stream repair/outfall stabilization
  - Storm water retrofit
  - 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: ____________________________
  - Area available: _________________________________

### Outfall Severity

- **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 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.**

- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

### Sketch/Notes:

- [Hand-drawn sketch of a water outfall]

- Reported to authorities: ☐ Yes ☐ No
Severe Bank Erosion

**Watershed/Subshed:** Engle Borrough

**Survey Reach:** 6B-06

**Time:** 3:15 AM/PM

**Photo ID (Camera-Pic #):** F10 # 1781

**Site ID:** (Condition-#)

**Start Lat:** 41° 05' 15.2" Long 72° 04' 55.3"

**End Lat:** 41° 05' 15.7" Long 72° 04' 55.3"

**Process:**
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**Bank of Concern:**
- LT
- RT
- Both (looking downstream)

**Location:**
- Meander bend
- Straight section
- Steep slope/valley wall
- Other:

**Dimensions:**
- Length (if no GPS) LT 10 ft and/or RT 30 ft
- Bank Ht LT 6 ft and/or RT 6 ft
- Top width 30 ft
- Wetted Width 8 ft

**Land Ownership:**
- Private
- Public
- Unknown

**Land Cover:**
- Forest
- Field/Ag
- Developed

**Potential Restoration Candidate:**
- Grade control
- Bank stabilization
- Other:

**Threat to Property/Infrastructure:**
- No
- Yes (Describe): No threat to property or infrastructure.

**Existing Riparian Width:**
- ≤25 ft
- 25 - 50 ft
- 50 - 75 ft
- 75 - 100 ft
- >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 infrastructure.
- Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.
- Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian 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 stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.
- Difficult access. Must cross wetland, 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 required.

**Notes/Cross Section Sketch:**

---

REPORTED TO AUTHORITIES: Yes No
**Severe Bank Erosion**

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Ganges Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH:</td>
<td>GB-06</td>
</tr>
<tr>
<td>TIME:</td>
<td>3:30 AM (PM)</td>
</tr>
<tr>
<td>PHOTO ID (CAMERA-PIC #):</td>
<td>FA # 1794</td>
</tr>
<tr>
<td>SITE ID: (Condition #:</td>
<td>ER- 2</td>
</tr>
<tr>
<td>START LAT</td>
<td>41°51'14&quot; N</td>
</tr>
<tr>
<td>LONG</td>
<td>112°24'50&quot; W</td>
</tr>
<tr>
<td>LMK</td>
<td>5</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROCESS:</th>
<th>□ Currently unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Downcutting</td>
<td></td>
</tr>
<tr>
<td>□ Widening</td>
<td></td>
</tr>
<tr>
<td>□ Headcutting</td>
<td></td>
</tr>
<tr>
<td>□ Aggrading</td>
<td></td>
</tr>
<tr>
<td>□ Sed. deposition</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK OF CONCERN:</th>
<th>□ LT</th>
<th>□ RT</th>
<th>□ Both (looking downstream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION:</td>
<td>□ Meander bend</td>
<td>□ Straight section</td>
<td>□ Steep slope/valley wall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (if no GPS)</td>
<td>LT 75 ft and/or RT 75 ft</td>
</tr>
<tr>
<td>Bank Ht</td>
<td>LT 15 ft and/or RT 15 ft</td>
</tr>
<tr>
<td>Bank Angle</td>
<td>LT 45° and/or RT 45°</td>
</tr>
<tr>
<td>Top width</td>
<td>25 ft</td>
</tr>
<tr>
<td>Wetted Width</td>
<td>1 ft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAND OWNERSHIP:</th>
<th>□ Private</th>
<th>□ Public</th>
<th>□ Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND COVER:</td>
<td>□ Forest</td>
<td>□ Field/Ag</td>
<td>□ Developed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE:</th>
<th>□ Grade control</th>
<th>□ Bank stabilization</th>
<th>□ Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THREAT TO PROPERTY/INFRASTRUCTURE:</th>
<th>□ No</th>
<th>□ Yes (Describe):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>EXISTING RIPARIAN WIDTH:</th>
<th>□ &lt;25 ft</th>
<th>□ 25 - 50 ft</th>
<th>□ 50-75 ft</th>
<th>□ 75-100 ft</th>
<th>□ &gt;100 ft</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>EROSION SEVERITY (circle #:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure</td>
</tr>
<tr>
<td>Channelized= □ 1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACCESS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
<td>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.</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES/CROSS SECTION SKETCH:</th>
<th></th>
</tr>
</thead>
</table>

| REPORTED TO AUTHORITIES | □ Yes | □ No |
Severe Bank Erosion

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Super Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH:</td>
<td>0-5-06</td>
</tr>
<tr>
<td>TIME:</td>
<td>3:45 PM</td>
</tr>
<tr>
<td>PHOTO ID (CAMERA-PIC #):</td>
<td>D8978 #176-176</td>
</tr>
<tr>
<td>SITE ID: (Condition #):</td>
<td>ER-03</td>
</tr>
<tr>
<td>START LAT:</td>
<td>41°51′34″N</td>
</tr>
<tr>
<td>END LAT:</td>
<td>0°00′00″N</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td>LMK</td>
</tr>
<tr>
<td>PROCESS:</td>
<td>□ Currently unknown</td>
</tr>
<tr>
<td>□ Downcutting</td>
<td>□ Bed scour</td>
</tr>
<tr>
<td>□ Widening</td>
<td>□ Bank failure</td>
</tr>
<tr>
<td>□ Headcutting</td>
<td>□ Bank scour</td>
</tr>
<tr>
<td>□ Aggrading</td>
<td>□ Slope failure</td>
</tr>
<tr>
<td>□ Sed. deposition</td>
<td>□ Channelized</td>
</tr>
<tr>
<td>BANK OF CONCERN:</td>
<td>□ LT  □ RT  □ Both (looking downstream)</td>
</tr>
<tr>
<td>LOCATION:</td>
<td>□ Meander bend</td>
</tr>
<tr>
<td>□ Straight section</td>
<td></td>
</tr>
<tr>
<td>□ Steep slope/valley wall</td>
<td></td>
</tr>
<tr>
<td>□ Other:</td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td></td>
</tr>
<tr>
<td>Length (if no GPS)</td>
<td>LT 30 ft and/or RT 30 ft</td>
</tr>
<tr>
<td>Bottom width:</td>
<td>6 ft</td>
</tr>
<tr>
<td>Bank Ht:</td>
<td>LT 5 ft and/or RT 5 ft</td>
</tr>
<tr>
<td>Top width:</td>
<td>9 ft</td>
</tr>
<tr>
<td>Bank Angle:</td>
<td>LT 90° and/or RT 90°</td>
</tr>
<tr>
<td>Wetted Width:</td>
<td>5 ft</td>
</tr>
<tr>
<td>LAND OWNERSHIP:</td>
<td>□ Private □ Public □ Unknown</td>
</tr>
<tr>
<td>LAND COVER:</td>
<td>□ Forest □ Field/Ag □ Developed</td>
</tr>
<tr>
<td>POTENTIAL RESTORATION CANDIDATE:</td>
<td>□ Grade control □ Bank stabilization □ Other:</td>
</tr>
<tr>
<td>THREAT TO PROPERTY/INFRASTRUCTURE:</td>
<td>□ No □ Yes (Describe):</td>
</tr>
<tr>
<td>EXISTING RIPARIAN WIDTH:</td>
<td>□ &lt;25 ft □ 25-50 ft □ 50-75 ft □ 75-100 ft □ &gt;100 ft</td>
</tr>
<tr>
<td>EROSION SEVERITY (circle #):</td>
<td></td>
</tr>
<tr>
<td>□ 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.</td>
<td></td>
</tr>
<tr>
<td>□ Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td></td>
</tr>
<tr>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td></td>
</tr>
<tr>
<td>ACCESS:</td>
<td></td>
</tr>
<tr>
<td>□ Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
<td></td>
</tr>
<tr>
<td>□ 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.</td>
<td></td>
</tr>
<tr>
<td>□ Difficult access. Must cross wetland, 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 required.</td>
<td></td>
</tr>
<tr>
<td>NOTES/CROSS SECTION SKETCH:</td>
<td></td>
</tr>
<tr>
<td>REPORTED TO AUTHORITIES:</td>
<td>□ Yes □ No</td>
</tr>
</tbody>
</table>
Severe Bank Erosion

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Goon Brk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach:</td>
<td>GB-06</td>
</tr>
<tr>
<td>Time:</td>
<td>12:00 AM/PM</td>
</tr>
<tr>
<td>Photo ID (Camera-Pic #):</td>
<td>1787</td>
</tr>
<tr>
<td>Site ID: (Condition #):</td>
<td>ER-04</td>
</tr>
<tr>
<td>Start Lat/Long:</td>
<td>41° 51' 41&quot; N, 72° 34' 41&quot; W</td>
</tr>
<tr>
<td>End Lat/Long:</td>
<td>41° 51' 41&quot; N, 72° 34' 41&quot; W</td>
</tr>
<tr>
<td>GPS: (Unit ID):</td>
<td>LMK</td>
</tr>
<tr>
<td>Process:</td>
<td>Currently unknown</td>
</tr>
<tr>
<td>Bank of Concern:</td>
<td>LT</td>
</tr>
<tr>
<td>Location:</td>
<td>Meander bend</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>Length (if no GPS)</td>
</tr>
<tr>
<td></td>
<td>Bank Ht</td>
</tr>
<tr>
<td></td>
<td>Bank Angle</td>
</tr>
<tr>
<td>Land Ownership:</td>
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</tr>
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<td>Land Cover:</td>
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</tr>
<tr>
<td>Potential Restoration Candidate:</td>
<td>Grade control</td>
</tr>
<tr>
<td>Threat to Property/Infrastructure:</td>
<td>No</td>
</tr>
<tr>
<td>Existing Riparian Width:</td>
<td>&lt;25 ft</td>
</tr>
<tr>
<td>Erosion Severity (Circle #):</td>
<td>1</td>
</tr>
<tr>
<td>Access:</td>
<td>Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Difficult access. Must cross wetland, 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 required.</td>
</tr>
<tr>
<td>Notes/Cross Section Sketch:</td>
<td></td>
</tr>
</tbody>
</table>

REPORTED TO AUTHORITIES: Yes No
**Impacted Buffer**

### Watershed/Subshed:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach</td>
<td>4B-08</td>
</tr>
<tr>
<td>Date</td>
<td>6/20/08</td>
</tr>
<tr>
<td>Time</td>
<td>4:25 AM/PM</td>
</tr>
<tr>
<td>Photo ID</td>
<td>(Camera/Pic #) 136</td>
</tr>
</tbody>
</table>

### Site ID:

- **Start Lat/Long:** 41° 0' 51" N 72° 0' 36" W
- **End Lat/Long:** 41° 0' 51" N 72° 0' 36" W
- **Lmk:** 136

### Impacted Bank:

- **Left:** L
- **Right:** R
- **Both:** B

### Reason Inadequate:

- Lack of vegetation
- Too narrow
- Widespread invasive plants
- Recently planted
- Other: Encroachment from landscape

### Land Use:

- **Facing downstream:**
  - Left Bank
  - Right Bank
- **Other Public:**
  - Private
  - Institutional
  - Golf Course
  - Park
- **Public:**
  - Other

### Dominant

- **Left Bank:**
  - Paved
  - Bare ground
  - Turf/lawn
  - Tall grass
  - Shrub/scrub
  - Trees
  - Other
- **Right Bank:**
  - Paved
  - Bare ground
  - Turf/lawn
  - Tall grass
  - Shrub/scrub
  - Trees
  - Other

### Invasive Plants:

- None
- Rare
- Partial coverage
- Extensive coverage
- Unknown

### Stream Shade Provided?

- None
- Partial
- Full

### Land Cover:

- **Left Bank:**
  - Paved
  - Bare ground
  - Turf/lawn
  - Tall grass
  - Shrub/scrub
  - Trees
  - Other
- **Right Bank:**
  - Paved
  - Bare ground
  - Turf/lawn
  - Tall grass
  - Shrub/scrub
  - Trees
  - Other

### Invasives Removal:

- Active reforestation
- Greenway design
- Natural regeneration
- Invasives removal

### Potential Restoration Candidate:

- Active reforestation
- Greenway design
- Natural regeneration
- Invasives removal
- Other: Bank stabilization

### Potential Impact Area:

- Impacted area on public land
- Impacted area on either public or private land
- Impacted area on private land

### Potential Conflicts with Reforestation:

- Widespread invasive plants
- Potential contamination
- Lack of sun
- Poor/unsafe access to site
- Existing impervious cover
- Severe animal impacts (deer, beaver)

### Notes:

![Diagram of impacted area with bridge and invasive plants]
Stream Crossing

WATERSHED/SUBSHED: Goose Brook

DATE: 01/04/108

SURVEY REACH ID: G7-86

TIME: 3:30 AM/PM

PHOTO ID: (Camera Pic #) B3, Camera # 9779

SITE ID: (Condition #) SC-02

LAT 41°51'50.4" LONG 72°24'59.3"

ASSESSED BY: DRB

GPS (Unit ID)

REPORTED TO AUTHORITIES □ Yes □ No

**Type:** □ Road Crossing □ Railroad Crossing □ Manmade Dam □ Beaver Dam □ Geological Formation □ Other:

**Shape:** □ Arch □ Box □ Elliptical □ Circular □ Other:

**Barrels:** □ Single □ Double □ Triple □ Other:

**Material:** □ Concrete □ Metal □ Other:

**Align:** □ Flow-aligned □ Not flow-aligned □ Do not know

**For Road/Railroad Crossings ONLY**

**Condition:** (Evidence of...)

□ Cracking/chipping/corrosion □ Downstream scour hole
□ Sediment deposition □ Failing embankment

□ Other (describe):

**Alignment:** (variable, sketch)

Barrel diameter: (ft)
Height: (ft)

**Culvert Slope:**

□ Flat □ Slight (2° – 5°) □ Obvious (>5°)

Roadway elevation: (ft)

**Potential Restoration Candidate**

□ Fish barrier removal □ Culvert repair/replacement □ Upstream storage retrofit
□ No □ Local stream repair □ Other: Stream geomorphology restoration

**Is SC Acting as Grade Control**

□ No □ Yes □ Unknown

**Extent of Physical Blockage:**

□ Total □ Partial □ Unknown

If yes for fish barrier

**Cause:**

□ Drop too high □ Water Drop: 3 (in)
□ Flow too shallow □ Water Depth: (in)
□ Other:

**Blockage Severity:** (circle #)

A structure such as a dam or road culvert on a 3rd or larger stream block 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.

**Notes/Sketch:**

[Hand-drawn sketch of stream with notes and measurements]
Stream Crossing

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Watershed/Subshed</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>6B-6</td>
</tr>
<tr>
<td>TIME:</td>
<td>3:15 AM/PM</td>
</tr>
<tr>
<td>DATE:</td>
<td>6/4/108</td>
</tr>
<tr>
<td>ASSESSED BY:</td>
<td>CM</td>
</tr>
<tr>
<td>PHOTO ID:</td>
<td>Camera Pic #1</td>
</tr>
<tr>
<td>GPS (Unit ID)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE ID: (Condition-#)</th>
<th>SC-62</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT</td>
<td>41°51'58&quot;N</td>
</tr>
<tr>
<td>LONG</td>
<td>73°24'58&quot;W</td>
</tr>
<tr>
<td>LMK</td>
<td></td>
</tr>
</tbody>
</table>

| TYPE:                  | Road Crossing |
|                       | Railroad Crossing |
|                       | Manmade Dam     |
|                       | Beaver Dam      |
|                       | Geological Formation |

| SHAPE:                 | Arch | Elliptical |
|                       | Box  | Other      |
|                       | Circular |     |

| # BARRELS:             | Single | Double |
|                       | Triple | Other   |

| MATERIAL:              | Concrete | Metal |
|                       | Other    |

| ALIGNMENT:             | Flow-aligned | Not flow-aligned |
|                       | Do not know  |

| BARREL SLOPE:          | Flat         |
|                       | Slight (2° - 5°) |
|                       | Obvious (>5°)  |

<table>
<thead>
<tr>
<th>DIMENSIONS: (if variable, sketch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrel diameter: 3 (ft)</td>
</tr>
<tr>
<td>Height: 3 (ft)</td>
</tr>
<tr>
<td>Culvert length: 25 (ft)</td>
</tr>
<tr>
<td>Width: 3 (ft)</td>
</tr>
<tr>
<td>Roadway elevation: 8 (ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish barrier removal</td>
</tr>
<tr>
<td>Culvert repair/replacement</td>
</tr>
<tr>
<td>Upstream storage retrofit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IS SC ACTING AS GRADE CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXTENT OF PHYSICAL BLOCKAGE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Partial</td>
</tr>
<tr>
<td>Temporary</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUSE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop too high</td>
</tr>
<tr>
<td>Flow too shallow</td>
</tr>
<tr>
<td>Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WATER DROP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (in)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WATER DEPTH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLOCKAGE SEVERITY: (circle #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES/SKETCH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sketch</td>
</tr>
</tbody>
</table>

REPORTED TO AUTHORITIES: | Yes | No |
Stream Crossing

WATERSHED/SUBSHED:  
SURVEY REACH ID: A-B-31  
TIME: 3:15 AM/PM  
PHOTO ID: (Camera-Pic #) Canon # 1777  
SITE ID: (Condition-#) SC-DL  
LAT 41° 51' 51.4"  LONG 72° 25' 01.4"  LMK  

ASSESSSED BY: 3W  

TYPE: [ ] Road Crossing [ ] Railroad Crossing [ ] Manmade Dam [ ] Beaver Dam [ ] Geological Formation [ ] Other:  

FOR ROAD/RAILROAD CROSSINGS ONLY  

SHAPE: [ ] Arch [ ] Bottomless [ ] Box [ ] Elliptical [ ] Circular [ ] Other:  

# BARRELS: [ ] Single [ ] Double [ ] Triple [ ] Other:  

MATERIAL: [ ] Concrete [ ] Metal [ ] Other:  

ALIGNMENT: [ ] Flow-aligned [ ] Not flow-aligned [ ] Do not know  

CONDITION: (Evidence of...)  
[ ] Cracking/chipping/corrosion [ ] Downstream scour hole [ ] Sediment deposition [ ] Failing embankment [ ] Other (describe):  

CULVERT SLOPE: [ ] Flat [ ] Slight (2° – 5°) [ ] Obvious (>5°)  

DIMENSIONS: (if variable, sketch)  
Barrel diameter: ________ (ft)  
Height: ________ (ft)  
Culvert length: ________ (ft)  
Width: ________ (ft)  
Roadway elevation: ________ (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 [ ] Unknown  

EXTENT OF PHYSICAL BLOCKAGE:  
[ ] Total [ ] Partial [ ] Temporary [ ] Unknown  

If yes for fish barrier  
CAUSE:  
[ ] Drop too high [ ] Water Drop: ________ (in)  
[ ] Flow too shallow [ ] Water Depth: ________ (in)  
[ ] Other:  

BLOCKAGE SEVERITY: (circle #)  
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.  

REPORTED TO AUTHORITIES [ ] Yes [ ] No  

NOTES/SKETCH:  
X-section  

[Diagram of stream crossing with notes and a sketch]
### Reach Level Assessment

**Survey Reach ID:** GB-07  **Wtrsh/Subshd:**

**Start Time:** 6:30 AM  **LMK:**

- **Lat:** 41° 51' 51"  **Long:** 22° 01' 31.0"

**Description:**

**End Time:** 7:00 AM  **LMK:**

- **Lat:** 41° 51' 53"  **Long:** 22° 01' 21.1"

**Description:**

---

**Rain in Last 24 Hours:**
- [ ] Heavy rain
- [ ] Steady rain
- [ ] None

**Present Conditions:**
- [ ] Heavy rain
- [ ] Steady rain
- [ ] Intermittent

---

**Surrounding Land Use:**
- [ ] Industrial
- [ ] Commercial
- [ ] Golf course
- [ ] Park
- [ ] Crop
- [ ] Pasture
- [ ] Other:

**Average Conditions (check applicable):**

- **Base Flow as %**
  - [ ] 0-25%
  - [x] 50%-75%
  - [ ] 75-100%

- **Channel Width**
  - [x] 25-50%
  - [ ] 75-100%

**Dominant Substrate**
- [ ] Silt/clay (fine or slick)
- [ ] Sand (gritty)
- [ ] Gravel (0.1-2.5")
- [ ] Cobble (2.5—10")
- [ ] Boulder (>10")
- [ ] Bed rock

**Water Clarity**
- [ ] Clear
- [ ] Turbid (suspended matter)
- [ ] Stained (clear, naturally colored)
- [ ] Opaque (milky)
- [ ] Other (chemicals, dyes)

**Aquatic Plants in Stream**
- [ ] Attached: [ ] none  [ ] some  [x] lots
- [ ] Floating: [ ] none  [ ] some  [ ] lots

**Wildlife In or Around Stream**
- [ ] Fish
- [ ] Beaver
- [ ] Deer
- [ ] Snails
- [ ] Other:

**Stream Shading (water surface)**
- [x] Mostly shaded (>75% coverage)
- [ ] Halfway (50%)
- [ ] Partially shaded (>25%)
- [ ] Unshaded (< 25%)

**Channel Dynamics**
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Bed scour
- [ ] Bank failure
- [ ] Bank scour
- [ ] Slope failure
- [ ] Channelized

**Channel Dimensions (Facing Downstream)**
- **Height:**
  - LT bank: 2
  - RT bank: 2

- **Width:**
  - Bottom: 5
  - Top: 12-5

**Reach Accessibility**

**Good:** Open area in public ownership, sufficient room for 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.

---

**Notes:** (biggest problem you see in survey reach)

---

**Reported to Authorities:**
- [ ] Yes
- [ ] No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th><strong>IN-STREAM HABITAT</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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 stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VEGETATIVE PROTECTION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.</td>
<td>50-70% of the streambank surfaces covered by native vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>BANK EROSION</strong></th>
<th><strong>Left Bank</strong></th>
<th><strong>Right Bank</strong></th>
<th><strong>Left Bank</strong></th>
<th><strong>Right Bank</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
<td></td>
</tr>
<tr>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN CONNECTION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th><strong>VEGETATED BUFFER WIDTH</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN VEGETATION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN HABITAT</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN ENCROACHMENT</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of fill material, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: ____ /80 + Buffer/Floodplain: ____ /80 = Total Survey Reach ____ /160
**Watershed/Subshed:**

**Survey Reach:**

**Date:**

**Time:**

**Photo ID:**

**Reason Inadequate:**
- Lack of vegetation
- Too narrow
- Widespread invasive plants
- Recently planted
- Other:

**Land Use:**
- Private
- Institutional
- Golf Course
- Park
- Other Public

**Dominant Land Cover:**
- Paved
- Bare ground
- Turf/lawn
- Tall grass
- Shrub/scrub
- Trees
- Other

**Invasive Plants:**
- None
- Rare
- Partial coverage
- Extensive coverage
- Unknown

**Stream Shade Provided?**
- None
- Partial
- Full
- Wetlands Present?
- No
- Yes
- Unknown

**Potential Restoration Candidate**
- Active reforestation
- Greenway design
- Natural regeneration
- Invasives removal
- Other:

**Restorable Area**

**Length (ft):**
- LT Bank: 100
- RT Bank: 100

**Width (ft):**
- 25

**Reforestation Potential:**
- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

**Potential Conflicts with Reforestation**
- Widespread invasive plants
- Potential contamination
- Lack of sun
- Poor/unsafe access to site
- Existing impervious cover
- Severe animal impacts (deer, beaver)
- Other:

**Notes:**

[Diagram of a landscape with 'Lawn' and 'Paving' labeled areas.]

[Diagram of a landscape with 'Lawn' and 'Paving' labeled areas.]

[Diagram of a landscape with 'Lawn' and 'Paving' labeled areas.]

[Diagram of a landscape with 'Lawn' and 'Paving' labeled areas.]
**Stream Crossing**

**Watershed/Subshed:**  
**Survey Reach ID:**  
**Date:**  
**Assessed By:**

**Site ID:** (Condition-#) SC-01  
**Lat:** 41° 51.50"  
**Long:** 72° 29.71"  
**LMK:**  
**Gps (Unit ID):**

<table>
<thead>
<tr>
<th>Type:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch</td>
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<tr>
<td>Bottomless</td>
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<td>Other:</td>
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<tr>
<td><strong># Barrels:</strong></td>
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<tr>
<td>Flow-aligned</td>
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<tr>
<td>Not flow-aligned</td>
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<tr>
<td>Do not know</td>
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<tr>
<td><strong>Potential Restoration Candidate:</strong></td>
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<tr>
<td>Fish barrier removal</td>
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<td></td>
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<td>Culvert repair/replacement</td>
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<td>Upstream storage retrofit</td>
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<td>Local stream repair</td>
<td>Unknown</td>
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<td>Other:</td>
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<tr>
<td><strong>Is SC Acting as Grade Control:</strong></td>
<td></td>
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<tr>
<td>No</td>
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<td>Yes</td>
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<tr>
<td><strong>Extent of Physical Blockage:</strong></td>
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<tr>
<td>Total</td>
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<td><strong>Cause:</strong></td>
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<tr>
<td>Drop too high</td>
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<td></td>
<td>Water Drop: 74 (in)</td>
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<tr>
<td>Flow too shallow</td>
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<td></td>
<td></td>
<td></td>
<td>Water Depth: 5 (in)</td>
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<td>Other:</td>
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<tr>
<td><strong>Blockage Severity:</strong> (circle #)</td>
<td></td>
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</tbody>
</table>

- 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.

**Notes/Sketch:**

- [Handwritten notes and sketches]

**Reported to Authorities:** Yes No
**Reach Level Assessment**

<table>
<thead>
<tr>
<th>Survey Reach ID: GB-2</th>
<th>WtrSHD/Subshd:</th>
<th>Date: 6/5/08</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start</strong></td>
<td>Time:</td>
<td>11:55 AM/PM</td>
<td>LMK:</td>
</tr>
<tr>
<td>Lat: 41° 51' 51&quot;</td>
<td>Long: 72° 04' 47&quot;</td>
<td></td>
<td>Lat: 41° 51' 51&quot;</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rain in Last 24 Hours**
- □ Heavy rain
- □ Steady rain
- □ None

**Present Conditions**
- □ Heavy rain
- □ Steady rain
- □ Intermittent
- □ Trace
- □ Clear
- □ Overcast
- □ Partly cloudy

**Surrounding Land Use**
- □ Industrial
- □ Commercial
- □ Golf course
- □ Park
- □ Crop
- □ Pasture
- □ Forested
- □ Institutional
- □ Suburban/Res
- □ Other:

**Average Conditions (check applicable)**

<table>
<thead>
<tr>
<th>Base Flow as %</th>
<th>□ 0-25%</th>
<th>□ 25-50%</th>
<th>□ 50%-75%</th>
<th>□ 75-100%</th>
</tr>
</thead>
</table>

**Dominant Substrate**
- □ Silt/clay (fine or slick)
- □ Sand (gritty)
- □ Gravel (0.1-2.5")
- □ Cobble (2.5-10")
- □ Boulder (>10")
- □ Bed rock

**Water Clarity**
- □ Clear
- □ Turbid (suspended matter)
- □ Stained (clear, naturally colored)
- □ Opaque (milky)
- □ Other (chemicals, dyes)

**Aquatic Plants in Stream**
- Attached: □ none
- □ some
- □ lots
- □ floating: □ none
- □ some
- □ lots

**Wildlife in or Around Stream**
- □ Evidence of:
  - □ Fish
  - □ Beaver
  - □ Deer
  - □ Snails
  - □ Other:

**Stream Shading**
- □ Mostly shaded (>75% coverage)
- □ Halfway (50%)
- □ Partially shaded (25%)
- □ Unshaded (<25%)

**Channel Dynamics**
- □ Downcutting
- □ Widening
- □ Headcutting
- □ Aggrading
- □ Bed scour
- □ Bank failure
- □ Bank scour
- □ Sed. deposition
- □ Slope failure
- □ Channelized
- □ Unknown

**Reach Sketch and Site Impact Tracking**

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.

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**Notes:** (biggest problem you see in survey reach)

**Reported to Authorities**
- □ Yes
- □ No
## Overall Stream Condition

<table>
<thead>
<tr>
<th>Stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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);</td>
<td>40-60% 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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrata frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetative Protection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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 stable habitat height remaining.</td>
<td>50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or poorly cropped vegetation common; less than one-half of the potential plant stable habitat height remaining.</td>
<td>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 stable height.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

## Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures; some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures); Significant effect on floodplain function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 780 / 80 = Total Survey Reach 6 / 100
Storm Water Outfalls

OT

WATERSHED/SUBSHED: OT-04
SURVEY REACH ID: GB-04
SITE ID (Condition-#): OT-04

DATE: 6/15/10
ASSIGNED BY: DIB
TIME: 6:50 AM/PM
PHOTO ID: (Camera-Pic #) # 17995
LAT 41°51'53.6" LONG 76°28'14.7"

BANK: LT RT Head
FLOW: None Trickle Moderate Substantial Other:

TYPE: Closed pipe
CONVEYANCE: Concrete Metal PVC/Plastic Brick Other:
SHAPE: Single Circular Double Elliptical Triple Other:
DIMENSIONS: Diameter 2.5 (in)
SUBMERGED: YES No Partially Fully

IF YES FOR DAYLIGHTING:
Slope: Length of vegetative cover from outfall: Type of existing vegetation: Slope:

IF YES FOR STORMWATER:
Is stormwater currently controlled? Yes No Not investigated

OUTFALL SEVERITY: (circle #)

COLOR: Clear Brown Grey Yellow Green Orange Red Other:
TURBIDITY: None Slight Cloudiness Cloudy Opaque
FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other:

DEPOSITS/STAINS: None Gas Sewage Rancid/Sour Other:
VEGGIE DENSITY: None Normal Excessive Excessive Sedimentation Other:
POOL QUALITY: No pool Good Odors Colors Oils Other:

POTENTIAL RESTORATION CANDIDATE: Discharge investigation Stream daylighting Local stream repair/outfall stabilization

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 have a significant impact downstream.

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.

OUTFALL does not have dry weather discharge, staining, or appearance of causing any erosion problems.

REPORTED TO AUTHORITIES: Yes No
**Watershed/Subshed:** Hoges Blk

**Survey Reach:** GB-08

**Time:** 6:45 AM/PM

**Date:** 6-15-108

**Photo ID:** (Camera-Pic #) D9674m

**Assessed By:** DDB

---

**Site ID:** (Condition-#)

**Start Lat:** 41°51'52.6" Long 72°24'18.7"

**End Lat:** ° " Long ° "

**LMK**

**GPS:** (Unit ID)

**Impacted Bank:**
- [ ] LT
- [ ] RT
- [x] Both

**Reason Inadequate:**
- [ ] Lack of vegetation
- [ ] Too narrow
- [ ] Widespread invasive plants
- [ ] Recently planted
- [ ] Other: *Landscaping & maintained lawn*

**Land Use:**
- Private
- Institutional
- Golf Course
- Park
- Other Public

(Facing downstream)
- [x] LT Bank
- [ ] RT Bank

**Dominant Land Cover:**
- Paved
- Bare ground
- Turf/lawn
- Tall grass
- Shrub/scrub
- Trees
- Other

- [ ] LT Bank
- [x] RT Bank

**Invasive Plants:**
- [x] None
- [ ] Rare
- [ ] Partial coverage
- [ ] Extensive coverage
- [ ] Unknown

**Stream Shade Provided?**
- [ ] None
- [ ] Partial
- [ ] Full

**Wetlands Present?**
- [ ] No
- [ ] Yes
- [ ] Unknown

**Potential Restoration Candidate**
- [x] Active reforestation
- [ ] Greenway design
- [ ] Natural regeneration
- [ ] Invasives removal
- [ ] Other:

**Restorable Area**

- [ ] Length (ft): 500
- [ ] Width (ft): 50-75

**Reforestation Potential:**

- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on other public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

**Potential Conflicts with Reforestation**

- [ ] Widespread invasive plants
- [ ] Potential contamination
- [ ] Lack of sun
- [ ] Poor/unsafe access to site
- [ ] Existing impervious cover
- [ ] Severe animal impacts (deer, beaver)
- [ ] Other:

**Notes:**

- Road
- House
- Lawn
- Wooded
Stream Crossing

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Date: 6/15/15</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>TIME: 7:25 AM/PM</td>
<td>PHOTO ID: (Camera-Pic #) #1606</td>
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</table>
| SITE ID: (Condition #:) SC- | LAT: U1°51'55" | LONG: 72°04'10.7"

**Type:** [ ] Road Crossing [ ] Railroad Crossing [ ] Manmade Dam [ ] Beaver Dam [ ] Geological Formation [ ] Other:

**Shape:**
- Arch
- Box
- Elliptical
- Circular
- Other:

**For Road/Railroad Crossings Only**

- Barrels:
  - Single
  - Double
  - Triple
  - Other:

- Material:
  - Concrete
  - Metal
  - Other:

- Alignment:
  - Flow-aligned
  - Not flow-aligned
  - Do not know

- Dimensions: (if variable, sketch)
  - Barrel diameter: [ ] (ft)
  - Height: [ ] (ft)
  - Culvert length: [ ] (ft)
  - Width: [ ] (ft)
  - Roadway elevation: [ ] (ft)

**Potential Restoration Candidate**
- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair
- Other:

**Is SC acting as Grade Control**
- No
- Yes
- Unknown

**Extent of Physical Blockage:**
- Total
- Partial
- Unknown

**If yes for fish barrier**
- Cause:
  - Drop too high
  - Flow too shallow
  - Other:

**Blockage Severity:**

- 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.

**Notes/Sketch:**

![Sketch of pond and lawn]
### Trash and Debris

**Watershed/Subshed:** Rogers Brook  
**Date:** 6/5/18  
**Assessed By:**  
**Survey Reach ID:** 05 08  
**Time:** 2:10 AM/PM  
**Photo ID:** (Camera-Pic #) 1B (view #) 1801902  
**Site ID:** (Condition-) TR-01  
**Lat:** 41° 51' 54.9"  
**Long:** 70° 21' 18.6"  
**LMK:**  
**GPS:** (Unit ID)  

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<thead>
<tr>
<th>Type</th>
<th>Material</th>
<th>Source</th>
<th>Location</th>
<th>Land Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Residential</td>
<td>☑ Paper</td>
<td>☐ Unknown</td>
<td>☐ Stream</td>
<td>☑ Public</td>
</tr>
<tr>
<td>☐ Commercial</td>
<td>☑ Metal</td>
<td>☐ Flooding</td>
<td>☐ Riparian Area</td>
<td>☑ Unknown</td>
</tr>
<tr>
<td>☐ Industrial</td>
<td>☑ Tires</td>
<td>☐ Illegal dump</td>
<td>☐ Lt. bank</td>
<td>☑ Private</td>
</tr>
<tr>
<td>☑ Appliances</td>
<td>☐ Yard Waste</td>
<td>☐ Local outfall</td>
<td>☐ Rt. bank</td>
<td>☑ Private</td>
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<td>☑ Automotive</td>
<td>☐ Other</td>
<td>☐ Other</td>
<td>☐ Other</td>
<td>☑ Private</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Residential</td>
</tr>
<tr>
<td>Material: Paper</td>
</tr>
<tr>
<td>Source: Unknown</td>
</tr>
<tr>
<td>Location: Stream</td>
</tr>
<tr>
<td>Land Ownership: Public</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Restoration Candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Stream cleanup</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If yes for trash or debris removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment Needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Heavy equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Who can do it:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Volunteers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dumpster within 100 ft:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
</tr>
</tbody>
</table>

| Clean-Up Potential:  
(Circle #) |  
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ 5</td>
</tr>
</tbody>
</table>

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 drums or indications of hazardous materials.

**Notes:** Tire, Bathtub, 2 - 55 gallon drums

**Reported to Authorities:** ☑ Yes  

---

![Image of the form with hand-written notes and drawings]
Reach Level Assessment

**SURVEY REACH ID:** [Blank]

**WTRSHD/SUBSHD:** [Blank]

**DATE:** 6/14/12

**ASSESSED BY:** [Blank]

**START**
- **TIME:** 9:30 AM/PM
- **LMK:** [Blank]
- **LAT:** [Blank]
- **LONG:** [Blank]

**DESCRIPTION:**

**END**
- **TIME:** 10:45 AM/PM
- **LMK:** [Blank]
- **LAT:** [Blank]
- **LONG:** [Blank]

**DESCRIPTION:**

**RAIN IN LAST 24 HOURS**
- Heavy rain
- Steady rain
- Intermittent
- None

**PRESENT CONDITIONS**
- Heavy rain
- Steady rain
- Intermittent
- Clear
- Trace
- Overcast
- Partly cloudy

**SURROUNDING LAND USE**
- Industrial
- Commercial
- Golf course
- Park
- Urban/Residential
- Suburban/Res
- Forested
- Institutional
- Other
- Golf course
- Park

**DOMINANT SUBSTRATE**
- Silt/clay (fine or slick)
- Cobble (2.5 – 10")
- Sand (gritty)
- Boulder (>10")
- Gravel (0.1-2.5")
- Bedrock

**WATER CLARITY**
- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opaque (milky)
- Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM**
- Attached: none
- some
- lots

**FLOATING:**
- none
- some
- lots

**WILDLIFE IN OR AROUND STREAM**
- Fish
- Beaver
- Deer
- Snails
- Other

**STREAM SHADING (water surface)**
- Mostly shaded (>75% coverage)
- Halfway (>50%)
- Partially shaded (>25%)
- Unshaded (<25%)

**CHANNEL DYNAMICS**
- Downcutting
- Widening
- Headcutting
- Aggrading
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Sed. deposition
- Channelized
- Unknown

**CHANNEL HEIGHT:**
- LT bank [Blank] (ft)
- RT bank [Blank] (ft)
- Top [Blank] (ft)

**REACH ACCESSIBILITY**

**REPORTED TO AUTHORITIES**
- Yes
- No

**AVERAGE CONDITIONS**
- Base Flow as %
  - 0-25%
  - 50-75%
  - 75-100%

- Channel Width
  - 0-25%
  - 50-75%
  - 75-100%

**REACH SKETCH AND SITE IMPACT TRACKING**

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, SC, UT, IR, MD) as well as any additional features deemed appropriate. Indicate direction of flow.

**NOTES:** (biggest problem you see in survey reach)
### Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 now fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetative Protection</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-outs, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroach-ment</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function.</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: __/80 + Buffer/Floodplain: __/80 = Total Survey Reach __/160
Storm Water Outfalls

<table>
<thead>
<tr>
<th>BANK:</th>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SHAPE:</th>
<th>DIMENSIONS:</th>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lft</td>
<td>Closed pipe</td>
<td>Concrete</td>
<td>Circular</td>
<td>Diameter: 6 (in)</td>
<td>No</td>
</tr>
<tr>
<td>rt</td>
<td>Open channel</td>
<td>Concrete</td>
<td>Trapezoid</td>
<td>Width (Top): 36 (in)</td>
<td>Partially</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOW:</th>
<th>CONDITION:</th>
<th>ODOR:</th>
<th>DEPOSITS/STAINS:</th>
<th>VEGGIE DENSITY:</th>
<th>PIPE BENTHIC GROWTH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Trickle</td>
<td>Chip/Cracked</td>
<td>Gas</td>
<td>Oily</td>
<td>Brown</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>Peeling Paint</td>
<td>Sewage</td>
<td>Flow Line</td>
<td>Orange</td>
<td>Orange</td>
</tr>
<tr>
<td>None</td>
<td>Corrosion</td>
<td>Sulfide/Sour</td>
<td>Paint</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>None</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOR FLOWING ONLY</th>
<th>COLOR:</th>
<th>TURBIDITY:</th>
<th>FLOATABLES:</th>
<th>OTHER CONCERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Excess Trash (paper/plastic bags)</td>
</tr>
<tr>
<td>Brown</td>
<td>Slight Cloudiness</td>
<td>Sewage (toilet paper, etc.)</td>
<td>Dumping (bulk)</td>
<td></td>
</tr>
<tr>
<td>Grey</td>
<td>Cloudy</td>
<td>Petroleum (oil sheen)</td>
<td>Excessive Sedimentation</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>Opaque</td>
<td>Other</td>
<td>Needs Regular Maintenance</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td></td>
<td>Bank Erosion</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td>Other: Erosion from outfall</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge investigation</td>
<td>no</td>
</tr>
<tr>
<td>Stream daylighting</td>
<td>Storm water retrofit</td>
</tr>
<tr>
<td>Local stream repair/outfall stabilization</td>
<td>Other:</td>
</tr>
</tbody>
</table>

If yes for daylighting:
Length of vegetative cover from outfall: 50 ft  Type of existing vegetation: Grass  Slope: 30°

If yes for stormwater:
Is stormwater currently controlled?
Yes  No  Not investigated

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.

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.

Outfall does not have dry weather discharge; staining or appearance of causing any erosion problems.
Storm Water Outfalls

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>GATES</th>
<th>BIL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>C5W</td>
<td>55AM/PM</td>
</tr>
<tr>
<td>PHOTO ID: (Camera-Pic #)</td>
<td>D (Mon #)</td>
<td>17409</td>
</tr>
<tr>
<td>SITE ID (Condition-#):</td>
<td>OT - QL</td>
<td></td>
</tr>
<tr>
<td>LAT/°</td>
<td>51'51.5&quot;</td>
<td>LONG/°</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td>LMK_</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK:</th>
<th>LT</th>
<th>RT</th>
<th>Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE:</td>
<td>Closed pipe</td>
<td>Open channel</td>
<td></td>
</tr>
<tr>
<td>MATERIAL:</td>
<td>Concrete</td>
<td>Concrete</td>
<td>Earthen</td>
</tr>
<tr>
<td>SHAPE:</td>
<td>Single</td>
<td>Trapezoid</td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>Diameter: 18 (in)</td>
<td>Depth: (in)</td>
<td></td>
</tr>
<tr>
<td>SUBMERGED:</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| CONDITION: | None |
| ODOR: | No |
| DEPOSITS/STAINS: | None |
| VEGGIE DENSITY: | None |
| PIPE BENTHIC GROWTH: | None |

| FLOW: | None |
| COLOR: | Clear |
| TURBIDITY: | None |
| FLOATABLES: | None |

| OTHER: | Excess Trash (paper/plastic bags) |
| CONCERNS: | Needs Regular Maintenance |

**FOR FLOWING ONLY**

| COLOR: | Brown |
| TURBIDITY: | Slight Cloudiness |
| FLOATABLES: | Sewage (toilet paper, etc.) |

| OTHER: | Dumping (bulk) |
| CONCERNS: | Bank Erosion |

**POTENTIAL RESTORATION CANDIDATE**

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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? Yes No Not investigated
Land Use description: Industrial
Area available: __________

<table>
<thead>
<tr>
<th>OUTFALL SEVERITY: (circle #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>Outhfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.</td>
</tr>
</tbody>
</table>

| 5 | (4) | 3 | 2 | 1 |

**REPORTED TO AUTHORITIES:** Yes No

**SKETCH/NOTES:**

---

**SEVERITY DUE TO COLOR, NOT FLOW. QM WATER DECOLORIZATION.**
Stream Crossing

**WATERSHED/SUBSHED:**

**DATE:** 6/1/10

**SURVEY REACH ID:** 42-09

**TIME:** 10:00 AM/PM

**PHOTO ID:** (Camera Pic #) 123456789

**SITE ID:** (Condition #) SC-01

**LAT:** 91° 51' 47.8"

**LONG:** 11° 21' 00.6"

**LMK:**

**GPS (Unit ID):**

---

**SITE ID**

- **Condition #**
- **LAT:** 91° 51' 47.8"
- **LONG:** 11° 21' 00.6"
- **LMK:**
- **GPS (Unit ID):**

---

**Type:**

- [ ] Road Crossing
- [ ] Railroad Crossing
- [x] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

---

**Shape:**

- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [ ] Circular
- [ ] Other:

---

**Crossings Only**

**Condition:**

- Evidence of...

  - [x] Cracking/chipping/corrosion
  - [ ] Downstream scour hole
  - [ ] Sediment deposition
  - [ ] Failing embankment
  - [ ] Other (describe):

---

**Alignment:**

- Flow-aligned
- Not flow-aligned
- Do not know

---

**Material:**

- Concrete
- Metal
- Other:

---

**Barrels:**

- Single
- Double
- Triple
- Other:

---

**Dimensions:**

- Barreldiameter: _____(ft)
- Height: _____(ft)
- Culvert length: _____(ft)
- Width: _____(ft)
- Roadway elevation: _____(ft)

---

**Potential Restoration Candidate**

- [x] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit
- [ ] No
- [ ] Local stream repair
- [ ] Other:

---

**Is SC Acting as Grade Control**

- [x] Yes
- [ ] No
- [ ] Unknown

---

**Extent of Physical Blockage:**

- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

---

**If yes for fish barrier**

- [ ] Drop too high
- [ ] Flow too shallow
- [ ] Other:

---

**Cause:**

- Water Drop: ___(in)
- Water Depth: ___(in)
- Other:

---

**Blockage Severity:**

- 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.

---

**Notes/Sketch:**

[Diagram of stream and road with annotations]

---

**Reported to authorities**

- [ ] Yes
- [ ] No
<table>
<thead>
<tr>
<th>SURVEY REACH ID: B-10</th>
<th>WTRSHD/SUBSHD:</th>
<th>DATE: 6/4/10</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>START</td>
<td>TIME: 10:30 AM/PM</td>
<td>LMK:</td>
<td>END</td>
</tr>
<tr>
<td>LAT 41° 51' 47.3&quot;</td>
<td>LONG 2° 24' 39.6&quot;</td>
<td></td>
<td>LAT 41° 51' 47.3&quot;</td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RAIN IN LAST 24 HOURS
- □ Heavy rain
- □ Steady rain
- □ Intermittent rain
- □ Trace
- □ Overcast
- □ Partly cloudy
- □ None

### PRESENT CONDITIONS
- □ Heavy rain
- □ Steady rain
- □ Intermittent rain
- □ Trace
- □ Overcast
- □ Partly cloudy
- □ None

### SURROUNDING LAND USE
- □ Industrial
- □ Commercial
- □ Urban/Residential
- □ Suburban/Res
- □ Forested
- □ Institutional
- □ Other:

### DOMINANT SUBSTRATE
- □ Silt/clay (fine or slick)
- □ Cobble (2.5—10")
- □ Boulder (>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 IN STREAM
- □ Attached: none
gone
- □ some
gone
- □ lots

### WILDLIFE IN OR AROUND STREAM
- □ Evidence of
- □ Fish
- □ Beaver
- □ Deer
- □ Snails
- □ Other: 

### STREAM SHADING (water surface)
- □ Mostly shaded (≥75% coverage)
- □ Halfway (≥50%)
- □ Partially shaded (≥25%)
- □ Unshaded (<25%)

### CHANNEL DYNAMICS
- □ Downcutting
- □ Widening
- □ Headcutting
- □ Aggrading
- □ Sed. deposition
- □ Bed scour
- □ Bank failure
- □ Bank scour
- □ Slope failure
- □ Channelized
- □ Unknown

### CHANNEL HEIGHT: LT bank 3 (ft)
- RT bank 3 (ft)
- Top 8 (ft)

### CHANNEL DIMENSIONS (FACING DOWNSTREAM)

### REACH ACCESSIBILITY

### AVERAGE CONDITIONS (check applicable)

### REACH SKETCH AND SITE IMPACT TRACKING

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.

### NOTES:
(biggest problem you see in survey reach)

### REPORTED TO AUTHORITIES
□ Yes □ No
<table>
<thead>
<tr>
<th><strong>IN-STREAM HABITAT</strong> (May modify criteria based on appropriate habitat regime)</th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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).</td>
<td>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 new fall, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VEGETATIVE PROTECTION</strong> (score each bank, determine sides by facing downstream)</th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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 stature height remaining.</td>
<td>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 stature height remaining.</td>
<td>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 stature height.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>BANK EROSION</strong> (facing downstream)</th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure</td>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN CONNECTION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>OVERALL BUFFER AND FLOODPLAIN CONDITION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN VEGETATION</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN HABITAT</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLOODPLAIN ENCROACHMENT</strong></th>
<th><strong>Optimal</strong></th>
<th><strong>Suboptimal</strong></th>
<th><strong>Marginal</strong></th>
<th><strong>Poor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: /80 + Buffer/Floodplain: /80 = Total Survey Reach /160
Storm Water Outfalls

**WATERSHED/SUBSHED:**

**SURVEY REACH ID:** GB10

**SITE ID (Condition-#): OT-**

**BANK:**
- LT
- RT
- Head

**FLOW:**
- None
- Trickle
- Moderate
- Substantial
- Other:

**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
- Inhibited
- Excessive
- Other:

**OUTFALL SEVERITY:**
- 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 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.
- Outfall does not have dry weather discharge; staining or appearance of causing any erosion problems.

**REPORTED TO AUTHORITIES:**
- Yes
- No
### Impacted Buffer

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>DATE:</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE ID: (Condition #:)</th>
<th>START</th>
<th>LAT</th>
<th>LONG</th>
<th>LMK</th>
<th>GPS: (Unit ID)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACTED BANK:</th>
<th>REASON INADEQUATE:</th>
<th>LAND USE: (Facing downstream)</th>
<th>DOMINANT LAND COVER:</th>
<th>INVASIVE PLANTS:</th>
<th>STREAM SHADE PROVIDED?</th>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>RESTORABLE AREA</th>
<th>POTENTIAL CONFLICTS WITH REFORESTATION</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>RT</td>
<td>Both</td>
<td>Lack of vegetation</td>
<td>Too narrow</td>
<td>Widespread invasive plants</td>
<td>Private</td>
<td>Institutional</td>
<td>Golf Course</td>
<td>Park</td>
</tr>
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<td></td>
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</tr>
</tbody>
</table>

- Impact area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impact area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impact area on private land where road; building encroachment or other feature significantly limits available area for planting

- Widespread invasive plants
- Potential contamination
- Lack of sun
- Poor/unsafe access to site
- Existing impervious cover
- Severe animal impacts (deer, beaver)

*Buffer from GPS coordinate to SC*
**Stream Crossing**

**WATERSHED/SUBSHED:**

**JURVEY REACH ID:**

**TIME:**

**PHOTO ID:**

**DATE:**

**ASSESSED BY:**

**SITE ID:**

**LAT:**

**LONG:**

**LMK:**

**GPS (Unit ID):**

---

### TYPE:
- Road Crossing
- Railroad Crossing
- Mannmade Dam
- Beaver Dam
- Geological Formation
- Other:

**SHAPE:**
- Arch
- Bottomless
- Box
- Elliptical
- Circular
- Other:

**FOR ROAD/RAILROAD CROSSINGS ONLY**

**# BARRELS:**
- Single
- Double
- Triple
- Other:

**MATERIAL:**
- Concrete
- Metal
- Other:

**ALIGNMENT:**
- Flow-aligned
- Not flow-aligned
- Do not know

**DIMENSIONS:** (if variable, sketch)
- Barrel diameter: [value] (ft)
- Height: [value] (ft)
- Culvert length: [value] (ft)
- Width: [value] (ft)
- Roadway elevation: [value] (ft)

**CONDITION:** (Evidence of...)
- Cracking/chipping/corrosion
- Downstream scour hole
- Sediment deposition
- Failing embankment
- Other (describe):

**CULVERT SLOPE:**
- Flat
- Slight (2° – 5°)
- Obvious (>5°)

**ALIGNMENT:**
- Flow-aligned
- Not flow-aligned
- Do not know

**DIMENSIONS:** (if variable, sketch)
- Barrel diameter: [value] (ft)
- Height: [value] (ft)
- Culvert length: [value] (ft)
- Width: [value] (ft)
- Roadway elevation: [value] (ft)

---

### POTENTIAL RESTORATION CANDIDATE
- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair
- Other:

**IS SC ACTING AS GRADE CONTROL**
- No
- Yes
- Unknown

---

### EXTENT OF PHYSICAL BLOCKAGE:
- Total
- Partial
- Temporary
- Unknown

**CAUSE:**
- Drop too high
- Flow too shallow
- Other:

**DROPPED WATERSHED (in):**
- Water Drop: [value] (in)

**WATER DEPTH (in):**
- Water Depth: [value] (in)

---

**BLOCKAGE SEVERITY:** (circle #)
- 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.

---

**NOTES/SKETCH:**

[Sketch of stream crossing]

---

**REPORTED TO AUTHORITIES**
- Yes
- No
Utility Impacts

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>LOCATION:</th>
<th>POTENTIAL FISH BARRIER:</th>
<th>PIPE DIMENSIONS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking sewer</td>
<td>Concrete</td>
<td>Floodplain</td>
<td>No</td>
<td>Diameter: _____ in</td>
</tr>
<tr>
<td>Exposed pipe</td>
<td>Corrugated metal</td>
<td>Stream bank</td>
<td>No</td>
<td>Length exposed: _____ ft</td>
</tr>
<tr>
<td>Exposed manhole</td>
<td>Smooth metal</td>
<td>Above stream</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>PVC</td>
<td>Stream bottom</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EVIDENCE OF DISCHARGE:</th>
<th>COLOR</th>
<th>ODOR</th>
<th>DEPOSITS</th>
<th>POTENTIAL RESTORATION CANDIDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Structural repairs</td>
</tr>
<tr>
<td></td>
<td>Clear</td>
<td>Sewage</td>
<td>Tampons/Toilet Paper</td>
<td>Pipe testing</td>
</tr>
<tr>
<td></td>
<td>Dark Brown</td>
<td>Oily</td>
<td>Lime</td>
<td>Citizen hotlines</td>
</tr>
<tr>
<td></td>
<td>Lt Brown</td>
<td>Sulfide</td>
<td>Surface oils</td>
<td>Dry weather sampling</td>
</tr>
<tr>
<td></td>
<td>Yellowish</td>
<td>Chlorine</td>
<td>Stains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greenish</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDITION:</th>
<th>POTENTIAL RESTORATION CANDIDATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint failure</td>
<td>Structural repairs</td>
</tr>
<tr>
<td>Pipe corrosion/cracking</td>
<td>Pipe testing</td>
</tr>
<tr>
<td>Protective covering broken</td>
<td>Citizen hotlines</td>
</tr>
<tr>
<td>Manhole cover absent</td>
<td>Dry weather sampling</td>
</tr>
</tbody>
</table>

| UTILITY IMPACT SEVERITY: | 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. | Small section of exposed pipe, stream bank near the pipe is stable; the pipe is across the bottom of the stream but only a small portion of the top of the pipe is exposed; the pipe is exposed but is reinforced with concrete and it is not causing a blockage to upstream fish movement; a manhole stack that is at the edge of the stream and does not extend very far out into the active stream channel. |

<table>
<thead>
<tr>
<th>Leaks</th>
<th>Leaking sewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Leaking sewer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES:</th>
<th>REPORTED TO LOCAL AUTHORITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No exposed pipe</td>
<td>Yes No</td>
</tr>
</tbody>
</table>
**Stream Crossing**

**Watershed/Subshed:** Ludington

**Survey Reach ID:** 472-03

**Time:** 5:50 PM

**Photo ID:** (Camera Pic #) 29, 30, 31

**Site ID:** (Condition-#) SC-01

**Lat:** 41° 49' 29.2"  **Long:** 72° 29.186'  **Lmk:** GPS (Unit ID)

**Type:**
- [ ] Road Crossing
- [ ] Railroad Crossing
- [x] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**For Road/Railroad Crossings Only**

**Shape:**
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [x] Circular
- [ ] Other:

**Condition:** (Evidence of...)
- [ ] Cracking/chipping/corrosion
- [ ] Downstream scour hole
- [ ] Sediment deposition
- [ ] Failing embankment
- [ ] Other (describe):

**Barrels:**
- [ ] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**Material:**
- [ ] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**
- [ ] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barrel diameter: ______ (ft)
- Height: ______ (ft)
- Culvert length: ______ (ft)
- Width: ______ (ft)
- Roadway elevation: ______ (ft)

**Potential Restoration Candidate**
- [ ] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit
- [x] Local stream repair
- [ ] Other:

**Is SC Acting as Grade Control**
- [ ] No
- [x] Yes
- [ ] Unknown

**Extent of Physical Blockage:**
- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**If yes for fish barrier**

**Cause:**
- [ ] Drop too high
- [ ] Water Drop: ______ (in)
- [ ] Flow too shallow
- [ ] Water Depth: ______ (in)
- [ ] Other:

**Blockage Severity:** (circle #)
- 1
- 2
- 3
- 4
- 5

**Notes/Sketch:**

**Reported to Authorities**
- [ ] Yes
- [ ] No
### Reach Level Assessment

**Survey Reach ID:** L72-03  
**WTRSHD/SUBSHD:** Lower Tank Run  
**Date:** 6/5/10  
**Assessed By:** JS, 6A, 17

<table>
<thead>
<tr>
<th>START</th>
<th>TIME: 5:01 AM</th>
<th>LMK:</th>
<th>END</th>
<th>TIME: 5:06 PM</th>
<th>LMK:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT: 41° 49' 20.3&quot;</td>
<td>LONG: 97° 29' 14.7&quot;</td>
<td></td>
<td>LAT: 41° 49' 23.2&quot;</td>
<td>LONG: 97° 29' 15.9&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Robertsville Run  
**Description:** Dobsonville Dam

**Rain in Last 24 Hours:**  
- Heavy rain  
- Steady rain

**Present Conditions:**  
- Heavy rain  
- Steady rain  
- Intermittent rain

**Surrounding Land Use:**  
- Industrial  
- Commercial

**Average Conditions (check applicable):**  
- Base Flow as %:  
  - 0-25%  
  - 50%-75%  
  - 75-100%

- Channel Width:  
  - 25-50%

- Dominant Substrate:  
  - Silt/clay (fine or stick)  
  - Sand (gritty)  
  - Gravel (0.1-2.5")  
  - Cobble (2.5-10")  
  - Boulder (>10")  
  - Bed rock

- Water Clarity:  
  - Clear  
  - Turbid (suspended matter)

- Stained (clear, naturally colored)  
- Other (chemicals, dyes)  
- Somewhat cloudy

- Aquatic Plants in Stream:  
  - Attached:  
    - none  
    - some  
    - lots

- Floating:  
  - none  
  - some  
  - lots

- Wildlife In Or Around Stream:  
  - Evidence of:  
    - Fish  
    - Beaver  
    - Deer

- Snails  
- Other:

- Stream Shading (water surface):  
  - Mostly shaded (>75% coverage)
  - Halfway (50%)
  - Partially shaded (25%)
  - Unshaded (<25%)

- Channel Dynamics:  
  - Downcutting  
  - Widening  
  - Headcutting  
  - Aggrading  
  - Sed. deposition  
  - Bed scour  
  - Bank failure  
  - Bank scour  
  - Slope failure  
  - Channelized

- Channel Dimensions (Facing Downstream):  
  - Height: LT bank  
    - 25 (ft)
  - RT bank  
    - 4.5 (ft)
  - Width: Bottom  
    - 20 (ft)
  - Top  
    - 25 (ft)

**Reach Sketch and Site Impact Tracking:**  
Simple planar sketch of survey reach. Track locations and IDs for all sites impacts within the survey reach (OT, ER, IB, SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow.

---

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

---

**Notes:** (biggest problem you see in survey reach)

- STORM WATER CATCH BASIN FOR 7-84 HIGHWAY RUNOFF

**Reported to authorities:**  
- Yes
- No
<table>
<thead>
<tr>
<th>STREAM HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 75% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGETATIVE PROTECTION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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 suitable height remaining.</td>
<td>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 suitable height remaining.</td>
<td>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 suitable height.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK EROSION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. (&lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OVERALL BUFFER AND FLOODPLAIN CONDITION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN VEGETATION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN ENCROACHMENT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or man-made structures, but not affecting floodplain function</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or man-made structures, but not affecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or man-made structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 53 /80 + Buffer/Floodplain: 56 /80 = Total Survey Reach /11 /160
Storm Water Outfalls

OT

Watershed/Subshed: Lower Tank River

Survey Reach ID: L2R-05

Date: 6/15/08

Photo ID: (Camera-Pic #) 27

Assessed by: 5/21/07

Site ID (Condition #): OT-04

Lon. Lat. 41.049, 236, "Long 72.29, 316"

Lmk

Gps: (unit id)

Bank: [X] Lt. Head

Flow: [X] None

Material: [X] Concrete

Shape: [X] Circular

Dimensions: [x] Diameter (in)

Submerged: [x] No

Condition: None

Type: [X] Closed pipe

Other:

Deposits/Stains: [X] None

Veggie Density: [X] None

Pipe Benthic Growth: None

Other Concerns: Excess Trash (paper/plastic bags)

Other:

For Flowing Only

Flow: [X] None

Odor: [X] No

Material: [X] Concrete

Pipe Benthic Growth: [X] None

Odor: [X] No

Flow: [X] None

Other: Excess Trash (paper/plastic bags)

Other Concerns: Excess Sedimentation

Potential Restoration Candidate: [X] Discharge investigation

Stormwater Current: Yes

If Yes for daylighting:

Length of vegetation cover from outfall: ___ ft

Type of vegetation: ___

Slope: ___

If Yes for stormwater:

Is stormwater currently controlled? Yes

Land Use Description: ___

Area available: ___

Outfall Severity:

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the normal flow in the receiving stream; discharge appears to be having a significant impact downstream.

Small discharge, flow mostly clear and odorless, if the discharge has a color and odor, 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 weather discharge, staining, or appearance of causing any erosion problems.

Sketch/Notes:

7-84 Runoff goes to retention pond -> pond to river, slalty/orange/rusty -> thick sludge bottom.

Reported to authorities: ___ Yes ___ No
## Reach Level Assessment

### Survey Reach ID: 2

**WTRSHD/SUBSHD:**

**DATE:** 6/1/2021

**ASSESSED BY:**

**TIME:** 3:00 AM/PM

**LMK:**

---

### Rain in Last 24 Hours
- Heavy rain
- Steady rain
- None

### Present Conditions
- Heavy rain
- Steady rain
- Intermittent

---

### Surrounding Land Use
- Industrial
- Commercial
- Golf course
- Park
- Other:

### Aquatic Plants in Stream
- Attached:
- Floating:

### Wildlife in or Around Stream
- Fish
- Beaver
- Deer
- Snails
- Other:

### Stream Shading (Water Surface)
- Mostly shaded (>75% coverage)
- Halfway (50%)
- Partially shaded (25%)
- Unshaded (<25%)

### Channel Dynamics
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

### Channel Dimenisons (Facing Downstream)
- Height: LT bank
- RT bank
- Width: Bottom
- Top

### 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 of 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.

---

### Notes:

- (biggest problem you see in survey reach)

---

**REPORTED TO AUTHORITIES:**

*Yes* / *No*
### Overall Stream Condition

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substrate</strong></td>
<td>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 new fall and not transient).</td>
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</table>

### Vegetative Protection

(score each bank, determine sides by facing downstream)

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
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<tr>
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### Floodplain Connection

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th>Optimal</th>
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</tbody>
</table>

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
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<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
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<td></td>
</tr>
<tr>
<td>Left Bank 10 9</td>
<td>8 7 6</td>
<td>5 4 3 2 1 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Bank 10 9</td>
<td>8 7 6</td>
<td>5 4 3 2 1 0</td>
<td></td>
<td></td>
</tr>
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</table>

### Floodplain Vegetation

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<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
<td></td>
</tr>
</tbody>
</table>

### Floodplain Habitat

<table>
<thead>
<tr>
<th>Floodplain Enencroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</td>
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<tr>
<td>Left Bank 10 9</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1 0</td>
<td></td>
</tr>
</tbody>
</table>

### Sub Total In-stream: \( \frac{17}{80} \) + Buffer/Floodplain: \( \frac{241}{80} \) = Total Survey Reach \( \frac{258}{160} \)
Storm Water Outfalls

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: 6/4/05</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>Time: 2:30 AM/PM</td>
<td>Photo ID: (Camera-Pic #) 24</td>
</tr>
<tr>
<td>Site ID (Condition-#): OT-01</td>
<td>Lat: 41° 49' 36&quot;</td>
<td>Long: 71° 49' 13&quot;</td>
</tr>
<tr>
<td>Bank:</td>
<td>Flow:</td>
<td></td>
</tr>
<tr>
<td>LT RT Head</td>
<td>None Trickle Moderate Substantial Other</td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td>Material:</td>
<td></td>
</tr>
<tr>
<td>Closed pipe</td>
<td>Concrete Metal PVC/Plastic Brick Other</td>
<td></td>
</tr>
<tr>
<td>Material:</td>
<td>Shape:</td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>Circular Double Elliptical Triple Other</td>
<td></td>
</tr>
<tr>
<td>Shape:</td>
<td>Dimensions:</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>Diameter: (in)</td>
<td></td>
</tr>
<tr>
<td>Condition:</td>
<td>Deposits/Stains:</td>
<td></td>
</tr>
<tr>
<td>No Chip/Cracked Peeling Paint Corrosion Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposits/Stains:</td>
<td>Veggie Density:</td>
<td></td>
</tr>
<tr>
<td>None Gas Sewage Rancid/Sour Sulfide Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veggie Density:</td>
<td>Benthic Growth:</td>
<td></td>
</tr>
<tr>
<td>None Oily Flow Line Paint Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benthic Growth:</td>
<td>Submerged:</td>
<td></td>
</tr>
<tr>
<td>None Gas Brown Orange Green Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submerged:</td>
<td>Pool Quality:</td>
<td></td>
</tr>
<tr>
<td>None Gas Brown Orange Green Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool Quality:</td>
<td>Other Concerns:</td>
<td></td>
</tr>
<tr>
<td>None Gas Brown Orange Green Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Concerns:</td>
<td>Potential Restoration Candidate:</td>
<td></td>
</tr>
<tr>
<td>Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Restoration Candidate:</td>
<td>For Flowing Only:</td>
<td></td>
</tr>
<tr>
<td>Discharge investigation Stream daylighting Local stream repair/outfall stabilization Storm water retrofit Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Flowing Only:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Color: Clear Brown Grey Yellow Green Orange Red Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color:</td>
<td>Turbidity:</td>
<td></td>
</tr>
<tr>
<td>Clear Brown Grey Yellow Green Orange Red Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity:</td>
<td>Floatables:</td>
<td></td>
</tr>
<tr>
<td>None Slight Cloudiness Cloudy Opaque Petroleum (oil sheen) Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floatables:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Needs Regular Maintenance Bank Erosion Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Outfall Severity:</td>
<td></td>
</tr>
<tr>
<td>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 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. Outfall does not have dry weather discharge; staining or appearance of causing any erosion problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outfall Severity: (circle #)</td>
<td>Sketch/Notes:</td>
<td></td>
</tr>
</tbody>
</table>

Reported to Authorities: YES NO
Storm Water Outfalls

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>WATERSHED/SUBSHED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>TIME: 2:45 AM/PM</td>
</tr>
<tr>
<td>SITE ID (Condition #): OT-02</td>
<td>PHOTO ID: (Camera-Pic #) 30/#</td>
</tr>
</tbody>
</table>

| MANUFACTURED BY: | DATE: / / |
| ASSESSED BY:     |          |
| SITE ID (Condition #): OT-02 | LAT 41° 41.663' LONG 71° 26.631' |

<table>
<thead>
<tr>
<th>BANK:</th>
<th>TYPE:</th>
<th>MATERIAL:</th>
<th>SHAPE:</th>
<th>DIMENSIONS:</th>
<th>SUBMERGED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>RT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Head</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fully</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOW:</th>
<th>COLOR:</th>
<th>TURBIDITY:</th>
<th>FLOATABLES:</th>
<th>OTHER CONCERNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Clear</td>
<td>None</td>
<td>None</td>
<td>Excess Trash (paper/plastic bags)</td>
</tr>
<tr>
<td>Trickle</td>
<td>Brown</td>
<td>Slight Cloudiness</td>
<td>Sewage (toilet paper, etc.)</td>
<td>Dumping (bulk)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Grey</td>
<td>Cloudy</td>
<td>Petroleum (oil sheen)</td>
<td>Excessive Sedimentation</td>
</tr>
<tr>
<td>Substantial</td>
<td>Yellow</td>
<td>Opaque</td>
<td>Other:</td>
<td>Needs Regular Maintenance</td>
</tr>
<tr>
<td>Other:</td>
<td>Green</td>
<td>Other:</td>
<td>Other:</td>
<td>Bank Erosion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDITION:</th>
<th>DEPOSITS/STAINS:</th>
<th>VEGGIE DENSITY:</th>
<th>PIPE BENTHIC GROWTH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Chip/Cracked</td>
<td>Oily</td>
<td>None</td>
<td>Orange</td>
</tr>
<tr>
<td>Peeling Paint</td>
<td>Flow Line</td>
<td>Normal</td>
<td>Green</td>
</tr>
<tr>
<td>Corrosion</td>
<td>Paint</td>
<td>Excessive</td>
<td>Other:</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE:</th>
<th>FOR FLOWING ONLY:</th>
<th>POOL QUALITY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge investigation</td>
<td>COLOR:</td>
<td>No pool</td>
</tr>
<tr>
<td>Stream daylighting</td>
<td>TURBIDITY:</td>
<td>Brown</td>
</tr>
<tr>
<td>Storm water retrofit</td>
<td>FLOATABLES:</td>
<td>Orange</td>
</tr>
<tr>
<td>Other:</td>
<td>OTHER CONCERNS:</td>
<td>Other:</td>
</tr>
<tr>
<td>No</td>
<td>Excess Trash (paper/plastic bags)</td>
<td>Excessive Sedimentation</td>
</tr>
<tr>
<td>Yes</td>
<td>Dumping (bulk)</td>
<td>Needs Regular Maintenance</td>
</tr>
<tr>
<td>Not investigated</td>
<td>Bank Erosion</td>
<td>Other:</td>
</tr>
</tbody>
</table>

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
- Land Use description: __________________________
- Area available: __________________________

<table>
<thead>
<tr>
<th>OUTFALL SEVERITY:</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(circle #)</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES:</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKETCH/NOTES:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Storm Water Outfalls

**Watershed/Subshed:** OT

**Survey Reach ID:** [Image]

**Site ID (Condition-#):** OT-

**Date:** __/__/__ **Assessed By:**

**Time:** 3:00 AM/PM **Photo ID:** (Camera-Pic #) 31

**LatLng:** 42° 24' 0.1" **LMK**

**GPS:** (Unit ID)

---

<table>
<thead>
<tr>
<th>Bank:</th>
<th>Type:</th>
<th>Material:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Closed pipe</td>
<td>Concrete</td>
</tr>
<tr>
<td>Right</td>
<td>Open channel</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow:</th>
<th>Condition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>Chip/Cracked</td>
</tr>
<tr>
<td>None</td>
<td>Peeling Paint</td>
</tr>
<tr>
<td>None</td>
<td>Corrosion</td>
</tr>
<tr>
<td>None</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Odor:</th>
<th>Deposits/Stains:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>Gas</td>
</tr>
<tr>
<td>None</td>
<td>Sewage</td>
</tr>
<tr>
<td>None</td>
<td>Rancid/Sour</td>
</tr>
<tr>
<td>None</td>
<td>Sulfide</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Veggie Density:</th>
<th>Pipe Benthic Growth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td>Brown</td>
</tr>
<tr>
<td>None</td>
<td>Orange</td>
</tr>
<tr>
<td>None</td>
<td>Green</td>
</tr>
<tr>
<td>None</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow quality:</th>
<th>Other Concerns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Excess Trash (paper/plastic bags)</td>
</tr>
<tr>
<td>None</td>
<td>Dumping (bulk)</td>
</tr>
<tr>
<td>None</td>
<td>Excessive Sedimentation</td>
</tr>
<tr>
<td>None</td>
<td>Needs Regular Maintenance</td>
</tr>
<tr>
<td>None</td>
<td>Bank Erosion</td>
</tr>
<tr>
<td>None</td>
<td>Other</td>
</tr>
</tbody>
</table>

---

**Potential Restoration Candidate:**

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?
  - Yes
  - No
  - Not investigated
- Land Use description: __________________________
- Area available: __________________________

---

**Outfall Severity:**

- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

---

**Sketch/Notes:**

- [Handwritten notes: 6 inch drop from _______]

**Reported to authorities:**

- Yes □ No □
**Storm Water Outfalls**

**Watershed/Subshed:** Mobile Tannehasee River

**Survey Reach ID:** MTR-01

**Time:** : AM/PM

**Photo ID:** (Camera-Pic #)

**Site ID (Condition-#):** OT-04

**Lat:** 31° 49' 26.31"

**Long:** 87° 23' 57.37"

**LMK:**

**Bank:**
- [ ] LT [ ] RT [ ] Head

**Flow:**
- [ ] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

**Condition:**
- [ ] None
- [ ] Chip/Cracked
- [ ] Peeling Paint
- [ ] Corrosion
- [ ] Other:

**Odor:**
- [ ] None
- [ ] Gas
- [ ] Sewage
- [ ] Rancid/Sour
- [ ] Sulfide
- [ ] Other:

**Deposits/Stains:**
- [ ] None
- [ ] Oily
- [ ] Flow Line
- [ ] Paint
- [ ] Other:

**Vegetation Density:**
- [ ] None
- [ ] Normal
- [ ] Inhibited
- [ ] Excessive
- [ ] Other:

**Pipe Benthic Growth:**
- [ ] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

**Pool Quality:**
- [ ] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

**Potential Restoration Candidate:**
- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] 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?
  - [ ] Yes
  - [ ] No
  - [ ] Not investigated
  - Land Use Description: ________________________
  - Area available: ____________________________

**Outfall Severity:**
- [ ] 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 have a significant impact downstream.
- [ ] 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.
- [ ] Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

**Reported to Authorities:** [ ] Yes [ ] No
## Trash and Debris

**Watershed/Subshed:** Tankershoen Brier

**Survey Reach ID:** MTR-01

**Time:** 7:50 AM/PM

**Photo ID:** (Camera-Pic #)

**Site ID:** (Condition #) TR-01

**Lat:** 41°49'36.0"  **Long:** 72°28'12.6"

**Land Ownership:**
- Public
- Unknown
- Private

**Potential Restoration Candidate:**
- Stream cleanup
- Stream adoption segment
- Removal/prevention of dumping
- No

**Equipment Needed:**
- Heavy equipment
- Trash bags
- Unknown

**Who Can Do It:**
- Volunteers
- Local Gov
- Hazmat Team
- 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 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 drums or indications of hazardous materials.

**Notes:**
- Blue plastic 55 gallon barrel/drum labeled ZYKO cold pro
- Do not know if barrel is sealed or open

**Reported to Authorities:**
- Yes
- No
<table>
<thead>
<tr>
<th>WATERED/SUBSHED: Mobile Tonnawanda Bn.</th>
<th>DATE: 6 / 1 / 06</th>
<th>ASSESSED BY: 35, 6A, 9K, PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID: MTR-01</td>
<td>TIME: 2:36 AM/PM</td>
<td># 28, 29</td>
</tr>
<tr>
<td>PHOTO ID: (Camera-Pic #)</td>
<td>LAT: 41° 44' 36.3&quot;</td>
<td>LONG: 72° 26' 18.4&quot;</td>
</tr>
<tr>
<td>SITE ID: (Condition #)</td>
<td>LMK</td>
<td>GPS: (Unit ID)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Plastic</td>
<td>Unknown</td>
<td>Stream</td>
<td>Public</td>
<td>2 - 3</td>
</tr>
<tr>
<td></td>
<td>Paper</td>
<td>Flooding</td>
<td>Riparian Area</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Illegal dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical</td>
<td>Trash bags</td>
<td>Local outfall</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Right bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>EQUIPMENT NEEDED:</th>
<th>WHO CAN DO IT:</th>
<th>DUMPSTER WITHIN 100 FT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream cleanup</td>
<td>🗑️ Heavy equipment</td>
<td>🗑️ Volunteers</td>
<td>🗑️ Yes</td>
</tr>
<tr>
<td>Stream adoption segment</td>
<td>🗑️ Trash bags</td>
<td>🗑️ Local Gov</td>
<td>🗑️ No</td>
</tr>
<tr>
<td>Removal/prevention of dumping</td>
<td>🗑️ Unknown</td>
<td>🗑️ Hazmat Team</td>
<td>🗑️ Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLEAN-UP POTENTIAL:</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small amount of trash (i.e., less than two pickup truck loads) located inside a park 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.</td>
<td>WE WERE TOLD BY NEIGHBORS OF SITE THAT BERNARD DPW CAME OUT TO REMOVE BEAVER DAM. DEBRIS WAS PILED ON EITHER SIDE OF STREAM CHANNEL. DEBRIS ON RESIDENTIAL SIDE WAS REMOVED BY HOMEOWNERS. DEBRIS ON FOR SIDE WAS LEFT.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>
**Trash and Debris**

**WATERSHED/SUBSHED:** Middle Toanoahoen River  
**DATE:** 6/1/07  
**ASSESSED BY:** JS, GA

**SURVEY REACH ID:** MTH-01  
**TIME:** 3:20 AM/PM  
**PHOTO ID:** (Camera-Pic #)

**SITE ID:** (Condition-) TR-05  
**LAT:** 41° 49' 36"  
**LONG:** 72° 29' 00"  
**LMK**  
**GPS:** (Unit ID)

<table>
<thead>
<tr>
<th><strong>TYPE:</strong></th>
<th><strong>MATERIAL:</strong></th>
<th><strong>SOURCE:</strong></th>
<th><strong>LOCATION:</strong></th>
<th><strong>LAND OWNERSHIP:</strong></th>
<th><strong>AMOUNT (# Pickup truck loads):</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Residential</td>
<td>☑ Plastic</td>
<td>☑ Unknown</td>
<td>Stream</td>
<td>☑ Public</td>
<td>2 or 3</td>
</tr>
<tr>
<td></td>
<td>☑ Tires</td>
<td>☑ Flooding</td>
<td>Riparian Area</td>
<td>☑ Private</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☑ Appliances</td>
<td>☑ Illegal dump</td>
<td>Lt. bank</td>
<td>☑ Unknown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☑ Automotive</td>
<td>☑ Local outfall</td>
<td>Rt. bank</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**POTENTIAL RESTORATION CANDIDATE:** ☑ Stream cleanup  
☐ Stream adoption segment  
☐ Removal/prevention of dumping

**If yes for trash or debris removal:** ☑ 
☐ no  

**EQUIPMENT NEEDED:**  
☐ Heavy equipment  
☐ Trash bags  
☐ Unknown

**WHO CAN DO IT:** ☑ Volunteers  
☐ Local Gov  
☑ Hazmat Team  
☐ Other

**DUMPSTER WITHIN 100 FT:** ☑ Yes  
☐ No  
☐ Unknown

**CLEAN-UP POTENTIAL:**  
(Circle #) 2 3 4 0

- 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:**  
ARE NOT SURE WHAT THE BUCKETS CONTAIN. THEY ARE CONCEALED AND SUNK INTO THE RIVER BOTTOM.  
- 16 BUCKETS TOTAL MAYBE MORE

**REPORTED TO AUTHORITIES:** ☑ YES  
☐ NO
### Reach Level Assessment

**SURVEY REACH ID:** M17-01  
**WTRSH/SUBSHD:** Muddy Fork

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DATE:</strong></td>
<td>6/14/08</td>
</tr>
<tr>
<td><strong>ASSESS BY:</strong></td>
<td>JS + GA</td>
</tr>
</tbody>
</table>

**START**  
**TIME:** 3:45 AM/PM  
**LMK:**  
**LAT:** 41° 49' 56.8"  
**LONG:** 92° 27' 10.3"  
**DESCRIPTION:** Stream divided in two

**END**  
**TIME:** 4:10 AM/PM  
**LMK:**  
**LAT:** 41° 49' 37.4"  
**LONG:** 92° 27' 50.9"  
**DESCRIPTION:** Tunnel Road Culvert

---

### Rain in Last 24 Hours
- None  
- None  

### Present Conditions
- Heavy rain  
- Intermittent  
- Trace  
- Overcast  
- Partly cloudy  

### Surrounding Land Use
- Industrial  
- Commercial  
- Golf course  
- Park  
- Crop  
- Pasture  
- Other: Highway, roadways

### Water Clarity
- Clear  
- Turbid (suspended matter)  
- Stained (clear, naturally colored)  
- Opaque (milky)  
- Other (chemicals, dyes)

### Aquatic Plants in Stream
- Attached:  
- Floating:  

### Wildlife in or Around Stream
- Fish  
- Beaver  
- Deer  
- Snails  
- Other:  

### Stream Shading (water surface)
- Mostly shaded (≥75% coverage)  
- Halfway (≥50%)  
- Partially shaded (≥25%)  
- Unshaded (< 25%)

### Channel Dynamics
- Downcutting  
- Widening  
- Headcutting  
- Aggrading  
- Channalization  
- Sed. deposition  
- Bed scour  
- Bank failure  
- Bank scour  
- Slope failure

### Channel Dimensions
- Height: LT bank: 3 ft  
- RT bank: 3 ft  
- Width: Bottom: 15 ft  
- Top: 20 ft

### Reach Sketch and Site Impact Tracking

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.

---

### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

<table>
<thead>
<tr>
<th>Number</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Good</td>
</tr>
<tr>
<td>4</td>
<td>Fair</td>
</tr>
<tr>
<td>3</td>
<td>Difficult</td>
</tr>
</tbody>
</table>

---

**NOTES:** (biggest problem you see in survey reach)
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>IN-STREAM HABITAT (May modify criteria based on appropriate habitat regime)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGETATIVE PROTECTION (score each bank; determine sides by facing downstream)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>50-70% of the streambank surfaces covered by native vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK EROSION (facing downstream)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN Connection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN VEGETATION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN ENCROACHMENT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
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<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: [number] /80 + Buffer/Floodplain: [number] /80 = Total Survey Reach [number] /160
<table>
<thead>
<tr>
<th>Condition:</th>
<th>Material:</th>
<th>Shape:</th>
<th>Dimension:</th>
<th>Submerged:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Concrete</td>
<td>Single</td>
<td>Diameter: 0</td>
<td>None</td>
</tr>
<tr>
<td>Chip/Cracked</td>
<td>PVC/Plastic</td>
<td>Double</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Peeling Paint</td>
<td>Brick</td>
<td>Elliptical</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Corrosion</td>
<td>Other:</td>
<td>Triple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deposits/Stains:</th>
<th>Veggie Density:</th>
<th>Pipe Benthic Growth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Oily</td>
<td>Inhibited</td>
<td>Brown</td>
</tr>
<tr>
<td>Flow Line</td>
<td>Excessive</td>
<td>Orange</td>
</tr>
<tr>
<td>Paint</td>
<td>Other:</td>
<td>Green</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flowing Turbidity:</th>
<th>Only:</th>
<th>Pool Quality:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Clear</td>
<td>No pool</td>
</tr>
<tr>
<td>Slight Cloudiness</td>
<td>Brown</td>
<td>Good</td>
</tr>
<tr>
<td>Cloudy</td>
<td>Grey</td>
<td>Odors</td>
</tr>
<tr>
<td>Opaque</td>
<td>Yellow</td>
<td>Colors</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Oils</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>Suds</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Algae</td>
</tr>
<tr>
<td></td>
<td>Other:</td>
<td>Floatables</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Concerns:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess Trash (paper/plastic bags)</td>
<td>Dumping (bulk)</td>
<td>Excessive Sedimentation</td>
</tr>
<tr>
<td>Needs Regular Maintenance</td>
<td>Bank Erosion</td>
<td>Other:</td>
</tr>
</tbody>
</table>

Potential Restoration Candidate: Discharge investigation Stream daylighting Local stream repair/outfall 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 investigated

Outfall Severity: (circle #)

<table>
<thead>
<tr>
<th></th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small discharge</td>
<td>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.</td>
</tr>
</tbody>
</table>

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

Sketch/Notes:
**Stream Crossing**

**WATERSHED/SUBSHED:** Middle Tank  
**DATE:** 6/4/08  
**ASSESSED BY:** Friends

**SURVEY REACH ID:** MTR 0.2  
**TIME:** 4:19 AM  
**PHOTO ID:** (Camera-Pic #)

**SITE ID:** (Condition-#) SC-01  
**LAT:** 41° 49' 32.4"  
**LONG:** 72° 07' 50.9"  
**LMK:**  
**GPS (Unit ID):**

**TYPE:**  
- [ ] Road Crossing  
- [ ] Railroad Crossing  
- [ ] Manmade Dam  
- [ ] Beaver Dam  
- [ ] Geological Formation  
- [ ] Other:

**FOR ROAD/RAILROAD CROSSINGS ONLY**  
- [ ] Arch  
- [ ] Bottomless  
- [ ] Box  
- [ ] Elliptical  
- [ ] Circular  
- [ ] Other:

**SHAPE:**

**# BARRELS:**

**MATIERIAL:**

**ALIGNMENT:**

**DIMENSIONS:** (if variable, sketch)

- [ ] Flow-aligned  
- [ ] Not flow-aligned  
- [ ] Do not know

**CULVERT SLOPE:**

- [ ] Flat  
- [ ] Slight (2° – 5°)  
- [ ] Obvious (>5°)

**CONDITION:** (Evidence of...)

- [ ] Cracking/chipping/corrosion  
- [ ] Downstream scour hole  
- [ ] Sediment deposition  
- [ ] Failing embankment  
- [ ] 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

**EXTENT OF PHYSICAL BLOCKAGE:**

- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown

**CAUSE:**

- [ ] Drop too high  
- [ ] Flow too shallow  
- [ ] Other:

**BLOCKAGE SEVERITY:** (circle #)

- [ ] 5  
- [ ] 4  
- [ ] 3  
- [ ] 2  
- [ ] 1

**NOTES/SKETCH:**

**REPORTED TO AUTHORITIES**

- [ ] Yes  
- [ ] No
Reach Level Assessment

SURVEY REACH ID: MT6-07
WTRSHD/SUBSHD: Most Tank Rev.
DATE: 6/1/08
ASSESSED BY:

START TIME: 12:45 PM
END TIME: 4:45 PM
LMK:
LAT 41° 49' 16.3" LONG 72° 27' 12.8"

RAIN IN LAST 24 HOURS:
- None
- Heavy rain
- Steady rain
- Intermittent
- Trace
- Overcast
- Partly cloudy

PRESENT CONDITIONS:
- None
- Heavy rain
- Steady rain
- Intermittent
- Clear
- Trace
- Overcast
- Partly cloudy
- Stained
- Clear, naturally colored
- Opaque (milky)
- Other (chemicals, dyes)

SURROUNDING LAND USE:
- Industrial
- Commercial
- Golf course
- Park
- Urban/Residential
- Suburban/Res
- Forested
- Institutional
- Pasture
- Other:

AVERAGE CONDITIONS (check applicable):

BASE FLOW AS %
- 0-25%
- 25-50%
- 50%-75%
- 75-100%

DOMINANT SUBSTRATE:
- Silt/clay (fine or slick)
- Sand (gritty)
- Gravel (0.1-2.5")
- Cobble (2.5-10")
- Boulder (>10")

WATER CLARITY:
- Clear
- Turbid (suspended matter)
- Stained
- Clear, naturally colored
- Opaque (milky)
- Other (chemicals, dyes)

WILDLIFE IN OR AROUND STREAM:
- Fish
- Beaver
- Deer
- Snails
- Other:

STREAM SHADING (water surface):
- Mostly shaded (≥75% coverage)
- Halfway (≥50%)
- Partially shaded (≥25%)
- Unshaded (< 25%)

CHANNEL DYNAMICS:
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized
- Unknown

CHANNEL HEIGHT:
- LT bank 2.5 ft
- RT bank 3.5 ft
- Width: Bottom 13 ft
- Top 18 ft

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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

NOTES: (biggest problem you see in survey reach)

REACH SKETCH AND SITE IMPACT TRACKING:
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.

REPORTED TO AUTHORITIES: Yes

LAT 110" LONG 110"
### OVERALL STREAM CONDITION

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</thead>
<tbody>
<tr>
<td><strong>N-STREAM HABITAT</strong> <em>(May modify criteria based on appropriate habitat regime)</em></td>
<td>Greater than 70% of substrate favorable for epilithon 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
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</table>

| **VEGETATION 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 cm (centimeters) or less in average stubble height. |

| **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. |

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
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<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
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</table>

| **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. |

| **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. |

| **FLOODPLAIN ENCROACHMENT** | 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 fill material, 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. |

Sub Total In-stream: 67 / 80 + Buffer/Floodplain: 70 / 80 - Total Survey Reach: 137 / 160
Reach Level Assessment

**SURVEY REACH ID:** MTH-04

**WTRSHD/SUBSHD:** Middle Tank, R.

**DATE:** 6/15/06

**ASSESSED BY:** [Blank]

**START**

**TIME:** 1:49 AM/PM

**LMK:** [Blank]

**LAT:** 41° 49' 49.7" N

**LONG:** 71° 29' 28.2" W

**DESCRIPTION:** Confluence of Clarkbrook Tank

**END**

**TIME:** 2:52 AM/PM

**LMK:** [Blank]

**LAT:** 41° 49' 49.6" N

**LONG:** 71° 26' 57.1" W

**DESCRIPTION:** Confluence of Tank Railroad Brook

**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:**

- □ Industrial
- □ Commercial
- □ Golf course
- □ Park
- □ Urban/Residential
- □ Suburban/Res
- □ Forested
- □ Institutional
- □ Crop
- □ Pasture
- □ Other

**DOMINANT SUBSTRATE**

- □ Silt/clay (fine or slick)
- □ Cobble (2.5—10")
- □ Sand (gritty)
- □ Boulder (>10")
- □ Gravel (0.1-2.5")
- □ Bedrock

**WATER CLARITY**

- □ Clear
- □ Turbid (suspended matter)
- □ Stained (clear, naturally colored)
- □ Opaque (milky)
- □ Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM**

- Attached: □ none □ some □ lots
- Floating: □ none □ some □ lots

**WILDLIFE IN OR AROUND STREAM**

- Evidence of
- □ Fish
- □ Beaver
- □ Deer
- □ Snails
- □ Other: [Blank]

**STREAM SHADING**

- Mostly shaded (>75% coverage)
- Halfway (>50%)
- Partially shaded (>25%)
- Unshaded (<25%)

**CHANNEL DYNAMICS**

- □ Downcutting
- □ Widening
- □ Headcutting
- □ Aggrading
- □ Sed. deposition
- □ Bed scour
- □ Bank failure
- □ Bank scour
- □ Slope failure
- □ Channelized
- □ Unknown

**CHANNEL DIMENSIONS**

- FACING (DOWNSTREAM)
  - Height: LT bank 3.0 (ft)
  - RT bank 3.0 (ft)
  - Width: Bottom 165 (ft)
  - Top 148 (ft)

**REACH ACCESSIBILITY**

- Good: Open area in public ownership, sufficient room to stockpile materials, easy access 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 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.

**NOTES:** (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES:** □ Yes □ No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong></td>
<td>Overall: when 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 pummeled and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
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<td><strong>VEGETATIVE PROTECTION</strong></td>
<td>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.</td>
<td>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.</td>
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<tr>
<td><strong>BANK EROSION</strong> (facing downstream)</td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. (&lt;5% of bank affected).</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
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</tr>
</tbody>
</table>

Sub Total In-stream: 177/80
Sub Total Buffer/Floodplain: 76/80
Total Survey Reach = 153/160
### Overall Stream Condition

<table>
<thead>
<tr>
<th>N-Stream Habitat</th>
<th>Optimal</th>
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<thead>
<tr>
<th>Vegetative Protection</th>
<th></th>
<th></th>
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</tbody>
</table>

| Bank Erosion | 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 failures/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. |

| 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) able to enter floodplain. Stream not deeply entrenched. | High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched. |

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Predominant floodplain vegetation type is mature forest</th>
<th>Predominant floodplain vegetation type is shrub or old field</th>
<th>Predominant floodplain vegetation type is turf or crop land</th>
</tr>
</thead>
</table>

| 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 |

| Floodplain Encroachment | 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 |

Sub Total In-stream: 155 /80 + Buffer/Floodplain: 49 /80 = Total Survey Reach: 204 /160
| WATERSHED/SUBSHED: Middle Tock River | DATE: 6/15/08 | ASSESSED BY: JS/JR (M/A) |
| SURVEY REACH ID: 012-Z9 | TIME: 10:05 AM/PM | PHOTO ID: (Camera-Pic #) 4/# |
| SITE ID (Condition #): OT-10 | LAT 41° 49.273' LONG 72° 27.540' | LMK | GPS: (Unit ID) |

| BANK: | TYPE: | MATERIAL: | SHAPE: | DIMENSIONS: | SUBMERGED: |
| LT | RT | Head | Closed pipe | Concrete | Single | Diameter: 15 (in) |
| None | Trickle | PVC/Plastic | Circular | None |
| Open channel | Concrete | Earthen | Elliptical | Partially |
| Other: | Other: | Other: | Other: | Fully |

| FLOW: | CONDITION: | ODOR: | DEPOSITS/STAINS: | VEGGIE DENSITY: | PIPE BENTHIC GROWTH: |
| None | None | None | None | None | None |
| None | None | None | None | None | None |
| None | None | None | None | None | None |
| None | None | None | None | None | None |
| None | None | None | None | None | None |

| CONDITION: | ODOR: | DEPOSITS/STAINS: | VEGGIE DENSITY: | PIPE BENTHIC GROWTH: |
| None | None | None | None | None |

| COLOR: | CLEAR | BROWN | GREY | YELLOW | GREEN | ORANGE | RED | OTHER: |
| Clear | Brown | Grey | Yellow | Green | Orange | Red |

| TURBIDITY: | FLOATABLES: |
| None | None |
| None | Sewage (toilet paper, etc.) | Petroleum (oil sheen) |

| FLOATABLES: | OTHER CONCERNS: |
| None | Excess Trash (paper/plastic bags) |
| None | Dumping (bulk) |
| None | Excessive Sedimentation |

| OTHER CONCERNS: | POTENTIAL RESTORATION CANDIDATE: |
| Needs Regular Maintenance | Discharge investigation |
| Bank Erosion | Storm water retrofit |
| Other | Local stream repair/outfall stabilization |

| For Flowing Only: |
| Color: |
| Turbidity: |
| Floatables: |

| Other Concerns: |
| Excess Trash (paper/plastic bags) |
| Dumping (bulk) |
| Excessive Sedimentation |

| Potentially Restoration Candidate: |
| Discharge investigation |
| Storm water retrofit |

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 investigated Land Use description: ____________________________ 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 stream; discharge appears to be having a significant impact downstream. |
| 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. |
| Outfall does not have dry weather discharge; staining or appearance of causing any erosion problems. |

| 5 | 4 | 3 | 2 | 1 |

| Sketch/Notes: |
| Black pipe coming from residence/drainway on wall are unclear of purpose. Is this legal? Silty discharge/brown |

| REPORTED TO AUTHORITIES: |
| Yes | No |
Storm Water Outfalls

**Watershed/Subshed:** Hidden Tank

**Survey Reach ID:** M72 00

**Date:** 6/14/106

**Assessed By:** Friends

**Site ID (Condition #):** OT-01

**Latitude:** 40° 49.35.7" **Longitude:** 72° 37.54.5"

**Photo ID:** (Camera-Pic #) #48

### Bank:
- [ ] LT
- [ ] RT
- [ ] Head

### Flow:
- [ ] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

### Type:
- [ ] Closed pipe
- [ ] Open channel

### Material:
- [ ] Concrete
- [ ] Metal
- [ ] PVC/Plastic
- [ ] Brick
- [ ] Other:

### Shape:
- [ ] Single
- [ ] Circular
- [ ] Double
- [ ] Elliptical
- [ ] Triple
- [ ] Other:

### Dimensions:
- Diameter: ___ (in)
- Depth: ___ (in)
- Width (Top): ___ (in)
- Width (Bottom): ___ (in)

### Submerged:
- [ ] No
- [ ] Partially
- [ ] Fully

### 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 Growth:
- [ ] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

### Pool Quality:
- [ ] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

### For Flowing Only:
- [ ] Color:
  - [ ] Clear
  - [ ] Brown
  - [ ] Grey
  - [ ] Yellow
  - [ ] Green
  - [ ] Orange
  - [ ] Red
  - [ ] Other:

- [ ] Turbidity:
  - [ ] None
  - [ ] Slight Cloudiness
  - [ ] Cloudy
  - [ ] Opaque

- [ ] Floatables:
  - [ ] None
  - [ ] Sewage (toilet paper, etc.)
  - [ ] Petroleum (oil sheen)
  - [ ] Other:

### Other Concerns:
- [ ] Excess Trash (paper/plastic bags)
- [ ] Dumping (bulk)
- [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance
- [ ] Bank Erosion
- [ ] Other:

### Potential Restoration Candidate:
- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] Other:

**If yes for daylighting:**
- Length of vegetation cover from outfall: _____ ft
- Type of existing vegetation: ______________
- Slope: _____

**If yes for stormwater:**
- Is stormwater currently controlled?
  - [ ] Yes
  - [ ] No
  - [ ] Not investigated

- Land Use description: __________________________

**Outfall Severity:**

- [ ] Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of natural flow in receiving stream; discharge appears to be having a significant impact downstream.
- [ ] 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.

**Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.**

**Sketch/Notes:**

---

**Reported to Authorities:** [ ] Yes  [ ] No
<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Middly Tank</th>
<th>Date:</th>
<th>6/1/08</th>
<th>Assessed By:</th>
<th>Friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>HTE 09</td>
<td>Time:</td>
<td>5:32 AM/PM</td>
<td>Photo ID:</td>
<td>(Camera-Pic #)</td>
</tr>
<tr>
<td>Site ID (Condition-#): OT-02</td>
<td>Lat: 41° 49' 31.3&quot;</td>
<td>Long: 72° 27' 31.1&quot;</td>
<td>LMK</td>
<td>GPS: (Unit ID)</td>
<td></td>
</tr>
</tbody>
</table>

**Bank:**
- LT [ ] RT [ ] Head [ ]
- Closed pipe [ ]
- Open channel [ ]
- Concrete [ ]
- Earthen [ ]
- Other: [ ]
- Metal [ ]
- PVC/Plastic [ ]
- Brick [ ]
- Other: [ ]

**Flow:**
- None [ ]
- Trickle [ ]
- Moderate [ ]
- Substantial [ ]
- Other: [ ]

**Condition:**
- None [ ]
- Chip/Cracked [ ]
- Peeling Paint [ ]
- Corrosion [ ]
- Other: [ ]

**Flow:**
- Gas [ ]
- Sewage [ ]
- Rancid/Sour [ ]
- Sulfide [ ]
- Other: [ ]

**Deposits/Stains:**
- None [ ]
- Oily [ ]
- Flow Line [ ]
- Paint [ ]
- Other: [ ]

**Turbidity:**
- None [ ]
- Slight Cloudiness [ ]
- Cloudy [ ]
- Opaque [ ]

**Other Concerns:**
- Excess Trash (paper/plastic bags) [ ]
- Dumping (bulk) [ ]
- Excessive Sedimentation [ ]
- Needs Regular Maintenance [ ]
- Bank Erosion [ ]
- Other: [ ]

**Potential Restoration Candidate:**
- Discharge investigation [ ]
- Stream daylighting [ ]
- Local stream repair/outfall stabilization [ ]
- Storm water retrofit [ ]
- 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? [ ] Yes [ ] No [ ] Not investigated [ ]
- Land Use description: ______________________
- Area available: ______________________

**Outfall Severity:**
- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

---

**Reported to Authorities:** [ ] Yes [ ] No
**Storm Water Outfalls**

**Watershed/Subshed:** MiddleTol

**Survey Reach ID:** MT2-09

**Site ID (Condition-#):** OT-08

**Date:** 6/14/08

**Assessed by:** Friends

**Photo ID:** (Camera-Pic #) /#

**Photo ID:** (Unit ID)

**Bank:**
- [X] LT
- [ ] RT
- [ ] Head

**Flow:**
- [X] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

**Condition:**
- [X] None
- [ ] Chip/Cracked
- [ ] Peeling Paint
- [ ] Corrosion
- [ ] Other:

**Odor:**
- [X] No
- [ ] Gas
- [ ] Sewage
- [ ] Rancid/Sour
- [ ] Sulfide
- [ ] Other:

**Deposits/Stains:**
- [X] None
- [ ] Oily
- [ ] Flow Line
- [ ] Paint
- [ ] Other:

**Veggie Density:**
- [X] None
- [ ] Normal
- [ ] Inhibited
- [ ] Excessive
- [ ] Other:

**Pipe Benthic Growth:**
- [X] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

**Pool Quality:**
- [X] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

**For flowing only:**
- [ ] Color:
  - [ ] Clear
  - [ ] Brown
  - [ ] Grey
  - [ ] Yellow
  - [ ] Green
  - [ ] Orange
  - [ ] Red
  - [ ] Other:

- [ ] Turbidity:
  - [X] None
  - [ ] Slight Cloudiness
  - [ ] Cloudy
  - [ ] Opaque

- [ ] Floatables:
  - [X] None
  - [ ] Sewage (toilet paper, etc.)
  - [ ] Petroleum (oil sheen)
  - [ ] Other:

**Other concerns:**
- [ ] Excess Trash (paper/plastic bags)
- [ ] Dumping (bulk)
- [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance
- [ ] Bank Erosion
- [ ] Other:

**Potential Restoration Candidate:**
- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [X] No
- [ ] Storm water retrofit
- [ ] 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?
  - [X] Yes
  - [ ] No
  - [ ] Not investigated

- Land Use description: __________

- 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 stream; discharge appears to be having a significant impact downstream.
  - 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.
  - Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

**Reported to Authorities:**
- [ ] Yes
- [ ] No
Storm Water Outfalls

WATERSHED/SUBSHED: Middle Town

SURVEY REACH ID: MTR 09
SITE ID (Condition-#): OT- 01

DATE: 6/14/08
ASSESSED BY:

PHOTO ID: (Camera-Pic #) /#

LAT ° ‘ ’ ’ ’ ” ” LONG ° ‘ ’ ” ” LMK

BANK: [ ] LT [ ] RT [ ] Head
[ ] Open channel

FLOW: [ ] None [ ] Trickle [ ] Moderate [ ] Substantial [ ] Other:
[ ] Open channel

TYPE: [ ] Closed pipe [ ] Concrete [ ] Earthen
[ ] Trapezoid

MATERIAL: [ ] Concrete [ ] Metal [ ] PVC/Plastic [ ] Brick [ ] Other:
[ ] Other:

SHAPE: [ ] Single [ ] Circular [ ] Double [ ] Elliptical [ ] Triple
[ ] Trapezoid

DIMENSIONS: Diameter: (in)
Width (Top): (in)

SUBMERGED: [ ] No [ ] Partially [ ] Fully

CONDITON: [ ] 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 GROWTH: [ ] None [ ] Brown [ ] Orange [ ] Green [ ] Other:

POOL QUALITY: [ ] No pool [ ] Good [ ] Odors [ ] Colors [ ] Oils [ ] Other:

FOR FLOWING ONLY
COLOR: [ ] Clear [ ] Brown [ ] Grey [ ] Yellow [ ] Green [ ] Orange [ ] Red [ ] Other:
TURBIDITY: [ ] None [ ] Slight Cloudiness [ ] Cloudy [ ] Opaque

FLOATABLES: [ ] None [ ] Sewage (toilet paper, etc.) [ ] Petroleum (oil sheen) [ ] Other:

OTHER CONCERNS:
[ ] Excess Trash (paper/plastic bags) [ ] Dumping (bulk) [ ] Excessive Sedimentation
[ ] Needs Regular Maintenance [ ] Bank Erosion [ ] Other:

OUTFALL SEVERITY: (circle #)

5 4 3 2 1

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 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.

OUTFALL DOES NOT HAVE DRY WEATHER DISCHARGE; STAINING; OR APPEARANCE OF CAUSING ANY EROSION PROBLEMS.

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 investigated
Land Use description:

Area available:

REPORTED TO AUTHORITIES: [ ] YES [ ] NO

REPORTED TO AUTHORITIES: [ ] YES [ ] NO
**Storm Water Outfalls**

**Watershed/Subshed:** Middle Tank

**Survey Reach ID:** MT-09

**Site ID (Condition-#):** OT-08

**Date:** 6/14/08

**Assessed By:** Friends

**Photo ID:** (Camera-Pic #)

**Time:** 5:53 AM/PM

**Photo ID:** (Camera-Pic #)

**Site Lat & Long:** 41° 49' 31.3" N 72° 27' 55.0" W

**LMK:**

**GPS:** (Unit ID)

---

**Bank:**
- LT
- RT
- Head

**Flow:**
- None
- Trickle
- Moderate
- Substantial
- Other:
- Open channel

**Type:**
- Closed pipe

**Material:**
- Concrete
- Metal
- PVC/Plastic
- Brick
- Other:

**Shape:**
- Single
- Circular
- Double
- Elliptical
- Triple
- Other:

**Dimensions:**
- Diameter: __ (in)
- Depth: __ (in)
- Width (Top): __ (in)
- Width (Bottom): __ (in)

**Submerged:**
- No
- Partially
- Fully

**Not Applicable**

---

**Condition:**
- None
- Chip/Cracked
- Peeling Paint
- Corrosion
- Other:

**Odor:**
- No
- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

**Deposits/Stains:**
- None
- Oily
- Flow Line
- Paint
- Other:

**Vegetation Density:**
- None
- Normal
- Inhibited
- Excessive
- Other:

**Pipe Benthic Growth:**
- None
- Brown
- Orange
- Green
- Other:

**Pool Quality:**
- No pool
- Good
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

---

**For Flowing Only**

**Color:**
- Clear
- Brown
- Grey
- Yellow
- Green
- Orange
- Red
- Other:

**Turbidity:**
- None
- Slight Cloudiness
- Cloudy
- Opaque

**Floatables:**
- None
- Sewage (toilet paper, etc.)
- Petroleum (oil sheen)
- Other:

**Other Concerns:**
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

---

**Potential Restoration Candidate**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- Other:

**If yes for daylighting:**
- Length of vegetation cover from outfall: ______ feet
- Type of existing vegetation: ____________
- Slope: ______°

**If yes for stormwater:**
- Is stormwater currently controlled?
- Yes
- No
- Not investigated
- Land Use description: __________________________
- Area available: ______________________________

**Outfall Severity:**
- 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 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.
- Outfall does not have dry weather discharge; staining, or appearance of causing any erosion problems.

**Sketch/Notes:**
### Storm Water Outfalls

**Watershed/Subshed:** Middle Thumb  
**Survey Reach ID:** MTR 09  
**Site ID (Condition #:)** OT-001  
**Date:** 1/4/108  
**Assessed By:** Friends  
**Photo ID:** (Camera-Pic #) #560  
**Site Lat:** 41°39.295'  
**Long:** 72°27.549'  
**LMK:**  
**GPS:** (Unit ID)  

#### Potential Restoration Candidate

- [ ] Discharge investigation  
- [ ] Stream daylighting  
- [ ] Local stream repair/outfall stabilization  
- [ ] Storm water retrofit  
- [ ] 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: ____________________________  
- Area available:  
- Yes  
- No  
- Not investigated  

#### Sketch/Notes:

**Potential Restoration Candidate:**  
- Discharge investigation  
- Stream daylighting  
- Local stream repair/outfall stabilization  
- Storm water retrofit  
- Other:  

**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.  
- 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.  
- Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.  

**Outfall**  
- Head  
- Concrete  
- Metal  
- PVC/Plastic  
- Brick  
- Other:  

**Material:**  
- Single  
- Circular  
- Double  
- Elliptical  
- Triple  
- Other:  

**Shape:**  
- Single  
- Circular  
- Double  
- Elliptical  
- Triple  
- Other:  

**Dimensions:**  
- Diameter: ______ (in)  
- Depth: ______ (in)  
- Width (Top): ______ (in)  
- Bottom: ______ (in)  

**Submerged:**  
- No  
- Partially  
- Fully  
- Not Applicable  

**Flow:**  
- None  
- Trickle  
- Moderate  
- Substantial  
- Other:  

**Type:**  
- Closed pipe  
- Inlet  
- Open channel  
- Other:  

**Condition:**  
- None  
- Chip/Cracked  
- Peeling Paint  
- Corrosion  
- Other:  

**Pond Quality:**  
- No pond  
- Good  
- Odors  
- Colors  
- Oils  
- Suds  
- Algae  
- Floatables  
- Other:  

**Odor:**  
- None  
- Gas  
- Sewage  
- Rancid/Sour  
- Sulfide  
- Other:  

**Deposits/Stains:**  
- None  
- Oily  
- Flow Line  
- Paint  
- Other:  

**Vegetation Density:**  
- None  
- Normal  
- Inhibited  
- Excessive  
- Other:  

**Pipe Benthic Growth:**  
- None  
- Brown  
- Orange  
- Green  
- Other:  

**COLOR:**  
- Clear  
- Brown  
- Grey  
- Yellow  
- Green  
- Oily  
- Red  
- Other:  

**Turbidity:**  
- None  
- Slight Cloudiness  
- Cloudy  
- Opaque  

**Flow:**  
- Concrete  
- Earthen  
- Trapezoid  
- Parabolic  
- Other:  

**Pipe Material:**  
- Concrete  
- Metal  
- PVC/Plastic  
- Brick  
- Other:  

**Pipe Shape:**  
- Single  
- Circular  
- Double  
- Elliptical  
- Triple  
- Other:  

**Pipe Dimensions:**  
- Diameter: ______ (in)  
- Depth: ______ (in)  
- Width (Top): ______ (in)  
- Bottom: ______ (in)  

**Submerged:**  
- No  
- Partially  
- Fully  
- Not Applicable  

**Flowing Only:**  
- Color:  
- Clear  
- Brown  
- Grey  
- Yellow  
- Green  
- Oily  
- Red  
- Other:  

**Turbidity:**  
- None  
- Slight Cloudiness  
- Cloudy  
- Opaque  

**Other Concerns:**  
- Excess Trash (paper/plastic bags)  
- Dumping (bulk)  
- Excessive Sedimentation  
- Needs Regular Maintenance  
- Bank Erosion  
- Other:  

**Reported to Authorities:**  
- Yes  
- No  
- Not investigated
**Storm Water Outfalls**

**WATERSHED/SUBSHED:** Middle Tank  
**DATE:** 01.05.18  
**ASSESSED BY:** JS.  
**SURVEY REACH ID:** MT-09  
**TIME:** 9:49 AM/PM  
**PHOTO ID:** (Camera Pic #)  
**SITE ID:** OT-08  
**LAT:** 41° 49' 26.7"  
**LONG:** 72° 27' 51.5"  
**LMK:**  
**GPS:** (Unit ID)

<table>
<thead>
<tr>
<th>BANK</th>
<th>TYPE</th>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Closed pipe</td>
<td>Concrete</td>
<td>Single</td>
<td>Diameter: 24 in</td>
<td>No</td>
</tr>
<tr>
<td>trickle</td>
<td>Open channel</td>
<td>Concrete</td>
<td>Trapezoid</td>
<td>Depth: ___ (in)</td>
<td>Partially</td>
</tr>
<tr>
<td>None</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Width (Top): ___ (in)</td>
<td>Fully</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Other</td>
<td>Width (Bottom): ___ (in)</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

**FLOW:**  
- None  
- Moderate  
- Substantial  
- Other  
- Trickle

**SITE CONDITION:**  
- ODOR: None  
- DEPOSITS/STAINS: None  
- VEGGIE DENSITY: None

**DEPOSITS/STAINS:**  
- None  
- Oily  
- Flow Line  
- Paint  
- Other:

**VEGETATION:**  
- No pool  
- Good  
- Odors  
- Colors  
- Oils  
- Suds  
- Algae  
- Floatables

**COLOR:**  
- Clear  
- Brown  
- Grey  
- Yellow  
- Green  
- Orange  
- Red  
- Other:

**TURBIDITY:**  
- None  
- Slight Cloudiness  
- Cloudy  
- Opaque

**FLOATABLES:**  
- None  
- Sewage (toilet paper, etc.)  
- Petroleum (oil sheen)  
- Other:

**OTHER CONCERNS:**  
- Excess Trash (paper/plastic bags)  
- Dumping (bulk)  
- Excessive Sedimentation  
- Needs Regular Maintenance  
- Bank Erosion  
- Other:

**POSSIBLE RESTORATION CANDIDATE:**  
- Discharge investigation  
- Stream daylighting  
- Local stream repair/outfall stabilization  
- Storm water retrofit  
- 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?  
- Yes  
- No  
- Not investigated

**OUTFALL SEVERITY:**  
- 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 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.  
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**REPORTED TO AUTHORITIES:**  
- Yes  
- No
**Storm Water Outfalls**

**Watershed/Subshed:** Middle Tonn Run

**Survey Reach ID:** MK-09

**Time:** 9:51 AM/PM

**Photo ID:** (Camera Pic #) 2

**Site ID:** OT-09

**Lat:** 41° 49' 26.7'' **Long:** 72° 27' 31.5'' **LMK:**

**Type:**
- [ ] Closed pipe
- [ ] Open channel

**Material:**
- [ ] Concrete
- [ ] Metal
- [ ] PVC/Plastic
- [ ] Brick

**Shape:**
- [ ] Single
- [ ] Circular
- [ ] Elliptical

**Dimensions:**
- Diameter: 2 ft
- Depth: ________ (in)
- Width (Top): ________ (in)
- " (Bottom): ________ (in)

**Submerged:**
- [ ] No
- [ ] Partially
- [ ] Fully

**Flow:**
- [ ] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

**Condition:**
- [ ] None
- [ ] Chip/Cracked
- [ ] Peeling Paint
- [ ] Corrosion
- [ ] Other:

**Odor:**
- [ ] No
- [ ] Gas
- [ ] Sewage
- [ ] Rancid/Sour
- [ ] Sulfide
- [ ] Other:

**Deposits/Stains:**
- [ ] None
- [ ] Oily
- [ ] Flow Line
- [ ] Paint
- [ ] Other:

**Vegetable Density:**
- [ ] None
- [ ] Normal
- [ ] Inhibited
- [ ] Excessive
- [ ] Other:

**Pipe Benthic Growth:**
- [ ] None
- [ ] Brown
- [ ] Orange
- [ ] Green
- [ ] Other:

**Pool Quality:**
- [ ] No pool
- [ ] Good
- [ ] Odors
- [ ] Colors
- [ ] Oils
- [ ] Suds
- [ ] Algae
- [ ] Floatables
- [ ] Other:

**For Flowing Only**

**Color:**
- [ ] Clear
- [ ] Brown
- [ ] Grey
- [ ] Yellow
- [ ] Green
- [ ] Orange
- [ ] Red
- [ ] Other:

**Turbidity:**
- [ ] None
- [ ] Slight Cloudiness
- [ ] Cloudy
- [ ] Opaque

**Floatables:**
- [ ] None
- [ ] Sewage (toilet paper, etc.)
- [ ] Petroleum (oil sheen)
- [ ] Other:

**Other Concerns:**
- [ ] Excess Trash (paper/plastic bags)
- [ ] Dumping (bulk)
- [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance
- [ ] Bank Erosion
- [ ] Other:

**Potential Restoration Candidate**
- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] 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? [ ] Yes [ ] No [ ] Not investigated
- Land Use description: __________________________
- Area available: __________________________

**Outfall Severity:**
- (Circle #)

**Reported to authorities:** [ ] Yes [ ] No
Severe Bank Erosion

<table>
<thead>
<tr>
<th>PROCESS:</th>
<th>Currently unknown</th>
<th>Downcutting</th>
<th>Bed scour</th>
<th>Widening</th>
<th>Bank failure</th>
<th>Headcutting</th>
<th>Bank scour</th>
<th>Aggrading</th>
<th>Slope failure</th>
<th>Sed. deposition</th>
<th>Channelized</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION:</td>
<td>Meander bend</td>
<td>Straight section</td>
<td>Steep slope/valley wall</td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>Length (if no GPS)</td>
<td>LT 20 ft and/or RT</td>
<td>Bottom width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Ht</td>
<td>LT 6 ft and/or RT 3 ft</td>
<td>Top width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Angle</td>
<td>LT 0° and/or RT 0°</td>
<td>Wetted Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| LAND OWNERSHIP: | Private | Public | Unknown |
| LAND COVER: | Forest | Field/Ag | Developed: |

| POTENTIAL RESTORATION CANDIDATE: | Grade control | Bank stabilization | Other: |
| 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 (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 infrastructure. | Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure. | Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian 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 stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream. | Difficult access. Must cross wetland, 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 required. |

NOTES/CROSS SECTION SKETCH:
Stream Crossing

**Watershed/Subshed:** Middle Tank

**Type:** Road Crossing

---

**Site ID:** SC-01
**Lat:** 41° 49' 28.7" N
**Long:** 72° 37' 54.3" W

**Shape:** Arch
**Barrels:** Single
**Material:** Concrete
**Alignment:** Flow-aligned
**Dimensions:**
- Diameter: ___ ft
- Height: ___ ft

**Condition:** Cracking/chipping/corrosion
**Culvert Slope:** Flat
**Culvert Length:** ___ ft
**Roadway Elevation:** ___ ft

---

**Potential Restoration Candidate:**
- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair
- Other

**Is SC Acting as Grade Control:** Yes

---

**Extent of Physical Blockage:**
- Total
- Partial
- Temporary
- Unknown

**Cause:**
- Drop too high
- Flow too shallow
- Other

---

**Blockage Severity:**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little visible fish habitat above it; natural barriers such as waterfalls.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>Water Drop: ____ in</td>
</tr>
<tr>
<td>5</td>
<td>Water Depth: ____ in</td>
</tr>
</tbody>
</table>

---

**Notes/Sketch:**

---

**Reported to Authorities:** No
**Stream Crossing**

**Watershed/Subshed:** Middle Fork, River  
**Date:** 6/15/19  
**Assessed by:** J.J.  
**Survey Reach ID:** MR-09  
**Time:** 7:52 AM/PM  
**Photo ID:** (Camera Pic #) 3  
**Site ID:** (Condition #) SC-02  
**Lat:** 41° 49' 26.2"  
**Long:** 72° 23' 51.7"  
**LMK:**  
**GPS (Unit ID):**

**Type:**  
- Road Crossing: X  
- Railroad Crossing:  
- Manmade Dam:  
- Beaver Dam:  
- Geological Formation:  
- Other:  

**Shape:**  
- Arch:  
- Bottomless:  
- Box: X  
- Elliptical:  
- Circular:  
- Other:  

**Barrels:**  
- Single: X  
- Double:  
- Triple:  
- Other:  

**Material:**  
- Concrete: X  
- Metal:  
- Other:  

**Alignment:**  
- Flow-aligned: X  
- Not flow-aligned:  
- Do not know:  

**Dimensions:**  
- Barrel diameter:  
- Height: 5 ft  
- Culvert length:  
- Width: 10 ft  
- Roadway elevation: 3 ft

**Potential Restoration Candidate:**  
- Fish barrier removal:  
- Culvert repair/replacement:  
- Upstream storage retrofit:  
- Local stream repair:  
- Other:  

**Is SC Acting as Grade Control:**  
- No:  
- Yes:  
- Unknown:  

**Extent of Physical Blockage:**  
- Total:  
- Partial:  
- Temporary:  
- Unknown:  

**Cause:**  
- Drop too high:  
- Water Drop: ____ in  
- Flow too shallow:  
- Water Depth: ____ in

**Blockage Severity:**  
- 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.

**Notes/Sketch:**
### Stream Crossing SC

**Watershed/Subshed:** Mississauga River  
**Survey Reach ID:** MRT-02  
**Date:** 6/5/10  
**Assessed by:** G. S. Gaspar

**Site ID:** SC-03  
**Lat:** 41°49′26.9″  
**Long:** 79°27′51.3″  
**LMK:** ___  
**GPS (Unit ID):** ___

**Type:**  
- Road Crossing
- Railroad Crossing
- Manmade Dam
- Beaver Dam
- Geological Formation
- Other: Railroad Tracks

**Shape:**  
- Arch
- Box
- Circular
- Bottomless
- Elliptical
- Other:

**# Barrels:**  
- Single
- Double
- Triple
- Other:

**Material:**  
- Concrete
- Metal
- Other: Stone Blocks

**Alignment:**  
- Flow-aligned
- Not flow-aligned
- Do not know

**Dimensions:**  
- Barrel diameter: ___ ft
- Height: ___ ft
- Culvert length: ___ ft
- Width: 3 ft
- Roadway elevation: ___ ft

**Potential Restoration Candidate:**  
- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair
- Other:

**Is SC acting as grade control:**  
- No
- Yes
- Unknown

**Extent of Physical Blockage:**  
- Total
- Partial
- Temporary
- Unknown

**Cause:**  
- Drop too high
- Water Drop: ___ in
- Flow too shallow
- Water Depth: ___ in
- Other:

**Blockage Severity:** (Circle #)  
- 5
- 4
- 3
- 2
- 1

**Notes/Sketch:**

- Blocks seem out of place
- Blocks eaten

- Blocks appear to be out of alignment.
- Erosion on the sides.

- Rails to Trails Culvert
- Looks dangerous in need of repair

**Reported to authorities:** Yes

---

**Condition:**  
- Evidence of:
  - Cracking/chipping/corrosion
  - Sediment deposition
  - Other (describe): Blocks twisted

**Culvert Slope:**  
- Flat
- Slight (2°-5°)
- Obvious (>5°)

---

**Potential Erosion or Sedimentation:**  
- Erosion of banks
- Sediment deposition in culvert

---

**Notes:**

- Blockage seems to be temporary.
- Need to remove blocks to prevent further damage.

---

**Comments:**

- Needs immediate attention.
- Repair needed to prevent further damage.

---

**Reported to authorities:** Yes
**Stream Crossing**

<table>
<thead>
<tr>
<th>WATERSHED/SUBSHED:</th>
<th>Moncho Topc</th>
<th>DATE:</th>
<th>6/5/08</th>
<th>ASSESSED BY:</th>
<th>94A7 157</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY REACH ID:</td>
<td>124.09</td>
<td>TIME:</td>
<td>12 AM/PM</td>
<td>PHOTO ID:</td>
<td>(Camera-Pic #) 1011, # 1.12</td>
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<tr>
<td>SITE ID:</td>
<td>(Condition-#) SC-04</td>
<td>LAT</td>
<td>41° 49' 22.3&quot;</td>
<td>LONG</td>
<td>71° 24' 43.6&quot;</td>
</tr>
</tbody>
</table>

**Type:**
- [ ] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other

**Shape:**
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [ ] Circular
- [ ] Other

**Condition:** (Evidence of...)
- [x] Cracking/chipping/corrosion
- [x] Downstream scour hole
- [ ] Sediment deposition
- [ ] Failing embankment
- [ ] Other (describe):

**Material:**
- [ ] Concrete
- [ ] Metal
- [x] Other

**Alignment:**
- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barrel diameter: \( \frac{4}{10} \) ft
- Height: ______ (ft)
- Culvert length: ______ (ft)
- Width: ______ (ft)
- Roadway elevation: ______ (ft)

**Potential Restoration Candidate**
- [x] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit

**Is SC acting as grade control**
- [ ] no
- [ ] Local stream repair
- [ ] Other

**Extent of Physical Blockage:**
- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**
- [ ] Drop too high
- [ ] Flow too shallow
- [ ] Other: Dye tracer

**Notes/Sketch:**

**Reported to authorities:**
- [ ] Yes
- [ ] No
### Trash and Debris

**Watershed/Subshred:** Middle Tank  
**Date:** 01/14/08  
**Assessed By:** Friends

**Survey Reach ID:** MTR 09  
**Time:** 5:30 AM/PM  
**Photo ID:** (Camera Pic #) #49

**Site ID:** (Condition #) TR-1  
**Lat:** 41°49'34.5"  
**Long:** 78°27'55.9"  
**LMK:**

**GPS:** (Unit ID)

<table>
<thead>
<tr>
<th>Type</th>
<th>Material</th>
<th>Source</th>
<th>Location</th>
<th>Land Ownership</th>
<th>Amount (# Pickup truck loads)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Plastic</td>
<td>Unknown</td>
<td>Stream</td>
<td>Public</td>
<td>1/10</td>
</tr>
<tr>
<td>-</td>
<td>Tires</td>
<td>Local outfall</td>
<td>Riparian Area</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Appliances</td>
<td>Illegal dump</td>
<td>Lt bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Automotive</td>
<td>Local outfall</td>
<td>Rt bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Potential Restoration Candidate:**
- Stream cleanup
- Stream adoption segment
- Removal/prevention of dumping

**If yes for trash or debris removal:**
- Heavy equipment
- Trash bags
- Unknown

**Who can do it:**
- Volunteers
- Local Gov
- Hazmat Team
- Other

**Clean-Up Potential:**

**Notes:**

**Reported to Authorities:**
- Yes
- No
**Trash and Debris**

<table>
<thead>
<tr>
<th><strong>WATERSHED/SUBSHED:</strong></th>
<th>Middle Tumt</th>
<th><strong>DATE:</strong></th>
<th>6/4/208</th>
<th><strong>ASSSESSED BY:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SURVEY REACH ID:</strong></td>
<td>MTR 09</td>
<td><strong>TIME:</strong></td>
<td>5:32 AM/PM</td>
<td><strong>PHOTO ID:</strong> (Camera-Pic #) #1</td>
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<tr>
<td><strong>SITE ID:</strong></td>
<td>TR-02</td>
<td><strong>LAT:</strong></td>
<td>41° 49' 39.3&quot;</td>
<td><strong>LONG:</strong> 72° 07' 56.1&quot;</td>
</tr>
<tr>
<td><strong>GPS:</strong></td>
<td>(Unit ID)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **TYPE:** | ■ Industrial | ■ Commercial | ■ Residential |
| **MATERIAL:** | ■ Plastic | ■ Paper | ■ Metal |
| ■ Tires | ■ Construction | ■ Medical |
| ■ Appliances | ■ Yard Waste | |
| ■ Automotive | | ■ Other: |
| **SOURCE:** | ■ Unknown | ■ Flooding | ■ Illegal dump |
| ■ Stream | ■ Riparian Area | ■ Local outfall |
| **LOCATION:** | ■ Public | ■ Unknown |
| ■ Private | | |

| **AMOUNT (# Pickup truck loads):** | 1 |
| **POTENTIAL RESTORATION CANDIDATE:** | □ Stream cleanup | □ Stream adoption segment | □ Removal/prevention of dumping |
| □ no | | | |

- **If yes for trash or debris removal**

- **EQUIPMENT NEEDED:** | ■ Heavy equipment | ■ Trash bags | ■ Unknown |
| | | | |
| **WHO CAN DO IT:** | □ Volunteers | □ Local Gov | □ Hazmat Team | □ Other |
| | | | |
| **DUMPSTER WITHIN 100 FT:** | □ Yes | □ No | □ Unknown |

- **CLEAN-UP POTENTIAL:**

- **(Circle #)**

- **5**

- **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 drums or indications of hazardous materials**

<table>
<thead>
<tr>
<th><strong>NOTES:</strong></th>
</tr>
</thead>
</table>

**REPORTED TO AUTHORITIES** □ YES □ NO
**Trash and Debris**

| WATERSHED/SUBSHED: |ミズブ |
| DATE: | 6/5/2026 |
| ASSESSED BY: | FRIENDS |
| SURVEY REACH ID: | MR-09 |
| TIME: | 10:15 AM/PM |
| PHOTO ID: | (Camera Pic #) S # |
| SITE ID: | TR-03 |
| LAT: | 41°49'26" |
| LONG: | 72°27'54" |
| GPS: | (Unit ID) |
| TYPE: | Residential |
| MATERIAL: | Paper |
| SOURCE: | Unknown |
| LOCATION: | Stream |
| LAND OWNERSHIP: | Private |
| AMOUNT (# Pickup truck loads): | 1 |
| POTENTIAL RESTORATION CANDIDATE: | Stream cleanup |
| EQUIPMENT NEEDED: | Heavy equipment |
| WHO CAN DO IT: | Volunteers |
| DUMPSTER WITHIN 100 FT: | Yes |
| CLEAN-UP POTENTIAL: | A small 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. |

**NOTES:**

**REPORTED TO AUTHORITIES** | YES | NO
### Trash and Debris

**Watershed/Subshed:** Middle Tank River  
**Date:** 6/5/06  
**Assessed by:** DJC

<table>
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<tr>
<th>Survey Reach ID:</th>
<th>TR-09</th>
<th>Time: 12:35PM</th>
<th>Photo ID: (Camera-Pic #) 89</th>
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<tbody>
<tr>
<td>Site ID: (Condition #)</td>
<td>TR-04</td>
<td>Lat: 41°49'.245&quot;</td>
<td>Long: 71°27'.465&quot;</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td>LMK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>TR-LATI</th>
<th>L1?$LONGO2LMK</th>
<th>GPS: (Unit ID)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type:</th>
<th>Material:</th>
<th>Source:</th>
<th>Location:</th>
<th>Land Ownership:</th>
<th>Amount (# Pickup truck loads):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Tires</td>
<td>Stream</td>
<td>Riparian Area</td>
<td>Public</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Appliances</td>
<td>Unknown</td>
<td></td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automotive</td>
<td>Flooding</td>
<td></td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Illegal dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local outfall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Restoration Candidate</th>
<th>Equipment Needed:</th>
<th>Dumpster Within 100 Ft:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream cleanup</td>
<td>Heavy equipment</td>
<td>Yes</td>
</tr>
<tr>
<td>Stream adoption segment</td>
<td>Trash bags</td>
<td>No</td>
</tr>
<tr>
<td>Removal/prevention of dumping</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clean-Up Potential: (Circle #)</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>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</td>
<td>Lots of debris, leaves, logs, tires, stumps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reporter to Authorities</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Storm Water Outfalls

### Watershed/Subshed:
- OT

### Survey Reach ID:
- None

### Site ID (Condition-#):
- OT

### Lat/Long:
- °' "

### LMK:
- None

### Bank:
- LT RT Head

### Flow:
- None Trickle Moderate Substantial Other:

### Type:
- Closed pipe Open channel

### Material:
- Concrete PVC/Plastic Metal Other:

### Shape:
- Single Circular Double Elliptical Triple Other:

### Dimensions:
- Diameter: ___ (in)

### Submerged:
- No Partially Fully

### Condition:
- None Chip/Cracked Peeling Paint Corrosion Other:

### Odor:
- None Gas Sewage Rancid/Sour Sulfide Other:

### Deposits/Stains:
- None Oily Flow Line Paint Other:

### Veggie Density:
- None Normal Inhibited Excessive Other:

### Pipe Benthic Growth:
- None Brown Orange Green Other:

### Pool Quality:
- None Good Odors Colors Oils Suds Algae Floatables Other:

### Color:
- Clear Brown Grey Yellow Green Orange Red Other:

### Turbidity:
- None Slight Cloudiness Cloudy Opaque

### Floatables:
- None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other:

### Other Concerns:
- Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation Needs Regular Maintenance Bank Erosion Other:

### Potential Restoration Candidate:
- Discharge investigation Stream daylighting Local stream repair/outfall stabilization No Storm water retrofit 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:
  - Yes No Not investigated

### Outfall Severity:
- 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 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.
  - Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

### Sketch/Notes:

### Reported to authorities:
- Yes No
### Severe Bank Erosion

**Watershed/Subhed:**

**Survey Reach:**

**Site ID:** (Condition-#)

**Process:**

- [□] Currently unknown
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition
- [□] Channelized

**Bank of Concern:**

- [□] LT
- [ ] RT
- [ ] Both (looking downstream)

**Location:**

- [□] Meander bend
- [ ] Straight section
- [ ] Steep slope/valley wall
- [ ] Other:

**Dimensions:**

- Length (if no GPS) LT _______ ft and/or RT _______ ft
- Bottom width _______ ft
- Bank Ht LT _______ ft and/or RT _______ ft
- Top width _______ ft
- Bank Angle LT _______° and/or RT _______°
- Wetted Width _______ ft

**Land Ownership:**

- [□] Private
- [ ] Public
- [ ] Unknown

**Land Cover:**

- [□] Forest
- [ ] Field/Ag
- [ ] Developed

**Potential Restoration Candidate:**

- [□] Grade control
- [ ] Bank stabilization
- [ ] Other:

**Threat to Property/Infrastructure:**

- [□] No
- [ ] Yes (Describe):

**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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**Erosion Severity (circle #):**

- [□] Channelized = 1

**Existing Riparian Width:**

- [□] <25 ft
- [ ] 25 - 50 ft
- [ ] 50 - 75 ft
- [ ] 75 - 100 ft
- [ ] >100 ft

**Notes/Cross section sketch:**

**Reported to authorities:**

- [□] Yes
- [□] No
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LT □ RT □ Both</td>
<td>□ Lack of vegetation □ Too narrow □ Widespread invasive plants □ Recently planted □ Other:</td>
<td>Private □ Institutional □ Golf Course □ Park □ Other Public:</td>
<td>LT Bank □ □ □ □ □:</td>
<td>□ None □ Rare □ Partial coverage □ Extensive coverage □ unknown</td>
<td>□ None □ Partial □ Full □ WETLANDS PRESENT? □ No □ Yes □ Unknown</td>
<td>□ Active reforestation □ Greenway design □ Natural regeneration □ Invasives removal □ no □ Other:</td>
<td>Length (ft): □ □ Width (ft): □ □</td>
</tr>
</tbody>
</table>

**Reforestation Potential:**

**Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting**

**Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate**

**Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting**

**Potential Conflicts with Reforestation:**

□ Widespread invasive plants □ Potential contamination □ Lack of sun □ Poor/unsafe access to site □ Existing impervious cover □ Severe animal impacts (deer, beaver) □ Other:

**Notes:**
### Stream Crossing

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date:<strong>/</strong>/__</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>Time: <em>:</em> AM/PM</td>
<td>Photo ID: (Camera-Pic #) /#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>SC-___</td>
<td>Lat °'&quot; Long °'&quot; LMK__</td>
</tr>
</tbody>
</table>

**Type:**
- [ ] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**For Road/ Railroad Crossings Only**

**Shape:**
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [ ] Circular
- [ ] Other:

**# Barrels:**
- [ ] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**Material:**
- [ ] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**
- [ ] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barrel diameter: _____ (ft)
- Height: _____ (ft)
- Culvert length: _____ (ft)
- Width: _____ (ft)
- Roadway elevation: _____ (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
- [ ] Unknown

**Extent of Physical Blockage:**
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**
- [ ] Drop too high
- [ ] Flow too shallow
- [ ] Other:

**Water Drop:** _____ (in)

**Water Depth:** _____ (in)

**Blockage Severity:** (circle #)
- [ ] 5
- [ ] 4
- [ ] 3
- [ ] 2
- [ ] 1

**Notes/Sketch:**

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.

**Reported to authorities:** [ ] Yes [ ] No
**Watershed/Subshed:**

**Survey Reach ID:**

**Time:** AM/PM

**Assessed By:**

**Photo ID:** (Camera-Pic #) #

**Site ID:** (Condition-#)

**Start Lat:** ° ' " Long ° ' " LMK

**End Lat:** ° ' " Long ° ' " LMK

**GPS:** (Unit ID)

---

**Type:**
- [ ] Channelization
- [ ] Bank armoring
- [ ] Concrete channel
- [ ] Floodplain encroachment
- [ ] Other:

**Material:**
- [ ] Concrete
- [ ] Gabion
- [ ] Rip Rap
- [ ] Earthen
- [ ] Other:

**Does channel have perennial flow?**
- [ ] Yes
- [ ] No

**Is there evidence of sediment deposition?**
- [ ] Yes
- [ ] No

**Is vegetation growing in channel?**
- [ ] Yes
- [ ] No

**Is channel connected to floodplain?**
- [ ] Yes
- [ ] No

**Dimensions:**

<table>
<thead>
<tr>
<th>Height</th>
<th>________________(ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom Width</td>
<td>________________(ft)</td>
</tr>
<tr>
<td>Top Width</td>
<td>________________(ft)</td>
</tr>
<tr>
<td>Length</td>
<td>________________(ft)</td>
</tr>
</tbody>
</table>

**Base Flow Channel**

**Depth of flow:** ____________(in)

**Defined low flow channel?**
- [ ] Yes
- [ ] No

**% of channel bottom:** ________%

**Adjacent Stream Corridor**

**Available width:**
- [ ] LT _______(ft)
- [ ] RT _______(ft)

**Utilities Present?**
- [ ] Yes
- [ ] No

**Fill in floodplain?**
- [ ] Yes
- [ ] No

**Potential Restoration Candidate**

- [ ] Structural repair
- [ ] Base flow channel creation
- [ ] Natural channel design
- [ ] Can't tell
- [ ] De-channelization
- [ ] Fish barrier removal
- [ ] Bioengineering

**Channelization Severity:**

**(Circle #)**

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**Notes:**

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 (> 200') channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed 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.
### Trash and Debris

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: / /</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>Time: ___ AM/PM</td>
<td>Photo ID: (Camera-Pic #) /#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>TR-___</td>
<td>Lat ___° ___' ___&quot; Long ___° ___' ___&quot;</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Type:
- [ ] Industrial
- [ ] Commercial
- [ ] Residential

#### Material:
- [ ] Plastic
- [ ] Paper
- [ ] Metal
- [ ] Tires
- [ ] Construction
- [ ] Medical
- [ ] Appliances
- [ ] Yard Waste
- [ ] Automotive
- [ ] Other:

#### Source:
- [ ] Unknown
- [ ] Flooding
- [ ] Illegal dump
- [ ] Local outfall

#### Location:
- [ ] Stream
- [ ] Riparian Area
- [ ] Lt bank
- [ ] Rt bank

#### 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 debris removal

**Equipment Needed:**
- [ ] Heavy equipment
- [ ] Trash bags
- [ ] Unknown

**Who Can Do It:**
- [ ] Volunteers
- [ ] Local Gov
- [ ] Hazmat Team
- [ ] Other

#### Dumpster Within 100 ft:
- [ ] Yes
- [ ] No
- [ ] Unknown

#### Clean-Up Potential:

**Clean-Up Potential:**
- **(Circle #)**

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access</td>
<td>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.</td>
<td>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</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Notes:

**Reported to Authorities**
- [ ] Yes
- [ ] No
<table>
<thead>
<tr>
<th>Type:</th>
<th>Material:</th>
<th>Location:</th>
<th>Potential Fish Barrier:</th>
<th>Pipe Dimensions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking sewer</td>
<td>Concrete</td>
<td>Floodplain</td>
<td>No</td>
<td>Diameter: ___ in</td>
</tr>
<tr>
<td>Exposed pipe</td>
<td>Corrugated metal</td>
<td>Stream bank</td>
<td>Yes</td>
<td>Length exposed: _____ ft</td>
</tr>
<tr>
<td>Exposed manhole</td>
<td>Smooth metal</td>
<td>Above stream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>PVC</td>
<td>Stream bottom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition:</th>
<th>Pipe corrosion/cracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint failure</td>
<td>Manhole cover absent</td>
</tr>
<tr>
<td>Protective covering broken</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evidence of Discharge:</th>
<th>Color:</th>
<th>None</th>
<th>Clear</th>
<th>Dark Brown</th>
<th>Lt Brown</th>
<th>Yellowish</th>
<th>Greenish</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td>None</td>
<td>Sewage</td>
<td>Oily</td>
<td>Sulfide</td>
<td>Chlorine</td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deposits:</th>
<th>Tampons/Toilet Paper</th>
<th>Lime</th>
<th>Surface oils</th>
<th>Stains</th>
<th>Other:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Potential Restoration Candidate:</th>
<th>Structural repairs</th>
<th>Pipe testing</th>
<th>Citizen hotlines</th>
<th>Dry weather sampling</th>
<th>Fish barrier removal</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If yes to fish barrier, Water Drop: ________ (in)

**Utility Impact Severity:**

Leaking= □ 5

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.

Small section of exposed pipe, stream bank near the pipe is stable; the pipe is across the bottom of the stream but only a small portion of the top of the pipe exposed; the pipe is exposed but is reinforced with concrete and it is not causing a blockage to upstream fish movement; a manhole stack that is at the edge of the stream and does not extend very far out into the active stream channel.

**Notes:**
### Watershed/Subshed: MI

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: <em><strong>/</strong></em>/___</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>Time: <em><strong>:</strong></em> AM/PM</td>
<td>Photo ID: (Camera-Pic #) /#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>MI-____</td>
<td>Lat ° ' &quot; Long ° ' &quot;</td>
</tr>
</tbody>
</table>

**Potential Restoration Candidate:**
- Storm water retrofit
- Stream restoration
- Riparian Management
- Discharge Prevention
- Other:

**Describe:**

**Reported to Local Authorities:** No Yes

---

### Watershed/Subshed: MI

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: <em><strong>/</strong></em>/___</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach ID:</td>
<td>Time: <em><strong>:</strong></em> AM/PM</td>
<td>Photo ID: (Camera-Pic #) /#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>MI-____</td>
<td>Lat ° ' &quot; Long ° ' &quot;</td>
</tr>
</tbody>
</table>

**Potential Restoration Candidate:**
- Storm water retrofit
- Stream restoration
- Riparian Management
- Discharge Prevention
- Other:

**Describe:**

**Reported to Local Authorities:** No Yes

---

### Watershed/Subshed: MI

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Date: <em><strong>/</strong></em>/___</th>
<th>Assessed By:</th>
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<td>Photo ID: (Camera-Pic #) /#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>MI-____</td>
<td>Lat ° ' &quot; Long ° ' &quot;</td>
</tr>
</tbody>
</table>

**Potential Restoration Candidate:**
- Storm water retrofit
- Stream restoration
- Riparian Management
- Discharge Prevention
- Other:

**Describe:**

**Reported to Local Authorities:** No Yes
### Reach Level Assessment

<table>
<thead>
<tr>
<th>SURVEY REACH ID: ______</th>
<th>WRSHD/SUBSHD:</th>
<th>DATE: <strong><strong>/</strong></strong>/____</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>START</strong></td>
<td><strong>TIME:</strong>: AM/PM</td>
<td><strong>LMK:</strong> ______</td>
<td><strong>END</strong></td>
</tr>
<tr>
<td><strong>LAT</strong> • • • • • • •</td>
<td><strong>LONG</strong> • • • • • • •</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RAIN IN LAST 24 HOURS</strong></td>
<td><strong>PRESENT CONDITIONS</strong></td>
<td><strong>SURROUNDING LAND USE:</strong></td>
<td><strong>GPS ID:</strong></td>
</tr>
<tr>
<td>£ Heavy rain</td>
<td>£ Steady rain</td>
<td>£ Intermittent</td>
<td>£ Overcast</td>
</tr>
<tr>
<td>£ None</td>
<td>£ Intermittent</td>
<td>£ Trace</td>
<td>£ Trace</td>
</tr>
<tr>
<td>£ Heavy rain</td>
<td>£ Steady rain</td>
<td>£ Intermittent</td>
<td>£ Overcast</td>
</tr>
<tr>
<td>£ Intermittent</td>
<td>£ Trace</td>
<td>£ Overcast</td>
<td>£ Partly cloudy</td>
</tr>
<tr>
<td>£ Overcast</td>
<td>£ Partly cloudy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Partly cloudy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AVERAGE CONDITIONS</strong> (check applicable)</td>
<td><strong>REACH SKETCH AND SITE IMPACT TRACKING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BASE FLOW AS %</strong></td>
<td><strong>CHANNEL WIDTH</strong></td>
<td><strong>DOMINANT SUBSTRATE</strong></td>
<td><strong>Dominated by:</strong></td>
</tr>
<tr>
<td>£ 0-25%</td>
<td>£ 50%-75%</td>
<td>£ 75-100%</td>
<td>Silt/clay (fine or slick)</td>
</tr>
<tr>
<td>£ Sand (gritty)</td>
<td>£ Boulder (&gt;10&quot;)</td>
<td>£ Gravel (0.1-2.5&quot;)</td>
<td>Bed rock</td>
</tr>
<tr>
<td><strong>WATER CLARITY</strong></td>
<td><strong>EDUCATION</strong></td>
<td><strong>OTHER</strong></td>
<td><strong>OPAQUE</strong> (milky)</td>
</tr>
<tr>
<td>£ Clear</td>
<td>£ Stained (clear, naturally colored)</td>
<td>£ Other</td>
<td>£ Other (chemicals, dyes)</td>
</tr>
<tr>
<td>£ Turbid (suspended matter)</td>
<td>£ Stained (clear, naturally colored)</td>
<td>£ Other (chemicals, dyes)</td>
<td></td>
</tr>
<tr>
<td>£ Stained</td>
<td>£ Other</td>
<td>£ Other (chemicals, dyes)</td>
<td></td>
</tr>
<tr>
<td>£ Other (chemicals, dyes)</td>
<td>£ Clear (clear, naturally colored)</td>
<td>£ Opaque (milky)</td>
<td></td>
</tr>
<tr>
<td>£ Other (chemicals, dyes)</td>
<td>£ Clear (clear, naturally colored)</td>
<td>£ Opaque (milky)</td>
<td></td>
</tr>
<tr>
<td>£ Clear (clear, naturally colored)</td>
<td>£ Opaque (milky)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Opaque (milky)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AQUATIC PLANTS IN STREAM</strong></td>
<td><strong>WILDLIFE IN OR AROUND STREAM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached: £ none</td>
<td>£ some</td>
<td>£ lots</td>
<td>£ Fish</td>
</tr>
<tr>
<td>Floating: £ none</td>
<td>£ some</td>
<td>£ lots</td>
<td>£ Snails</td>
</tr>
<tr>
<td><strong>STREAM SHADING</strong> (water surface)</td>
<td><strong>STREAM SHADING</strong> (water surface)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Mostly shaded (&gt;75% coverage)</td>
<td>£ Mostly shaded (&gt;75% coverage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Halfway (&gt;50%)</td>
<td>£ Halfway (&gt;50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Partially shaded (&gt;25%)</td>
<td>£ Partially shaded (&gt;25%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Unshaded (&lt; 25%)</td>
<td>£ Unshaded (&lt; 25%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£ Unshaded (&lt; 25%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CHANNEL DYNAMICS</strong></td>
<td><strong>CHANNEL DYNAMICS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Downcutting</td>
<td>[ ] Bed scour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Widening</td>
<td>[ ] Bank failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Headcutting</td>
<td>[ ] Bank scour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Aggrading</td>
<td>[ ] Slope failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Sed. deposition</td>
<td>[ ] Channelized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Unknown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CHANNEL DIMENSIONS</strong> (FACING DOWNSTREAM)</td>
<td><strong>CHANNEL DIMENSIONS</strong> (FACING DOWNSTREAM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height: LT bank ____________(ft)</td>
<td>Width: Bottom ____________(ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT bank ____________(ft)</td>
<td>Top ____________(ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>REACH ACCESSIBILITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>REACH ACCESSIBILITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>NOTES: (biggest problem you see in survey reach)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REPORTED TO AUTHORITIES** [ ] Yes [ ] No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat (May modify criteria based on appropriate habitat regime)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BANK EROSION (facing downstream)</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN Connection</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN VEGETATION</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN HABITAT</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN ENCROACHMENT</th>
<th>20 19 18 17 16</th>
<th>15 14 13 12 11</th>
<th>10 9 8 7 6</th>
<th>5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: ____/80 + Buffer/Floodplain: ____/80 = Total Survey Reach ____/160
Photo Inventory  
(By Camera)

Project: ____________  
Group: ____________  
Camera: ____________

This field sheet is to be completed AS photos are taken in the field. The intent is to 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 new spatial or temporal location.

<table>
<thead>
<tr>
<th>Date</th>
<th>Stream/Reach</th>
<th>Location ID</th>
<th>Photo #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Date</td>
<td>Stream/Reach</td>
<td>Location ID</td>
<td>Photo #</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
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<td>---------</td>
<td>-------------</td>
</tr>
</tbody>
</table>

Comments:

(BACK)
### Reach Level Assessment

**SURVEY REACH ID:** TB-01  
**WTRSHID/SUBSHID:**  
**DATE:** 7/1/09  
**ASSESSED BY:** KB/DR

<table>
<thead>
<tr>
<th>START</th>
<th>TIME: 3:00 AM/PM</th>
<th>LMK:</th>
<th>END</th>
<th>TIME: 4:00 AM/PM</th>
<th>LMK:</th>
<th>GPS ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 41° 44' 27&quot;</td>
<td>LONG 72° 29' 16&quot;</td>
<td></td>
<td>LAT 41° 44' 17&quot;</td>
<td>LONG 72° 29' 13&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION:** Conf W/ LTR

**REACH Sketch and Site Impact Tracking**
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.

### Average Conditions (check applicable)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASE FLOW AS %</strong></td>
<td>0-25%</td>
</tr>
<tr>
<td><strong>CHANNEL WIDTH</strong></td>
<td>25-50%</td>
</tr>
<tr>
<td><strong>DOMINANT SUBSTRATE</strong></td>
<td>Cobble (2.5-10&quot;)</td>
</tr>
<tr>
<td><strong>WATER CLARITY</strong></td>
<td>Clear</td>
</tr>
<tr>
<td><strong>AQUATIC PLANTS IN STREAM</strong></td>
<td>Attached: none some lots</td>
</tr>
<tr>
<td><strong>WILDLIFE IN OR AROUND STREAM</strong></td>
<td>Fish, Beaver, Deer</td>
</tr>
<tr>
<td><strong>STREAM SHADING</strong></td>
<td>Mostly shaded (≥75% coverage)</td>
</tr>
<tr>
<td><strong>CHANNEL DYNAMICS</strong></td>
<td>Downcutting Bed scour</td>
</tr>
<tr>
<td><strong>CHANNEL DIMENSIONS</strong></td>
<td>Height: LT bank 3 (ft)</td>
</tr>
<tr>
<td><strong>REACH ACCESSIBILITY</strong></td>
<td>Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</td>
</tr>
</tbody>
</table>

**RAIN IN LAST 24 HOURS**  
- Heavy rain  
- Steady rain  
- None  

**PRESENT CONDITIONS**  
- Heavy rain  
- Steady rain  
- Intermittent  
- Clear  
- Trace  
- Overcast  
- Partly cloudy  
- Other:

**SURROUNDING LAND USE**  
- Industrial  
- Commercial  
- Golf course  
- Park  
- Crop  
- Suburban/Res  
- Forested  
- Institutional  
- Other:

**WATER CLARITY**  
- Clear  
- Turbid (suspended matter)  
- Stained (clear, naturally colored)  
- Opaque (milky)  
- Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM**  
- Attached: none some lots
- Floating: none some lots

**WILDLIFE IN OR AROUND STREAM**  
- Fish  
- Beaver  
- Deer  
- Snails  
- Other:

**STREAM SHADING** (water surface)  
- Mostly shaded (≥75% coverage)  
- Halfway (≥50%)  
- Partially shaded (≥25%)  
- Unshaded (< 25%)  

**CHANNEL DYNAMICS**  
- Downcutting  
- Widening  
- Headcutting  
- Aggrading  
- Sed. deposition  
- Bank failure  
- Bank scour  
- Slope failure  
- Channelized

**CHANNEL DIMENSIONS**  
- Height: LT bank 3 (ft)  
- RT bank 3 (ft)  
- Width: Bottom 12 (ft)  
- Top 20 (ft)

**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.

**NOTES:** (biggest problem you see in survey reach)

**REPORTED TO AUTHORITIES**  
- Yes  
- No

[Image of stream sketch and numbers 1-5]
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 6</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

### VEGETATIVE PROTECTION

(score each bank, determine sides by facing downstream)

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(facing downstream)</td>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Left Bank 10 9</td>
<td>Right Bank 10 9</td>
<td>Left Bank 10 9</td>
<td>Right Bank 10 9</td>
</tr>
<tr>
<td></td>
<td>8 7 6</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>5 4 3</td>
</tr>
</tbody>
</table>

### FLOODPLAIN CONNECTION

<table>
<thead>
<tr>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
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</tr>
<tr>
<td></td>
<td>Left Bank 10 9</td>
<td>Right Bank 10 9</td>
<td>Left Bank 10 9</td>
<td>Right Bank 10 9</td>
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<td></td>
<td>8 7 6</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>5 4 3</td>
</tr>
</tbody>
</table>

### Floodplain Vegetation

<table>
<thead>
<tr>
<th>Predominant floodplain vegetation type is mature forest</th>
<th>Predominant floodplain vegetation type is young forest</th>
<th>Predominant floodplain vegetation type is shrub or old field</th>
<th>Predominant floodplain vegetation type is turf or crop land</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

### Floodplain Habitat

<table>
<thead>
<tr>
<th>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</th>
<th>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</th>
<th>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</th>
<th>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Floodplain Encroachment

<table>
<thead>
<tr>
<th>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</th>
<th>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function</th>
<th>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</th>
<th>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sub Total In-stream: ____/80 + Buffer/Floodplain: ____/80 - Total Survey Reach ____/160
**Severe Bank Erosion**

**Watershed/Subshed:** Tucker Brk  
**Date:** 7/11/08  
**Assessed By:** KB

**Survey Reach:** TB01  
**Time:** 3:15 AM (PM)  
**Photo ID (Camera-Pic #):** #

**Site ID:** (Condition #)  
**Start Lat:** 41° 24' 26" Long 72° 29' 15.8" LMK  
**End Lat:** 41° 24' 26" Long 72° 29' 15.8" LMK

**Process:**  
- [ ] Currently unknown  
- [ ] Downcutting  
- [ ] Widening  
- [ ] Headcutting  
- [ ] Aggrading  
- [ ] Sed. deposition

**Bank of Concern:**  
- [ ] LT  
- [ ] RT  
- [ ] Both (looking downstream)

**Location:**  
- [ ] Meander bend  
- [ ] Straight section  
- [ ] Steep slope/valley wall  
- [ ] Other:

**Dimensions:**  
- Length (if no GPS)  
  - LT ft and/or RT 50 ft
- Bank Ht  
  - LT ft and/or RT 10 ft
- Bank Angle  
  - LT ° and/or RT 90 °
- Wetted Width

**Land Ownership:**  
- [ ] Private  
- [ ] Public  
- [ ] Unknown

**Land Cover:**  
- [ ] Forest  
- [ ] Field/Ag  
- [ ] Developed

**Potential Restoration Candidate:**  
- [ ] Grade control  
- [ ] Bank stabilization  
- [ ] Other:

**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 (circle #):**  
- [ ] Moderate  
- [ ] Active  
- [ ] Erosion contributing significant amount of sediment to stream  
- [ ] Obscures threat to property or infrastructure

**Channelized:**  
- [ ] Yes

**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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**Notes/Cross Section Sketch:**

Bank being stabilized by trees, roots, are hanging out of bank.
Stream Crossing

**Stream Crossing**

**WATERSHED/SUBSHED:**

**SURVEY REACH ID:**

**DATE:** 7/1/08

**TIME:** 4:00 AM/60

**PHOTO ID:** (Camera-Pic #)

**SITE ID:** (Condition-#)

**LAT:** 41° 49' 18''

**LONG:** 72° 29' 12''

**LMK:** GPS (Unit ID)

**ASSESSMENT ID:**

**ASSESSED BY:**

**REPORTED TO AUTHORITIES:**

---

**TYPE:**
- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Mannmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**FOR ROAD/RAILROAD CROSSINGS ONLY**

**SHAPE:**
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [x] Circular
- [ ] Other:

**# BARRELS:**
- [x] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**MATERIAL:**
- [x] Concrete
- [ ] Metal
- [ ] Other:

**ALIGNMENT:**
- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**FOR ROAD/RAILROAD CROSSINGS ONLY**

**DIMENSIONS:**
- Barreldiameter: [Blank]
- Height: [Blank]
- Culvert length: 100 (ft)
- Width: [Blank]
- Roadway elevation: 15 (ft)

**CONDITION:**
- [ ] Cracking/chipping/corrosion
- [x] Downstream scour hole
- [ ] Sediment deposition
- [ ] Failing embankment
- [ ] Other (describe):

**CULVERT SLOPE:**
- [x] Flat
- [ ] Slight (2°—5°)
- [ ] Obvious (>5°)

**EXTENT OF PHYSICAL BLOCKAGE:**
- [ ] Total
- [x] Partial
- [ ] Temporary
- [ ] Unknown

**If yes for fish barrier**

**CAUSE:**
- [ ] Drop too high
- [ ] Water Drop: [Blank] (in)
- [ ] Flow too shallow
- [ ] Water Depth: [Blank] (in)
- [ ] Other: Rocks @ds and

**BLOCKAGE SEVERITY (circle #)**

- 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.

**NOTES/SKETCH:**

---

Diagram of a stream with identified obstacles and fish barriers.
Stream Crossing

**Watershed/Subshed:** TAUKER

**Survey Reach ID:** B01

**Date:** 7/1/08

**Assessed By:**

**Photo ID:** (Camera-Pic #)

**Site ID:** (Condition-ID) SC-03

**Lat:** 41° 49' 10"

**Long:** 72° 09' 14"

**LMK**

**GPS (Unit ID):**

**Type:**

☑ Road Crossing

☐ Railroad Crossing

☐ Manmade Dam

☐ Beaver Dam

☐ Geological Formation

☐ Other:

**Shape:**

☑ Arch

☒ Bottomless

☐ Box

☐ Elliptical

☐ Circular

☐ Other:

**# Barrels:**

☐ Single

☐ Double

☐ Triple

☐ Other:

**Material:**

☑ Concrete

☐ Metal

☐ Other:

**Alignment:**

☑ Flow-aligned

☐ Not flow-aligned

☐ Do not know

**Dimensions:** (if variable, sketch)

Barrel diameter: 

Height: 

Culvert length: 

Width: 

Roadway elevation: 

**Watershed/Subshed:**

**Survey Reach ID:**

**Site ID:** (Condition-ID) SC-03

**Lat:**

**Long:**

**LMK**

**GPS (Unit ID):**

**Type:**

☑ Road Crossing

☐ Railroad Crossing

☐ Manmade Dam

☐ Beaver Dam

☐ Geological Formation

☐ Other:

**Shape:**

☑ Arch

☒ Bottomless

☐ Box

☐ Elliptical

☐ Circular

☐ Other:

**# Barrels:**

☐ Single

☐ Double

☐ Triple

☐ Other:

**Material:**

☑ Concrete

☐ Metal

☐ Other:

**Alignment:**

☑ Flow-aligned

☐ Not flow-aligned

☐ Do not know

**Dimensions:** (if variable, sketch)

Barrel diameter: 

Height: 

Culvert length: 

Width: 

Roadway elevation: 

**Watershed/Subshed:**

**Survey Reach ID:**

**Site ID:** (Condition-ID) SC-03

**Lat:**

**Long:**

**LMK**

**GPS (Unit ID):**

**Type:**

☑ Road Crossing

☐ Railroad Crossing

☐ Manmade Dam

☐ Beaver Dam

☐ Geological Formation

☐ Other:

**Shape:**

☑ Arch

☒ Bottomless

☐ Box

☐ Elliptical

☐ Circular

☐ Other:

**# Barrels:**

☐ Single

☐ Double

☐ Triple

☐ Other:

**Material:**

☑ Concrete

☐ Metal

☐ Other:

**Alignment:**

☑ Flow-aligned

☐ Not flow-aligned

☐ Do not know

**Dimensions:** (if variable, sketch)

Barrel diameter: 

Height: 

Culvert length: 

Width: 

Roadway elevation: 

**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

**Extent of Physical Blockage:**

☐ Total

☐ Partial

☐ Temporary

☐ Unknown

**Cause:**

☐ Drop too high

Water Drop: ______ (in)

☐ Flow too shallow

Water Depth: ______ (in)

☐ Other:

**Blockage Severity:** (circle #)

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.

**Notes/Sketch:**

Box covered or abutment w/ deck type crossing

Scouring of bed is occurring downstream

Significant scouring near and under pilings on abutments

---

Reported to authorities ☐ Yes ☐ No
<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>Storm water retrofit</th>
<th>Local stream repair/outfall stabilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge investigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream daylighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removes ? Doesn’t seem to function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm water currently controlled?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 investigated [ ]

Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

REPORTED TO AUTHORITIES: [ ] YES [ ] NO
**Storm Water Outfalls**

**Watershed/Subshed:** Tucker  
**Survey Reach ID:** TB-01  
**Site ID (Condition #):** OT-02  
**Date:** 7/1/08  
**Time:** 2:45 AM/EDT  
**Photo ID:** (Camera-Pic #) /#  
**Assessed By:** KS  
**LAT:** 41° 49' 22"  
**LONG:** 72° 29' 13"  
**LMK:**  
**GPS:** (Unit ID)  

<table>
<thead>
<tr>
<th>Bank:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
</tr>
<tr>
<td>Flow:</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Type:</td>
</tr>
<tr>
<td>Closed pipe</td>
</tr>
<tr>
<td>Material:</td>
</tr>
<tr>
<td>Concrete</td>
</tr>
<tr>
<td>Shape:</td>
</tr>
<tr>
<td>Single</td>
</tr>
<tr>
<td>Dimension:</td>
</tr>
<tr>
<td>Diameter:</td>
</tr>
<tr>
<td>Submerged:</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

| Condition: |  
| None | Chip/Cracked | Peeling Paint | Corrosion | Other: |  
| Odor: |  
| None | Gas | Sewage | Rancid/Sour | Sulfide | Other: |  
| Deposits/Stains: |  
| None | Oily | Flow Line | Paint | Other: |  
| Veggie Density: |  
| None | Normal | Inhibited | Excessive | Other: |  
| Pipe Benthic Growth: |  
| None | Brown | Orange | Green | Other: |  

| Flowing only |  
| Color: |  
| Clear | Brown | Grey | Yellow | Green | Orange | Red | Other: |  
| Turbidity: |  
| None | Slight Clarity | Cloudy | Opaque |  
| Floatables: |  
| None | Sewage (oil sheen, etc.) | Petroleum (oil sheen) | Other: |  

| Other Concerns: |  
| Excess Trash (paper/plastic bags) | Dumping (bulk) | Excessive Sedimentation | 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 cover from outfall: _______ ft  
- Type of existing vegetation: ___________________  
- Slope: _______°

**If yes for stormwater:**  
- Is stormwater currently controlled?  
- Yes | No | Not investigated

**Outfall Severity:**  
- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Sketch/Notes:**

May be stormwater outflow from highway - entrance could be >200 ft upstream.

**Reported to authorities:**  
- Yes | No
**Stream Crossing**

**WATERSHED/SUBSHED:** Tucker Blk

**REPORTED TO AUTHORITIES:** No

**LAT:** 40°49’25" **LONG:** 72°29’14"

**TYPE:**

- Road Crossing [x]
- Railroad Crossing
- Manmade Dam
- Beaver Dam
- Geological Formation
- Other:

**FOR ROAD/RAILROAD CROSSINGS ONLY**

- Arch
- Box
- Circular
- Elliptical [x]
- Bottomless
- Other:

**INPUTS**

- Number of Barrels:
  - Single [x]
  - Double
  - Triple
  - Other:

- Material:
  - Concrete [x]
  - Metal
  - Other:

- Alignment:
  - Flow-aligned [x]
  - Not flow-aligned
  - Do not know

- Culvert Slope:
  - Flat
  - Slight (<2°)
  - Obvious (>5°)

- Condition:
  - Cracking/chipping/corrosion
  - Sediment deposition
  - Other (describe):
  - Downstream scour hole
  - Failing embankment

**DIMENSIONS:**

- Barrel diameter: 15 (ft)
- Height: NA (ft)
- Culvert length: 20 (ft)
- Width: _____ (ft)
- Roadway elevation: NA (ft)

**POTENTIAL RESTORATION CANDIDATE**

- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair [x]
- Other:

**IS SC ACTING AS GRADE CONTROL**

- No [x]
- Yes
- Unknown

**EXTENT OF PHYSICAL BLOCKAGE:**

- Total
- Partial
- Temporary
- Unknown

**CAUSE:**

- Drop too high
- Flow too shallow
- Other:

**BLOCKAGE SEVERITY:**

- 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 visible fish habitat above it; natural barriers such as waterfalls.

**NOTES/SKETCH:**

[Diagram of stream crossing with notes and sketch]
Stream Crossing

WATERSHED/SUBSHED: [blank]
DATE: 7/11/08
ASSESS BY: KB

SURVEY REACH ID: T601
TIME: 3:20 AM
PHOTO ID: [Camera-Pic #]

SITE ID: [Condition-#] SC02
LAT 41° 49.24' LONG 29° 14'

For Road/Railroad Crossings Only

<table>
<thead>
<tr>
<th>SHAPE:</th>
<th># BARRELS:</th>
<th>MATERIAL:</th>
<th>ALIGNMENT:</th>
<th>DIMENSIONS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch</td>
<td>Single</td>
<td>Concrete</td>
<td>Flow-aligned</td>
<td>(ft)</td>
</tr>
<tr>
<td>Box</td>
<td>Double</td>
<td>Metal</td>
<td>Not flow-aligned</td>
<td>(ft)</td>
</tr>
<tr>
<td>Circular</td>
<td>Triple</td>
<td>Other: Stone</td>
<td>Do not know</td>
<td>(ft)</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>(ft)</td>
</tr>
</tbody>
</table>

CONDITION: (Evidence of...) | CULVERT SLOPE: |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cracking/chipping/corrosion</td>
<td>Flat</td>
</tr>
<tr>
<td>Sediment deposition</td>
<td>Slight (2° – 5°)</td>
</tr>
<tr>
<td>Other (describe):</td>
<td>Obvious (&gt;5°)</td>
</tr>
</tbody>
</table>

TOTAL BARREL DIAMETER: 4 (ft)
HEIGHT: 12.5 (ft)
CULVERT LENGTH: 25 (ft)
WIDTH: 40 (ft)
ROADWAY ELEVATION: [blank]

POTENTIAL RESTORATION CANDIDATE
<table>
<thead>
<tr>
<th>Fish barrier removal</th>
<th>Culvert repair/replacement</th>
<th>Upstream storage retrofit</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Local stream repair</td>
<td>Other:</td>
</tr>
</tbody>
</table>

IS SC ACTING AS GRADE CONTROL | No | Yes | Unknown |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXTENT OF PHYSICAL BLOCKAGE: | BLOCKAGE SEVERITY: (circle #)
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Partial</td>
</tr>
</tbody>
</table>

If yes for fish barrier
CAUSE:
| Drop too high | Water Drop: 4 (in) |
| Flow too shallow | Water Depth: [blank] (in) |
| Other:         | Other:             |

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.

NOTES/SKETCH:

[Diagram of stream crossing and备注]
### Impacted Buffer

**Watershed/Subshed:** Parker BRK  
**Survey Reach:** TB01  
**Date:** 7/11/08  
**Assessed By:** KB  
**Time:** 3:04 AM/PM  
**Photo ID:** (Camera-Pic #) #3536  
**Site ID:** (Condition #) IB-O1  
**GPS:** (Unit ID)  

#### Impacted Bank:
- **LT:**  
- **RT:**  
- **Both:**  

#### Reason Inadequate:
- Lack of vegetation  
- Too narrow  
- Widespread invasive plants  
- Recently planted  
- Other: Bridge abutment/wing wall  

#### Land Use:
- Private  
- Institutional  
- Golf Course  
- Park  
- Other Public  

#### Dominant Land Cover:
- LT Bank  
- RT Bank  

#### Invasive Plants:
- None  
- Rare  
- Partial coverage  
- Extensive coverage  
- Unknown  

#### Potential Restoration Candidate:
- Active reforestation  
- Greenway design  
- Natural regeneration  
- Invasives removal  
- Other:  

#### Restorable Area:
- **Length (ft):** LT Bank 40, RT Bank 30  
- **Width (ft):** 20  

#### Stream Shade Provided?
- None  
- Partial  
- Full  

#### Wetlands Present?
- Yes  
- Unknown  

#### Potential Conflicts with Reforestation:
- Widespread invasive plants  
- Potential contamination  
- Lack of sun  
- Poor/unsafe access to site  
- Existing impervious cover  
- Severe animal impacts (deer, beaver)  
- Other:  

#### Notes:

Left bank could be restored. Currently grass/scrub.  
Right Bank has concrete abutment, approx 15 ft long.  
Possibly restoration.
### Reach Level Assessment

<table>
<thead>
<tr>
<th>SURVEY REACH ID: TB-02</th>
<th>WRTSHD/SUBSHD:</th>
<th>DATE: 7/1/08</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>START</strong></td>
<td><strong>TIME:</strong> AM/PM</td>
<td><strong>LMK:</strong></td>
<td><strong>END</strong></td>
</tr>
<tr>
<td>LAT: 41° 14' 15&quot;</td>
<td><strong>LONG:</strong> 12° 19' 11&quot;</td>
<td></td>
<td>LAT:</td>
</tr>
</tbody>
</table>

### Description:

- **Rain in Last 24 Hours:** None
- **Steady rain:** Present
- **Intermittent:** No
- **Trace:** No
- **Clear:** No
- **Overcast:** No
- **Partly cloudy:** No
- **Surrounding Land Use:**
  - Industrial
  - Commercial
  - Urban/Residential
  - Suburban/Residential
  - Forested
  - Institutional
  - Golf course
  - Park
  - Crop
  - Pasture
  - Other:

### Average Conditions:

<table>
<thead>
<tr>
<th><strong>Base Flow as %</strong></th>
<th>0-25%</th>
<th>25-50%</th>
<th>50%-75%</th>
<th>75-100%</th>
</tr>
</thead>
</table>

- **Dominant Substrate:**
  - Silt/clay (fine or slick)
  - Sand (gritty)
  - Gravel (0.1-2.5")
  - Boulder (>10")
  - Bedrock

- **Water Clarity:**
  - Clear
  - Turbid (suspended matter)
  - Stained (clear, naturally colored)
  - Opaque (milky)
  - Other (chemicals, dyes)

### Aquatic Plants:

- **Attached:**
  - None
  - Some
  - Lots

- **Floating:**
  - None
  - Some
  - Lots

### Wildlife in or Around Stream:

- **Evidence of**:
  - Fish
  - Beaver
  - Deer
  - Snails
  - Other:

- **Stream Shading:**
  - Mostly shaded (≥75% coverage)
  - Halfway (≥50%)
  - Partially shaded (≥25%)
  - Unshaded (<25%)

### Channel Dynamics:

- **Downcutting**
- **Widening**
- **Headcutting**
- **Aggrading**
- **Sed. deposition**
- **Bed scour**
- **Bank failure**
- **Bank scour**
- **Slope failure**
- **Channelized**
- **Unknown**

### Channel Dimensions:

- **Height:**
  - LT bank: 2 ft
  - RT bank: 2 ft

- **Width:**
  - Bottom: 15 ft
  - Top: 30 ft

### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

### Notes:

- **(biggest problem you see in survey reach):**

- **REPORTED TO AUTHORITIES:** Yes/No

---

**DID NOT WALK REACH - KBQO LIMITED**

**IN USE**
### Overall Stream Condition

<table>
<thead>
<tr>
<th>N-Stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrates in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

#### Vegetative Protection
(score each bank, determine sides by facing downstream)

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>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 moving minimal or not evident; almost all plants allowed to grow naturally.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

#### Floodplain Connection

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
</tr>
</tbody>
</table>

### Overall Buffer and Floodplain Condition

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face downstream</td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures; some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e., fill material, land development, or man-made structures); Significant effect on floodplain function.</td>
</tr>
</tbody>
</table>

Sub Total In-stream: ______ /80 + Buffer/Floodplain: ______ /80 = Total Survey Reach ______ /160
**Reach Level Assessment**

<table>
<thead>
<tr>
<th>Survey Reach ID:</th>
<th>Wtrshd/Subshd:</th>
<th>Date:</th>
<th>Assessed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-63</td>
<td></td>
<td>7/1/08</td>
<td>DE/KR</td>
</tr>
</tbody>
</table>

**Start Time:** AM/PM | LMK: | **End Time:** AM/PM | LMK: | GPS ID: |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td></td>
<td>8:00 AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>72° 29' 14&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td>END</td>
<td>60° 15' 14&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rain in Last 24 Hours:**
- □ Heavy rain
- □ Steady rain
- □ None

**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 in Stream:**
- □ Attached: none
- □ Floating: none

**Wildlife in or Around Stream:**
- □ Fish
- □ Beaver
- □ Deer
- □ Snails
- □ Other:

**Stream Shading (water surface):**
- □ Mostly shaded (≥75% coverage)
- □ Halfway (≥50%)
- □ Partially shaded (≥25%)
- □ Unshaded (< 25%)

**Channel Dynamics:**
- □ Downcutting
- □ Widening
- □ Headcutting
- □ Aggrading
- □ Sed. deposition
- □ Bed scour
- □ Bank failure
- □ Bank scour
- □ Slope failure
- □ Channelized

**Channel Dimensions (Facing Downstream):**
- Height: LT bank 2 (ft)
- RT bank 3 (ft)
- Width: Bottom 6 (ft)
- Top 12 (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:** (biggest problem you see in survey reach)

**Reach Sketch and Site Impact Tracking:**
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.

**Reported to authorities:** □ Yes □ No
**OVERALL STREAM CONDITION**

<table>
<thead>
<tr>
<th>N-STREAM HABITAT (May modify criteria based on appropriate habitat regime)</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 70% of substrate favorable for epiphanal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEGETATIVE PROTECTION (score each bank, determine sides by facing downstream)</th>
<th>Optimal</th>
<th>Suboptimal</th>
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<td>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.</td>
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<table>
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<tr>
<th>BANK EROSION (facing downstream)</th>
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<th>Suboptimal</th>
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<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. (&lt;5% of bank affected).</td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening; banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN CONNECTION</th>
<th>Optimal</th>
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</table>

<table>
<thead>
<tr>
<th>OVERALL BUFFER AND FLOODPLAIN CONDITION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEGETATED BUFFER WIDTH</td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
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<tr>
<th>FLOODPLAIN VEGETATION</th>
<th>Predominant floodplain vegetation type</th>
<th>Predominant floodplain vegetation type is young forest</th>
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<tbody>
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<td>Predominant floodplain vegetation type is turf or crop land</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN ENCROACHMENT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
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<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

| Sub Total In-stream: 80 | Buffer/Floodplain: 80 | Total Survey Reach 100 |
### Storm Water Outfalls

**WATERSHED/SUBSHED:** Tucker

**DATE:** 7/1/08

**ASSESS BY:** KMB

<table>
<thead>
<tr>
<th>SURVEY REACH ID</th>
<th>TIME: 10:00 AM/PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB 03</td>
<td></td>
</tr>
</tbody>
</table>

**SITE ID (Condition-#): OT-01**

**LAT:** 41.48.49 **LONG:** 72.29.7

**LMK:**

**GPS: (Unit ID):**

### Bank:

- LT [ ] ART [X] Head

### Flow:

- [X] None
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other

### Type:

- [X] Closed pipe

### Material:

- [ ] Concrete
- [ ] PVC/Plastic
- [ ] Other:

### Shape:

- [X] Single

### Dimensions:

- Diameter: 15 (in)

### Submerged:

- [ ] No
- [X] Partially
- [ ] Fully

### Condition:

- [X] None

### Odor:

- [X] No

### Deposits/Stains:

- [X] None

### Veggie Density:

- [X] None

### Pipe Benthic Growth:

- [X] None

### Pool Quality:

- [X] No pool

### For Flowing Only:

#### Color:

- [X] Clear
- [ ] Brown
- [ ] Grey
- [ ] Yellow
- [ ] Green
- [ ] Orange
- [ ] Red
- [ ] Other

#### Turbidity:

- [X] None
- [ ] Slight Cloudiness
- [ ] Cloudy
- [ ] Opaque

#### Floatables:

- [X] None
- [ ] Sewage (toilet paper, etc.)
- [ ] Petroleum (oil sheen)
- [ ] Other

### Other Concerns:

- [ ] Excess Trash (paper/plastic bags)
- [ ] Dumping (bulk)
- [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance
- [ ] Bank Erosion
- [ ] Other

### Potential Restoration Candidate

- [ ] Discharge investigation
- [ ] Stream daylighting
- [ ] Local stream repair/outfall stabilization
- [ ] Storm water retrofit
- [ ] 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? [ ] Yes [ ] No [ ] Not investigated
- Land Use description: ________
- Area available: ________

### Outfall Severity:

- [ ] 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 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.

### Sketch/Notes:

---

**Reported to authorities:** [ ] Yes [ ] No
**Impacted Buffer**

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Tucker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach:</td>
<td>TB03</td>
</tr>
<tr>
<td>Time:</td>
<td>9:45 AM</td>
</tr>
<tr>
<td>PHOTO ID: (Camera-Site #)</td>
<td>#</td>
</tr>
<tr>
<td>Site ID: (Condition-#)</td>
<td>IB-03</td>
</tr>
<tr>
<td>Start Lat:</td>
<td>41°44'46&quot; N 72°29'10&quot; W</td>
</tr>
<tr>
<td>End Lat:</td>
<td>41°44'44&quot; N 72°29'17&quot; W</td>
</tr>
<tr>
<td>Impact Bank:</td>
<td>Both</td>
</tr>
<tr>
<td>Reason Inadequate:</td>
<td>Lack of vegetation, Too narrow, Widespread invasive plants</td>
</tr>
<tr>
<td>Land Use:</td>
<td>Private, Institutional, Golf Course, Park, Other Public</td>
</tr>
<tr>
<td>Dominant</td>
<td>Paved, Bare ground, Turf/lawn, Tall grass, Shrub/scrub, Trees, Other</td>
</tr>
<tr>
<td>Land Cover:</td>
<td>LT Bank, RT Bank</td>
</tr>
<tr>
<td>Invasive Plants:</td>
<td>None, Rare, Partial coverage, Extensive coverage, Unknown</td>
</tr>
<tr>
<td>Stream Shade Provided?</td>
<td>None, Partial, Full</td>
</tr>
<tr>
<td>Wetlands Present?</td>
<td>No, Yes, Unknown</td>
</tr>
<tr>
<td>Potential Restoration Candidate</td>
<td>Active reforestation, Greenway design, Natural regeneration, Invasives removal</td>
</tr>
<tr>
<td>Restorable Area:</td>
<td>LT Bank, RT</td>
</tr>
<tr>
<td>Length (ft):</td>
<td></td>
</tr>
<tr>
<td>Width (ft):</td>
<td></td>
</tr>
<tr>
<td>Potential Conflicts with Reforestation</td>
<td>Widespread invasive plants, Potential contamination, Lack of sun, Poor/unsafe access to site, Existing impervious cover, Severe animal impacts (deer, beaver), Other</td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
</tr>
</tbody>
</table>
Impacted Buffer

<table>
<thead>
<tr>
<th>Watershed/Subshed:</th>
<th>Tucker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Reach:</td>
<td>TB03</td>
</tr>
<tr>
<td>Time:</td>
<td>9:29 AM</td>
</tr>
<tr>
<td>Date:</td>
<td>7/1/08</td>
</tr>
<tr>
<td>Assessed By:</td>
<td>K-MB</td>
</tr>
<tr>
<td>Site ID:</td>
<td>IB-02</td>
</tr>
<tr>
<td>GPS:</td>
<td>Lat: 41°48'49&quot; Long: 72°29'13&quot; LMK</td>
</tr>
</tbody>
</table>

**Reason Inadequate:**
- Lack of vegetation
- Too narrow
- Widespread invasive plants
- Recently planted
- Other: ATV trail?

**Land Use:**
- Private
- Institutional
- Golf Course
- Park
- Other Public
- (Facing downstream) LT Bank
- RT Bank

**Dominant Land Cover:**
- Paved
- Bare ground
- Turf/lawn
- Tall grass
- Shrub/scrub
- Trees
- Other

**Invasive Plants:**
- None
- Rare
- Partial coverage
- Extensive coverage
- Unknown

**Stream Shade Provided?**
- None
- Partial
- Full

**Wetlands Present?**
- No
- Yes
- Unknown

**Potential Restoration Candidate:**
- Active reforestation
- Greenway design
- Natural regeneration
- Invasives removal
- Natural regeneration
- Invasives removal
- Other:

**Restorable Area**
- Length (ft): 30
- Width (ft): 20

**Reforestation Potential:**
- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road, building encroachment or other feature significantly limits available area for planting

**Notes:**
- 2 sections
- Fens
- Left bank
### Watershed/Subshed: Tucker
- **Survey Reach:** TB 03
- **Time:** 9:27 AM
- **Photo ID:** (Camera Pic #) 1# 5
- **Site ID:** (Condition #:) IB-01
- **Start:** LAT 41° 49' 50" LONG 12° 29' 12"
- **End:** LAT ___° ___' ___" LONG ___° ___' ___"
- **Reason Inadequate:**
  - Lack of vegetation
  - Too narrow
  - Widespread invasive plants
  - Recently planted
  - Other: ___
- **Land Use:**
  - Private
  - Institutional
  - Golf Course
  - Park
  - Other Public: Forest
- **Dominant Land Cover:**
  - LT Bank
  - RT Bank
  - Paved
  - Bare ground
  - Turf/lawn
  - Tall grass
  - Shrub/scrub
  - Trees
  - Other
- **Invasive Plants:**
  - None
  - Rare
  - Partial coverage
  - Extensive coverage
  - Unknown
- **Stream Shade Provided?**
  - None
  - Partial
  - Full
- **Wetlands Present?**
  - No
  - Yes
  - Unknown
- **Potential Restoration Candidate**
  - Active reforestation
  - Greenway design
  - Natural regeneration
  - Invasives removal
  - Other: ___
- **Restorable Area**
  - LT Bank
  - RT Bank
  - Length (ft): 50
  - Width (ft): 20
  - Potential:
    - Impact on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
    - Impact on either public or private land that is presently used for a specific purpose; available area for planting adequate
    - Impact on private land where road; building encroachment or other feature significantly limits available area for planting
  - Potential Conflicts with reforestation:
    - Widespread invasive plants
    - Potential contamination
    - Lack of sun
    - Poor/unsafe access to site
    - Existing impervious cover
    - Severe animal impacts (deer, beaver)
    - Other: Residential
- **Notes:**
  - Private road
  - Dense shrub
  - Stream
Severe Bank Erosion

**WATERSHED/SUBSHED:** Tucker

**DATE:** 7/1/08  **ASSESSED BY:**

**SURVEY REACH:** 1B03  **TIME:** 9:05 PM

**SITE ID:** ER-01  **PHOTO ID (CAMERA-PIC #):**

**PROCESS:**
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition
- [ ] Channelized

**BANK OF CONCERN:**
- [ ] LT
- [ ] RT
- [ ] Both (looking downstream)

**LOCATION:** [X] Meander bend  [ ] Straight section  [ ] Steep slope/valley wall  [ ] Other:

**DIMENSIONS:**
- **Length (if no GPS):** LT: ___ ft and/or RT: ___ ft
- **Bank Ht:** LT: ___ ft and/or RT: ___ ft
- **Bank Angle:** LT: ___° and/or RT: ___°
- **Wetted Width:** ___ ft

**LAND OWNERSHIP:** [X] Private  [ ] Public  [ ] Unknown

**LAND COVER:**
- [ ] Forest
- [ ] Field/Ag
- [ ] Developed

**POTENTIAL RESTORATION CANDIDATE:**
- [ ] Grade control
- [ ] Bank stabilization
- [ ] Other:

**THREAT TO PROPERTY/INFRASTRUCTURE:**
- [ ] No
- [X] Yes (Describe):

**EXISTING RIPARIAN WIDTH:**
- [ ] <25 ft
- [X] 25 - 50 ft
- [ ] 50 - 75 ft
- [ ] 75 - 100 ft
- [ ] >100 ft

**EROSION SEVERITY (circle #):**
- [ ] Channelized = 1
- [5] 3 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 or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.

**REPORTED TO AUTHORITIES**
- [ ] Yes
- [ ] No

---

**Notes/Cross Section Sketch:**

1.25 ft in 2 sections
**Stream Crossing**

**Watershed/Subshed:** Tucker Brk  
**Survey Reach ID:** 7B 03  
**Date:** 7/1/08  
**Assessed By:** Ems  
**Photo ID:** (Camera Pic #)  
**Site ID:** (Condition #) SC-01  
**Lat:** 41° 48' 45"  
**Long:** 72° 29' 8"  
**LMK:** LMK  
**GPS (Unit ID):**

<table>
<thead>
<tr>
<th>Type:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape:</strong></td>
<td>Arch</td>
<td>Bottomless</td>
<td>Box</td>
<td>Elliptical</td>
<td>Circular</td>
<td>Other:</td>
</tr>
<tr>
<td><strong>Barrels:</strong></td>
<td>Single</td>
<td>Double</td>
<td>Triple</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Material:</strong></td>
<td>Concrete</td>
<td>Metal</td>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alignment:</strong></td>
<td>Flow-aligned</td>
<td>Not flow-aligned</td>
<td>Do not know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions:</strong></td>
<td>(if variable, sketch)</td>
<td>Barrel diameter:</td>
<td>Height:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Potential Restoration Candidate:</strong></td>
<td>Fish barrier removal</td>
<td>Culvert repair/replacement</td>
<td>Upstream storage retrofit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Is SC Acting as Grade Control:</strong></td>
<td>No</td>
<td>Yes</td>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extent of Physical Blockage:</strong></td>
<td>Total</td>
<td>Partial</td>
<td>Temporary</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Cause:** | Drop too high | Water Drop: 12 (in)  
Flow too shallow | Water Depth: <1 (in)  
Other: |
| **Blockage Severity:** | (circle #) |

- 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.

**Notes/Sketch:**

![Diagram of stream crossing with cascades, boulders, and other elements.]
### Stream Crossing

**Watershed/Subshed:** Tucker Brk  
**Survey Reach ID:** TB03  
**Time:** 9:54:58 AM  
**Photo ID:** (Camera Pic #) #11  
**Site ID:** SC-02  
**LAT:** 41° 48', 44"  
**LONG:** 72° 29', 4"  
**LMK**  
**GPS (Unit ID):**  

**Type:**  
- [x] Road Crossing  
- [ ] Railroad Crossing  
- [ ] Manmade Dam  
- [ ] Beaver Dam  
- [ ] Geological Formation  
- [ ] Other:  

**Shape:**  
- [x] Circular  
- [ ] Arch  
- [ ] Bottomless  
- [ ] Box  
- [ ] Elliptical  
- [ ] Other:  

**For Road/Railroad Crossings Only**  
- [x] Single  
- [ ] Double  
- [ ] Triple  
- [ ] Other:  

**Material:**  
- [x] Concrete  
- [ ] Metal  
- [ ] Other:  

**Alignment:**  
- [x] Flow-aligned  
- [ ] Not flow-aligned  
- [ ] Do not know  

**Condition:**  
- [ ] Cracking/chipping/corrosion  
- [ ] Downstream scour hole  
- [ ] Sediment deposition  
- [ ] Failing embankment  
- [ ] Other (describe):  

**Culvert Slope:**  
- [x] Flat  
- [ ] Slight (2°—5°)  
- [ ] Obvious (>5°)  

**Dimensions:** (if variable, sketch)  
- Barrel diameter: 48 in (ft)  
- Height: ______ (ft)  
- Culvert length: 32 ft (ft)  
- Width: ______ (ft)  
- Roadway elevation: ______ (ft)  

**Potential Restoration Candidate**  
- [ ] Fish barrier removal  
- [ ] Culvert repair/replacement  
- [ ] Upstream storage retrofit  
- [ ] Local stream repair  
- [ ] Other:  

**Is SC acting as grade control:**  
- [x] No  
- [ ] Yes  
- [ ] Unknown  

**Extent of Physical Blockage:**  
- [ ] Total  
- [ ] Partial  
- [ ] Temporary  
- [ ] Unknown  

**Cause:**  
- [ ] Drop too high  
- [ ] Flow too shallow  
- [ ] Other:  

**Blockage Severity:** (circle #)  
- 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 visible fish habitat above it; natural barriers such as waterfalls.  

**Notes/Sketch:**

![Sketch of stream crossing](image)
**Reach Level Assessment**

**SURVEY REACH ID:** RCH-MA

<table>
<thead>
<tr>
<th>Wtrshd/Subshd:</th>
<th>DATE:</th>
<th>ASSESSED BY:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>START</th>
<th>TIME:</th>
<th>LMK:</th>
<th>END</th>
<th>TIME:</th>
<th>LMK:</th>
<th>GPS ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 41° 46' 49&quot;</td>
<td>LONG 147° 29' 07&quot;</td>
<td></td>
<td>LAT 41° 46' 49&quot;</td>
<td>LONG 147° 29' 07&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION:** Phoenix Rd.

**RAIN IN LAST 24 HOURS:**
- [ ] None
- [ ] Intermittent
- [ ] Trace
- [ ] Steady rain
- [ ] Heavy rain
- [ ] Trace

**PRESENT CONDITIONS:**
- [ ] Overcast
- [ ] Partly cloudy
- [ ] Steady rain
- [ ] Intermittent
- [ ] Heavy rain

**SURROUNDING LAND USE:**
- [ ] Industrial
- [ ] Commercial
- [ ] Urban/Residential
- [ ] Suburban/Residential
- [ ] Forested
- [ ] Institutional
- [ ] Golf course
- [ ] Park
- [ ] Crop
- [ ] Pasture
- [ ] Other:

**AVERAGE CONDITIONS (check applicable):**

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>CHANNEL WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] 0-25%</td>
<td>[ ] 25-50%</td>
</tr>
<tr>
<td>[ ] 50%-75%</td>
<td>[ ] 75-100%</td>
</tr>
</tbody>
</table>

**DOMINANT SUBSTRATE:**
- [ ] Silt/clay (fine or slick)
- [ ] Cobble (2.5 – 10")
- [ ] Sand (gritty)
- [ ] Boulder (>10")
- [ ] Gravel (0.1-2.5")
- [ ] Bedrock

**WATER CLARITY:**
- [ ] Clear
- [ ] Turbid (suspended matter)
- [ ] Stained (clear, naturally colored)
- [ ] Opaque (milky)
- [ ] Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM:**
- [ ] Attached:
- [ ] Floating:
- [ ] None
- [ ] Some
- [ ] Lots

**WILDLIFE IN OR AROUND STREAM:**
- [ ] Fish
- [ ] Beaver
- [ ] Deer
- [ ] Snails
- [ ] Other:

**STREAM SHADING (water surface):**
- [ ] Mostly shaded (>75% coverage)
- [ ] Halfway (>50%)
- [ ] Partially shaded (>25%)
- [ ] Unshaded (<25%)

**CHANNEL DYNAMICS:**
- [ ] Downcutting
- [ ] Widening
- [ ] Headcutting
- [ ] Aggrading
- [ ] Sed. deposition
- [ ] Bed scour
- [ ] Bank failure
- [ ] Bank scour
- [ ] Slope failure
- [ ] Channelized

**CHANNEL DIMENSIONS (FACING DOWNSTREAM):**
- [ ] Height: LT bank 2 ft
- [ ] RT bank 2 ft
- [ ] Width: Bottom 3 ft
- [ ] Top 15 ft

**CHANNEL HEIGHT:**
- [ ] LT bank
- [ ] RT bank

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:**

 Reported to authorities: [ ] Yes [ ] No

**Invasive species encroaching on stream**

**Reach sketch and site impact tracking:**

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.
<table>
<thead>
<tr>
<th>OVERALL STREAM CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong></td>
</tr>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
</tr>
<tr>
<td>Optimal</td>
</tr>
<tr>
<td>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);</td>
</tr>
<tr>
<td>Suboptimal</td>
</tr>
<tr>
<td>40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrates in the form of newfall, but not yet prepared for colonization (may rate at high end of scale);</td>
</tr>
<tr>
<td>Marginal</td>
</tr>
<tr>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| VEGETATIVE PROTECTION |
| (score each bank, determine sides by facing downstream) |
| Optimal               |
| Greater 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. |
| Suboptimal            |
| 70-80% 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. |
| Marginal               |
| 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 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. |

| BANK EROSION (facing downstream) |
| Optimal             |
| Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. |
| Suboptimal          |
| Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use. |
| Marginal            |
| Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure. |
| Poor                |
| 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. |

| FLOODPLAIN CONNECTION |
| Optimal               |
| High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched. |
| Suboptimal            |
| High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched. |
| Marginal               |
| High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched. |
| Poor                   |
| High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched. |

<table>
<thead>
<tr>
<th>OVERALL BUFFER AND FLOODPLAIN CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
</tr>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
</tr>
<tr>
<td>Optimal</td>
</tr>
<tr>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
</tr>
<tr>
<td>Suboptimal</td>
</tr>
<tr>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
</tr>
<tr>
<td>Marginal</td>
</tr>
<tr>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
</tbody>
</table>

| FLOODPLAIN VEGETATION |
| Predominant floodplain vegetation type is mature forest. |
| Optimal               |
| Predominant floodplain vegetation type is young forest. |
| Suboptimal            |
| Predominant floodplain vegetation type is shrub or old field. |
| Marginal               |
| Predominant floodplain vegetation type is shrub or old field. |
| Poor                   |
| Predominant floodplain vegetation type is shrub or old field. |

| FLOODPLAIN HABITAT |
| Even mix of wetland and non-wetland habitats, evidence of standing/ponded water. |
| Optimal             |
| Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water. |
| Suboptimal          |
| Either all wetland or all non-wetland habitat, evidence of standing/ponded water. |
| Marginal            |
| Either all wetland or all non-wetland habitat, evidence of standing/ponded water. |
| Poor                |
| Either all wetland or all non-wetland habitat, evidence of standing/ponded water. |

| FLOODPLAIN ENCROACHMENT |
| No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures. |
| Optimal               |
| Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function. |
| Suboptimal            |
| Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function. |
| Marginal               |
| Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function. |
| Poor                   |
| Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function. |

Sub Total In-stream:  ____/80  +  Buffer/Floodplain:  ____/80 =  Total Survey Reach  ____/160
Reach Level Assessment

**SURVEY REACH ID:** TB04B  **WTRSH/Subsd:** Tucker Bk  **DATE:** 7/1/08  **ASSESSED BY:** DRB

**START**
- **Time:** 10:53 AM  **LMK:**
- **LAT:** 41°48'43"  **LONG:** 72°29'5"
- **Description:** putmitato beaver dam

**END**
- **Time:** 11:28 AM  **LMK:**
- **LAT:** 41°48'73"  **LONG:** 72°29'00"
- **Description:** residential begins

**RAIN IN LAST 24 HOURS**
- □ Heavy rain
- □ Steady rain
- □ Intermittent
- □ None

**PRESENT CONDITIONS**
- □ Heavy rain
- □ Steady rain
- □ Intermittent
- □ Clear
- □ Trace
- □ Overcast
- □ Partly cloudy

**SURROUNDING LAND USE:**
- □ Industrial
- □ Commercial
- □ Golf course
- □ Park
- □ Urban/residential
- □ Suburban/residential
- □ Forested
- □ Institutional
- □ Crop
- □ Pasture
- □ Other:

**AVERAGE CONDITIONS (check applicable)**

- **BASE FLOW AS %**
  - □ 0-25%
  - □ 25-50%
  - □ 50-75%
  - □ 75-100%

- **CHANNEL WIDTH**
  - □ 0-25%
  - □ 25-50%
  - □ 50-75%
  - □ 75-100%

- **DOMINANT SUBSTRATE**
  - □ Silt/clay (fine or slick)
  - □ Sand (gritty)
  - □ Gravel (0.1-2.5")
  - □ Boulder (>10")
  - □ Cobble (2.5-10")
  - □ Bedrock

- **WATER CLARITY**
  - □ Turbid (suspended matter)
  - □ Stained (clear, naturally colored)
  - □ Opaque (milky)
  - □ Other (chemicals, dyes)

- **AQUATIC PLANTS IN STREAM**
  - Attached: □ none
  - □ some
  - □ lots
  - Floating: □ none
  - □ some
  - □ lots

- **WILDLIFE IN OR AROUND STREAM**
  - □ Fish
  - □ Beaver
  - □ Deer
  - □ Snails
  - □ Other:

- **STREAM SHADING (water surface)**
  - □ Mostly shaded (≥75% coverage)
  - □ Halfway (≥50%)
  - □ Partially shaded (≥25%)
  - □ Unshaded (<25%)

- **CHANNEL DYNAMICS**
  - □ Downcutting
  - □ Widening
  - □ Headcutting
  - □ Aggrading
  - □ Bed scour
  - □ Bank failure
  - □ Bank scour
  - □ Slope failure
  - □ Sed. deposition
  - □ Channelized

- **CHANNEL HEIGHT**
  - □ LT bank 2 (ft)
  - □ RT bank 2 (ft)

- **CHANNEL WIDTH**
  - □ Bottom 8 (ft)
  - □ Top 7 (ft)

**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 landscape.
- **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.

**NOTES:** (biggest problem you see in survey reach)

Invasive species covering stream

**REPORTED TO AUTHORITIES:** □ Yes □ No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>In-stream Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetative Protection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. &lt;5% of bank affected.</td>
<td>Grade and width stable; isolated areas of bank failure/erosion likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Connection</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td>High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.</td>
<td></td>
</tr>
</tbody>
</table>

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 20/80 + Buffer/Floodplain: 20/80 = Total Survey Reach 40/100
Storm Water Outfalls

OUTFALL

Type: [ ] Closed pipe  [ ] Open channel

Material: [ ] Concrete  [ ] Metal  [ ] PVC/Plastic  [ ] Brick  [ ] Other:

Shape: [ ] Circular  [ ] Elliptical  [ ] Triple  [ ] Other:

Dimensions: Diameter: [ ] in  Height: [ ] in

Condition: [ ] None  [ ] Chip/Cracked  [ ] Peeling Paint  [ ] Corrosion  [ ] Other:

ORANGE:

Flow:

[ ] None  [ ] Trickle  [ ] Moderate  [ ] Substantial  [ ] Other:

ORANGE:

Condition:

[ ] None  [ ] Chip/Cracked  [ ] Peeling Paint  [ ] Corrosion  [ ] Other:

ORANGE:

Type: [ ] Single  [ ] Double  [ ] Other:

Material: [ ] Concrete  [ ] Metal  [ ] PVC/Plastic  [ ] Brick  [ ] Other:

Dimensions: Diameter: [ ] in  Height: [ ] in

Submerged: [ ] None  [ ] Partially  [ ] Fully  [ ] Not Applicable

ORANGE:

Outfall

Severities:

(circle #)

Reported to authorities: [ ] Yes  [ ] No

Sketch/Notes:

Dry weather flow from small wetland for stormwater drainage of residential area.

Watershed/Subhed: [ ]

Survey Reach ID: [ ]

Date: [ ]

Assessed by: [ ]

Photo ID: [ ]

Site ID: [ ]

Bank: [ ] LT  [ ] RT  [ ] Head

Flow:

[ ] None  [ ] Trickle  [ ] Moderate  [ ] Substantial  [ ] Other:

Condition: [ ] None  [ ] Chip/Cracked  [ ] Peeling Paint  [ ] Corrosion  [ ] Other:

Potential Restoration Candidate:

[ ] Discharge investigation  [ ] Stream daylighting  [ ] Local stream repair/outfall 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 investigated

ORANGE:

Land Use Description:

Area available:

Outfall Severity:

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 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.

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

ORANGE:

Pool Quality:

[ ] Good  [ ] Odors  [ ] Colors  [ ] Oils  [ ] Suds  [ ] Algae  [ ] Floatables  [ ] Other:

Pipe Benthic Growth:

[ ] None  [ ] Brown  [ ] Orange  [ ] Green  [ ] Other:

ORANGE:

Other Concerns:

[ ] Excess Trash (paper/plastic bags)  [ ] Dumping (bulk)  [ ] Excessive Sedimentation  [ ] Needs Regular Maintenance  [ ] Bank Erosion  [ ] Other:

ORANGE:

Potential Restoration Candidate:

[ ] Discharge investigation  [ ] Stream daylighting  [ ] Local stream repair/outfall 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 investigated

ORANGE:

Land Use Description:

Area available:

Outfall Severity:

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 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.

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

Sketch/Notes:

Dry weather flow from small wetland for stormwater drainage of residential area.

Reported to authorities: [ ] Yes  [ ] No
Trash and Debris

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRASH AND DEBRIS</th>
<th>DATE: 7/1/08</th>
<th>ASSESSED BY: FMB DBB</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SURVEY REACH ID:</th>
<th>PHOTO ID: (Camera-Pic #)</th>
<th>SITE ID: (Condition-#)</th>
<th>TIME: 11:02 AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB 04 B</td>
<td># 20</td>
<td>TR- 01</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GPS: (Unit ID)</th>
<th>LAT 41° 45', 44&quot; LONG 71° 19', 3&quot;</th>
<th>LMK</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL RESTORATION CANDIDATE</th>
<th>If yes for trash or debris removal</th>
<th>WHO CAN DO IT:</th>
<th>DUMPSTER WITHIN 100 FT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream cleanup</td>
<td>Yes</td>
<td>Volunteers</td>
<td>Yes</td>
</tr>
<tr>
<td>Stream adoption segment</td>
<td></td>
<td>Local Gov</td>
<td>Yes</td>
</tr>
<tr>
<td>Removal/prevention of dumping</td>
<td>No</td>
<td>Hazmat Team</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Other</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLEAN-UP POTENTIAL: (Circle #)</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access</td>
<td>grass and brush clippings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES</th>
<th>YES</th>
<th>NO</th>
</tr>
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<td>Local Gov</td>
<td>Yes</td>
</tr>
<tr>
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<td>Hazmat Team</td>
<td>No</td>
</tr>
<tr>
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<tr>
<th>CLEAN-UP POTENTIAL: (Circle #)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>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 cleared up in a few days, possibly with a small backhoe.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
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<td>Local Gov</td>
<td>Yes</td>
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<tr>
<td>Removal/prevention of dumping</td>
<td>No</td>
<td>Hazmat Team</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Other</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLEAN-UP POTENTIAL: (Circle #)</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPORTED TO AUTHORITIES</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>
**Reach Level Assessment**

**SURVEY REACH ID:** T1-01C  
**WTRSHID/SUBSHD:**  
**DATE:** 7/1/08  
**ASSESSED BY:** KB/DB

<table>
<thead>
<tr>
<th>START</th>
<th>TIME: 11:30 AM/PM</th>
<th>LMK:</th>
<th>END</th>
<th>TIME:</th>
<th>LMK:</th>
<th>GPS ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 41° 16.43&quot;</td>
<td>LONG 71° 29.00&quot;</td>
<td></td>
<td></td>
<td>LAT</td>
<td>LONG</td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION:**

**RAIN IN LAST 24 HOURS:**
- Heavy rain
- Steady rain
- None

**PRESENT CONDITIONS:**
- Heavy rain
- Steady rain
- Intermittent
- Trace
- Overcast
- Clear
- Partly cloudy

**SURROUNDING LAND USE:**
- Industrial
- Commercial
- Urban/Residential
- Suburban/Residential
- Forested
- Institutional
- Golf course
- Park
- Crop
- Pasture
- Other:

**AVERAGE CONDITIONS (check applicable):**

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>0-25%</th>
<th>50%-75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANNEL WIDTH</td>
<td>25-50%</td>
<td>75-100%</td>
</tr>
</tbody>
</table>

**DOMINANT SUBSTRATE:**
- Silt/clay (fine or slick)
- Sand (gritty)
- Gravel (0.1-2.5")
- Cobble (2.5-10")
- Boulder (>10")
- Bed rock

**WATER CLARITY:**
- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opaque (milky)
- Other (chemicals, dyes)

**AQUATIC PLANTS IN STREAM:**
- Attached: none, some, lots
- Floating: none, some, lots

**WILDLIFE IN OR AROUND STREAM:**
- Evidence of:
  - Fish
  - Beaver
  - Deer
  - Snails
  - Other:

**STREAM SHADING (water surface):**
- Mostly shaded (>75% coverage)
- Halfway (>50%)
- Partially shaded (>25%)
- Unshaded (<25%)

**CHANNEL DYNAMICS:**
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**CHANNEL HEIGHT:**
- LT bank
- RT bank

**CHANNEL WIDTH (FACING DOWNSTREAM):**
- Bottom (ft)
- Top (ft)

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**NOTES:** (biggest problem you see in survey reach)

**REACH SKETCH AND SITE IMPACT TRACKING:**
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.

**REPORTED TO AUTHORITIES:**
- Yes
- No
### OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>N-STREAM HABITAT</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epilithic 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

| VEGETATIVE PROTECTION | 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 densely 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. |

### OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>VEGETATED BUFFER WIDTH</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOODPLAIN VEGETATION</th>
<th>Predominant floodplain vegetation type is mature forest</th>
<th>Predominant floodplain vegetation type is young forest</th>
<th>Predominant floodplain vegetation type is shrub or old field</th>
<th>Predominant floodplain vegetation type is turf or crop land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water</td>
<td></td>
</tr>
</tbody>
</table>

### FLOODPLAIN ENCROACHMENT

| 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 affecting floodplain function | Moderate floodplain encroachment in the form of fill material, 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 |

Sub Total In-stream: __________ /80 + Buffer/Floodplain: __________ /80 - Total Survey Reach ________/160
**Storm Water Outfalls**

**OT**

**WATERSHED/SUBSHED:** Tucker  
**DATE:** 7/1/08  
**ASSESSED BY:** CMK

**SURVEY REACH ID:** B04C  
**TIME:** 12:00 AM/PST  
**PHOTO ID:** (Camera-Pic #) #

**SITE ID (Condition-#):** OT-04  
**LAT:** 41° 45' 43"  
**LONG:** 72° 28' 51"  
**LMK**

**BANK:**  
- [ ] LT  
- [ ] RT  
- [ ] Head

**FLOW:**  
- [ ] None  
- [x] Trickle  
- [ ] Moderate  
- [ ] Substantial  
- [ ] Other:

**CONDITION:**  
- [x] None  
- [ ] Chip/Cracked  
- [x] Peeling Paint  
- [x] Corrosion  
- [ ] Other:

**ODOR:**  
- [x] No  
- [ ] Gas  
- [ ] Sewage  
- [ ] Rancid/Sour  
- [ ] Sulfide  
- [ ] Other:

**DEPOSITS/STAINS:**  
- [ ] None  
- [ ] Oily  
- [ ] Flow Line  
- [ ] Paint  
- [ ] Other:

**VEGGIE DENSITY:**  
- [ ] None  
- [ ] Normal  
- [ ] Inhibited  
- [ ] Excessive  
- [ ] Other:

**PIPE BENTHIC GROWTH:**  
- [ ] None  
- [x] Brown  
- [x] Orange  
- [x] Green  
- [ ] Other:

**POOL QUALITY:**  
- [ ] No pool  
- [ ] Good  
- [ ] Odors  
- [ ] Colors  
- [ ] Oils  
- [ ] Other:

**TURBIDITY:**  
- [ ] None  
- [ ] Slight Cloudiness  
- [ ] Cloudy  
- [ ] Opaque

**FLOATABLES:**  
- [ ] None  
- [ ] Sewage (toilet paper, etc.)  
- [ ] Petroleum (oil sheen)  
- [ ] Other:

**FOR FLOWING ONLY**  
- [ ] Color: [ ] Clear  
- [ ] Brown  
- [ ] Grey  
- [ ] Yellow  
- [ ] Green  
- [x] Orange  
- [ ] Red  
- [ ] Other:

- [ ] Turbidity: [x] None  
- [ ] Slight Cloudiness  
- [ ] Cloudy  
- [ ] Opaque

- [ ] Floatables: [x] None  
- [ ] Sewage (toilet paper, etc.)  
- [ ] Petroleum (oil sheen)  
- [ ] Other:

**OTHER CONCERNS:**  
- [ ] Excess Trash (paper/plastic bags)  
- [ ] Dumping (bulk)  
- [ ] Excessive Sedimentation  
- [ ] Needs Regular Maintenance  
- [ ] Bank Erosion  
- [ ] Other:

---

**POTENTIAL RESTORATION CANDIDATE**  
- [x] Discharge investigation  
- [x] Stream daylighting  
- [ ] Local stream repair/outfall stabilization  
- [ ] Storm water retrofit  
- [ ] 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?**  
- [ ] Yes  
- [ ] No  
- [ ] Not investigated  

**Land Use description:**  
**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 stream; discharge appears to be having a significant impact downstream.  
- [ ] 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.  
- [ ] Outfall does not have dry weather discharge, staining, or appearance of causing any erosion problems.

**OUTFALL SEVERITY:** [5 4 3 2 1]

**REPORTED TO AUTHORITIES:** [ ] YES  
[ ] NO

**REPORTED TO AUTHORITIES:** [ ] YES  
[ ] NO

**SKETCH/NOTES:** 
*Iron pp*
<table>
<thead>
<tr>
<th><strong>Storm Water Outfalls</strong></th>
</tr>
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<tbody>
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<tr>
<td>(circle #)</td>
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</tbody>
</table>

**Potential Restoration Candidate**
- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- Other:

---

**For Flowing Only**
- Color: Clear
- Turbidity: None
- Floatables: None

---

**Other Concerns**
- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

---

**Reported to Authorities**
- Yes
- No
Storm Water Outfalls

Watershed/Subshed: Tucker Brook

Survey Reach ID: 718-04C

Site ID (Condition #: OT-02

Latitude: 41° 48' 44"
Longitude: 71° 26' 55"

Reported to Authorities: Yes

Potential Restoration Candidate: Yes

Discharge investigation: No
Stream daylighting: Yes
Local stream repair/outfall stabilization: No

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 investigated ______

Land Use description: __________________________
Area available: __________________________

Outfall Severity:

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 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.

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

Sketch/Notes:

Reported to Authorities: Yes ______ No ______
Storm Water Outfall

WATERSHED/SUBSHED: **Tucker**

SURVEY REACH ID: **TBOYC**

SITE ID (Condition-#): **OT-05**

DATE: **7/1/108**

ASSESS BY: **Kmb**

PHOTO ID: (Camera-Pic #) **# 27**

LAT 41° 46' 52" LONG 72° 28' 52"

**BANK:**
- [X] LT [ ] RT [ ] Head

**FLOW:**
- [X] None [ ] Trickle
- [ ] Moderate
- [ ] Substantial
- [ ] Other:

**TYPE:**
- [X] Open Channel
- [ ] Concrete [ ] Earthen [ ] Other:

**MATERIAL:**
- [ ] Concrete [ ] Metal [ ] PVC/Plastic [ ] Brick [ ] Other:

**SHAPE:**
- [X] Circular [ ] Elliptical [ ] Triple [ ] Other:

**DIMENSIONS:**
- Diameter: ___ (in)

**SUBMERGED:**
- [X] No [ ] Partially [ ] Fully

**CONDITION:**
- [X] None [ ] Chip/Cracked
- [ ] Peeling Paint
- [ ] Corrosion
- [ ] Other:

**FLOW:**
- [ ] Gas [ ] Sewage [ ] Rancid/Sour
- [ ] Sulfide [ ] Other:

**ODOR:**
- [X] No [ ] Gas [ ] Sewage
- [ ] Rancid/Sour [ ] Sulfide
- [ ] Other:

**DEPOSITS/STAINS:**
- [X] None [ ] Oily [ ] Flow Line [ ] Paint
- [ ] Other:

**VEGGIE DENSITY:**
- [X] None [ ] Normal [ ] Inhibited
- [ ] Excessive [ ] Other:

**PIPE BENTHIC GROWTH:**
- [X] None [ ] Brown [ ] Orange [ ] Green
- [ ] Other:

**POOL QUALITY:**
- [X] No pool [ ] Good [ ] Odors [ ] Colors [ ] Oils
- [ ] Suds [ ] Algae [ ] Floatables
- [ ] Other:

**FOR FLOWING ONLY:**

**COLOR:**
- [ ] Clear [ ] Brown [ ] Grey [ ] Yellow [ ] Green [ ] Orange [ ] Red [ ] Other:

**TURBIDITY:**
- [X] None [ ] Slight Cloudiness [ ] Cloudy [ ] Opaque

**FLOATABLES:**
- [X] None [ ] Sewage (toilet paper, etc.) [ ] Petroleum (oil sheen) [ ] Other:

**OTHER CONCERNS:**
- [ ] Excess Trash (paper/plastic bags) [ ] Dumping (bulk) [ ] Excessive Sedimentation
- [ ] Needs Regular Maintenance [ ] Bank Erosion [ ] Other:

**OUTFALL SEVERITY:**
- **5** [ ] 4 [ ] 3 [ ] 2 [ ]

**POTENTIAL RESTORATION CANDIDATE:**
- [ ] Discharge investigation [ ] Stream daylighting [ ] Local stream repair/outfall stabilization
- [X] None [ ] Storm water retrofit [ ] 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? [ ] Yes [ ] No [ ] Not investigated
- Land Use description: ________________________________
- Area available: ________________________________

**OUTFALL SEVERITY:**
- 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 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.
- Outfall does not have dry weather discharge, staining; or appearance of causing any erosion problems.

**REPORTED TO AUTHORITIES:** [ ] YES [ ] NO
### Watershed/Subshed: Tucker

**Survey Reach:** TB64C  
**Time:** 7:40 AM/PM

**Site ID:**  
**Start LAT:** 41° 43' 43"  
**END LAT:** 41° 45' 41"

**Impacted Bank:**  
**Reason Inadequate:**  
- Lack of vegetation  
- Too narrow  
- Widespread invasive plants

**Land Use:**  
(Facing downstream)  
- LT Bank  
- RT Bank

**Dominant Land Cover:**  
- LT Bank  
- RT Bank

**Invasive Plants:**  
- None  
- Rare  
- Partial coverage  
- Extensive coverage  
- Unknown

**Stream Shade Provided?**  
- None  
- Partial  
- Full

**Wetlands Present?**  
- No  
- Yes  
- Unknown

**Potential Restoration Candidate:**  
- Active reforestation  
- Greenway design  
- Natural regeneration  
- Invasives removal

**Restorable Area**  
**Length (ft):** 15  
**Width (ft):** 15

**Notes:**

- Potential Conflicts with Reforestation:
  - Widespread invasive plants  
  - Potential contamination  
  - Lack of sun  
  - Poor/unsafe access to site  
  - Existing impervious cover  
  - Severe animal impacts (deer, beaver)  
  - Other: Residential/urban
**Watershed/Subshed:** IB-04C  
**Date:** 7/1/109  
**Assessed By:** DZB

**Survey Reach:** IB-04C  
**Time:** 12:15 AM/PM  
**Photo ID:** (Camera-Pic #) #

<table>
<thead>
<tr>
<th>Site ID: (Condition #)</th>
<th>Start Lat.</th>
<th>Long.</th>
<th>LMK</th>
<th>Reason Inadequate:</th>
<th>Lack of vegetation</th>
<th>Too narrow</th>
<th>Widespread invasive plants</th>
<th>Recently planted</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB-04C</td>
<td>41° 04' 41&quot;</td>
<td>72° 26' 30&quot;</td>
<td>LMK</td>
<td>☑ Lack of vegetation</td>
<td>☐</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Impacted Bank:** ☑ LT  ☑ RT  ☑ Both

**Reason Inadequate:** ☑ Lack of vegetation  ☑ Too narrow  ☑ Widespread invasive plants  ☑ Recently planted  ☑ Other:

**Land Use:**
- Private
- Institutional
- Golf Course
- Park
- Other Public

(Facing downstream)
- LT Bank
- RT Bank

**Dominant Land Cover:**
- Paved
- Bare Ground
- Turf/lawn
- Tall Grass
- Shrub/scrub
- Trees
- Other

**Invasive Plants:**
- None
- Rare
- ☑ Partial coverage
- ☐ Extensive coverage
- ☐ Unknown

**Stream Shade Provided?**
- None
- ☑ Partial
- ☐ Full

**Wetlands Present?**
- ☑ Yes
- ☐ No
- ☐ Unknown

**Restorable Area**
- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

**Potential Restoration Candidate**
- ☑ Active reforestation
- ☑ Greenway design
- ☑ Natural regeneration
- ☑ Invasives removal
- ☐ No
- ☑ Other:

**Restorable Potential:**
- Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting
- Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate
- Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting

**Potential Conflicts with Reforestation**
- Widespread invasive plants
- Potential contamination
- Lack of sun
- Poor/unsafe access to site
- Existing impervious cover
- Severe animal impacts (deer, beaver)
- Other:

**Notes:**
- [Diagram of impacted area]
**Storm Water Outfalls**

**Watershed/Subshed:** Tucker Brk  
**Assessed By:** KMB DRB

**Survey Reach ID:** TBOY  
**Time:** 11:30 AM  
**Photo ID:** (Camera-Pic #)  
**Site ID (Condition-#):** OT-O1  
**Lat:** 41° 48' 43" _Long_ 72° 28' 57"  
**LMK**

**Potential Restoration Candidate**

- [ ] Discharge investigation  
- [ ] Stream daylighting  
- [x] Local stream repair/outfall stabilization  
- [ ] Storm water retrofit  
- [ ] 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?  
  - [ ] Yes  
  - [ ] No  
  - [ ] Not investigated  
  - Land Use description: ____________________________
  - Area available: ____________________________

**Outfall Severity**

- [x] 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 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.

- [ ] Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

**Potential for daylighting**

- [ ] Yes  
- [ ] No  
- [ ] Not investigated  
- If yes for daylighting, additional details:
  - Length of vegetative cover from outfall: ________ ft
  - Type of existing vegetation: ____________________________
  - Slope: ________°

**Sketch/Notes:**
**Stream Crossing**

**Watershed/Subshed:** Tucker  
**Survey Reach ID:** 7B04C  
**Time:** 11:45 AM  
**Photo ID:** (Camera-Pic #)  
**Site ID:** (Condition #) SC-01  
**Lat:** 49° 48' 44"  
**Long:** 72° 28' 55"  
**GPS (Unit ID):** LMK____

**Type:**  
- **Road Crossing**  
- **Railroad Crossing**  
- **Manmade Dam**  
- **Beaver Dam**  
- **Geological Formation**  
- **Other:** Bridge

**Shape:**  
- **Rectangular**  
- **Bottomless**  
- **Box**  
- **Circular**  
- **Elliptical**  
- **Other:**

**# Barrels:**  
- **Single**  
- **Double**  
- **Triple**  
- **Other:**

**Material:**  
- **Concrete**  
- **Metal**  
- **Other:**

**Alignment:**  
- **Flow-aligned**  
- **Not flow-aligned**  
- **Do not know**

**DIMENSIONS:**  
- **Barrel diameter:** _______(ft)  
- **Height:** _______(ft)  
- **Culvert length:** _______(ft)  
- **Width:** _______(ft)  
- **Roadway elevation:** _______(ft)

**Potential Restoration Candidate:**  
- **Fish barrier removal**  
- **Culvert repair/replacement**  
- **Upstream storage retrofit**  
- **Local stream repair**

**Is SC acting as grade control:**
- **No**  
- **Yes**  
- **Unknown**

**Extent of Physical Blockage:**  
- **Total**  
- **Partial**  
- **Temporary**  
- **Unknown**

**Cause:**  
- **Drop too high**  
- **Flow too shallow**  
- **Other:**

**Blockage Severity:** (circle #)  
- **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.**

**Notes/Sketch:**

[Sketch of stream crossing with annotations: Small dam, waterfall, cement & rock, water fall/dam]
Stream Crossing

WATERSHED/SUBSHED: 

DATE: 1/1/08 ASSESSED BY: LMK

SURVEY REACH ID: TBOY C TIME: AM/PM PHOTO ID: (Camera-Pic #) #

SITE ID: (Condition-#) SC-07 LAT 41° 48' 47" LONG 72° 28' 50" LMK GPS (Unit ID)

TYPE: [ ] Road Crossing [ ] Railroad Crossing [ ] Manmade Dam [ ] Beaver Dam [ ] Geological Formation [ ] Other:

FOR ROAD/RAILROAD CROSSINGS ONLY

SHAPE: [ ] Arch [ ] Bottomless [ ] Box [ ] Elliptical [ ] Circular [ ] Other:

# BARRELS: [ ] Single [ ] Double [ ] Triple [ ] Other:

MATERIAL: [ ] Concrete [ ] Metal [ ] Other:

ALIGNMENT: [ ] Flow-aligned [ ] Not flow-aligned [ ] Do not know

DIMENSIONS: (if variable, sketch)
Barrel diameter: ________(ft)
Height: ________(ft)
Culvert length: ________(ft)
Width: ________(ft)
Roadway elevation: ________(ft)

CONDITION: (Evidence of...)
[ ] Cracking/chipping/corrosion [ ] Downstream scour hole
[ ] Sediment deposition [ ] Failing embankment
[ ] Other (describe):

CULVERT SLOPE:
[ ] Flat [ ] Slight (2°—5°) [ ] Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE
[ ] Fish barrier removal [ ] Culvert repair/replacement [ ] Upstream storage retrofit
[ ] Local stream repair [ ] Other:

IS SC acting as Grade Control
[ ] No [ ] Yes [ ] Unknown

EXTENT OF PHYSICAL BLOCKAGE:
[ ] Total [ ] Partial [ ] Unknown

CAUSE:
[ ] Drop too high [ ] Water Drop: 36 (in)
[ ] Flow too shallow [ ] Water Depth: ________(in)
[ ] Other:

BLOCKAGE SEVERITY: (circle #)
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.

NOTES/SKETCH:

REPORTED TO AUTHORITIES [ ] YES [ ] NO
### Stream Crossing

**Watershed/Subshed:** Tucker  
**Survey Reach ID:** 1B04C  
**Time:** 12:50 AM/09  
**Photo ID:** (Camera-Pic #) 1#  
**Site ID:** (Condition #) SC-03  
**Lat:** 41° 19' 37"  
**Long:** 72° 26' 45"  
**LMK**  
**GPS (Unit ID)**  

**Date:** 7/1/08  
**Assessed by:** KM  

**Type:**  
- ☑ Road Crossing  
- ☐ Railroad Crossing  
- ☐ Mannmade Dam  
- ☐ Beaver Dam  
- ☐ Geological Formation  
- ☐ Other:  

**Shape:**  
- ☑ Arch  
- ☐ Bottomless  
- ☇ Box  
- ☐ Elliptical  
- ☐ Circular  
- ☐ Other:  

**# Barrels:**  
- ☐ Single  
- ☐ Double  
- ☑ Triple  
- ☐ Other:  

**Material:**  
- ☑ Flow-aligned  
- ☐ Not flow-aligned  
- ☐ Do not know  

**Alignment:**  
- ☐ Flow-aligned  
- ☐ Not flow-aligned  
- ☐ Do not know  

**Condition:**  (Evidence of...)  
- ☐ Cracking/chipping/corrosion  
- ☐ Downstream scour hole  
- ☐ Sediment deposition  
- ☐ Failing embankment  
- ☐ Other (describe):  

**Culvert Slope:**  
- ☐ Flat  
- ☐ Slight (2° — 5°)  
- ☑ Obvious (>5°)  

**Potential Restoration Candidate:**  
- ☐ Fish barrier removal  
- ☐ Culvert repair/replacement  
- ☐ Upstream storage retrofit  
- ☑ Local stream repair  
- ☐ Other:  

**Is SC Acting as Grade Control:**  
- ☑ No  
- ☐ Yes  
- ☐ Unknown  

**Extent of Physical Blockage:**  
- ☑ Total  
- ☐ Partial  
- ☐ Temporary  
- ☐ Unknown  

**Cause:**  
- ☑ Drop too high  
- ☐ Water Drop: _____ (in)  
- ☐ Flow too shallow  
- ☐ Water Depth: _____ (in)  
- ☐ Other:  

**Blockage Severity:**  (circle #)  
- 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.  

**Notes/Sketch:**  

**Reported to authorities:**  
- ☐ Yes  
- ☑ No
<table>
<thead>
<tr>
<th>TR TrashandDebris</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATERSHED/SUBSHED: Tucker</td>
</tr>
<tr>
<td>DATE: 7/1/08</td>
</tr>
<tr>
<td>ASSESSED BY: KMB</td>
</tr>
<tr>
<td>SURVEY REACH ID: TB 04C</td>
</tr>
<tr>
<td>TIME: 12:27 AM/PM</td>
</tr>
<tr>
<td>PHOTO ID: (Camera-Pic #)</td>
</tr>
<tr>
<td>SITE ID: (Condition-#) TR-02</td>
</tr>
<tr>
<td>LAT 41°48'40&quot; &quot; LONG 72°28'49&quot; &quot; LMK</td>
</tr>
<tr>
<td>GPS: (Unit ID)</td>
</tr>
<tr>
<td>TYPE:</td>
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</tbody>
</table>

- **Type:** Residential
- **Material:** Yard Waste
- **Source:** Illegal dump
- **Location:** Riparian area
- **Land Ownership:** Private
- **Amount:** 2 pickup truck loads
- **Potential Restoration Candidate:** Removal/prevention of dumping
- **Equipment Needed:** Heavy equipment
- **Who Can Do It:** Volunteers
- **Dumpster Within 100 FT:** Yes
- **Notes:** A large amount of trash or debris scattered over a large area, where access is very difficult. Presence of drums or indications of hazardous materials.
**Trash and Debris**

**WATERSHED/SUBSHED:** Tucker  
**DATE:** 7/1/08  
**ASSESSED BY:** FMK

**SURVEY REACH ID:** TB04C  
**TIME:** 12:00 AM/GMT  
**PHOTO ID:** (Camera-Pic #) # 28

**SITE ID:** (Condition #) TR-01  
**LAT:** 41°46'44"  
**LONG:** 72°28'52"  
**LMK**

**GPS:** (Unit ID)

|------|-----------|---------|-----------|-----------------|-------------------------------|
| □ Industrial  
□ Commercial  
☒ Residential | □ Plastic  
□ Tires  
□ Appliances  
□ Automotive | □ Unknown  
□ Flooding  
□ Medical  
□ Yard Waste  
□ Local outfall | □ Stream  
□ Riparian Area  
□ Lt bank  
□ Rt bank | □ Public  
□ Private  
□ Unknown | |

**POTENTIAL RESTORATION CANDIDATE**  
☒ Stream cleanup  
☐ Stream adoption segment  
☐ Removal/prevention of dumping

**If yes for trash or debris removal**  
☐ Heavy equipment  
☒ Trash bags  
☐ Unknown

**WHO CAN DO IT:**  
☒ Volunteers  
☐ Local Gov  
☐ Hazmat Team  
☐ Other

**DUMPSTER WITHIN 100 FT:**  
☐ Yes  
☐ No  
☒ Unknown

**CLEAN-UP POTENTIAL:**
(A 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, 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 drums or indications of hazardous materials

**NOTES:**

"pile of leaves and yard clippings"

**REPORTED TO AUTHORITIES**  
☐ YES  
☒ NO
Reach Level Assessment


START TIME: 10:20 AM/PM LMK: | END TIME: 10:23 AM/PM LMK: | GPS ID:
LAT: 41° 50' 51" | LONG: 76° 26' 13"

DESCRIPTION: Walker Res. Wust.

RAIN IN LAST 24 HOURS
- [] Heavy rain
- [X] Steady rain
- [] None
- [] Intermittent
- [] Trace

PRESENT CONDITIONS
- [] Heavy rain
- [] Steady rain
- [] Intermittent
- [] Clear
- [] Trace
- [] Overcast
- [] Partly cloudy

SURROUNDING LAND USE:
- [] Industrial
- [] Commercial
- [] Golf course
- [] Park
- [] Urban/Residential
- [] Suburban/Res.
- [] Forested
- [] Institutional
- [] Crop
- [] Pasture
- [X] Other: Sand/gritty

AVERAGE CONDITIONS (check applicable)

BASE FLOW as %
- [] 0-25%
- [] 25-50%
- [] 50-75%
- [] 75-100%

CHANNEL WIDTH
- [] 0-25%
- [] 25-50%
- [] 50-75%
- [] 75-100%

DOMINANT SUBSTRATE
- [] Silt/clay (fine or slick)
- [] Cobble (2.5-10"
- [] Sand (gritty)
- [] Boulder (>10"
- [] Gravel (0.1-2.5")
- [X] Bed rock

WATER CLARITY
- [] Clear
- [] Turbid (suspended matter)
- [] Stained (clear, naturally colored)
- [] Opaque (milky)
- [] Other (chemicals, dyes)

AQUATIC PLANTS
- [] Attached: none
- [] some
- [] lots

WILDLIFE IN OR AROUND STREAM
- [] Fish
- [] Beaver
- [] Deer
- [] Snails
- [X] Other:

STREAM SHADING
- [] Mostly shaded (>75% coverage)
- [] Halfway (50%)
- [] Partially shaded (25%)
- [] Unshaded (<25%)

CHANNEL DYNAMICS
- [] Downcutting
- [] Widening
- [] Headcutting
- [X] Aggrading
- [] Sed. deposition
- [] Channelized
- [] Bed scour
- [] Bank failure
- [] Bank scour
- [] Slope failure

CHANNEL HEIGHT
- [] LT bank
- [] RT bank

CHANNEL WIDTH
- [] Top
- [] Bottom

REACH ACCESSIBILITY
- [X] Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.
- [X] Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile area small or distant from stream.
- [X] 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.

NOTES: (biggest problem you see in survey reach)

REPORTED TO AUTHORITIES
- [] Yes
- [] No
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Stream Habitat</td>
<td>Greater than 70% of substrate favorable for epiphytal 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 now fall and not transient).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
</tbody>
</table>

### VEGETATIVE PROTECTION

(50% banks)

<table>
<thead>
<tr>
<th></th>
<th>Left Bank</th>
<th>Right Bank</th>
<th>Left Bank</th>
<th>Right Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

### BANK EROSION

<table>
<thead>
<tr>
<th></th>
<th>Left Bank</th>
<th>Right Bank</th>
<th>Left Bank</th>
<th>Right Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

### FLOODPLAIN CONNECTION

<table>
<thead>
<tr>
<th></th>
<th>Left Bank</th>
<th>Right Bank</th>
<th>Left Bank</th>
<th>Right Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th>Vegetated Buffer Width</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Vegetation</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Habitat</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floodplain Encroachment</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or man-made structures</td>
<td>8 7 6</td>
<td>5 4 3</td>
<td>2 1</td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 0/80 + Buffer/Floodplain: 25/80 = Total Survey Reach 25/160
### Storm Water Outfalls

**Watershed/Subshed:** Working Dusiness

**Survey Reach ID:** WR 01

**Site ID (Condition):** OT-01

**Date:** 6/1/10

**Assessed By:** W. 6/1/10

**Time:** 10:35 AM/PM

**Photo ID:** (Camera-Pic #) 16

---

#### Potential Restoration Candidate

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit

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 investigated

#### Outfall Severity

- 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 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.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

#### Sketch/Notes:

- Braided debris channel
- No current flow
- Lots of leaves, sticks, and trash

---

**Reported to Authorities:** Yes/No
Stream Crossing

**WATERSHED/SUBSHED:** Walker's Reservoir  
**DATE:** 6/4/2023  
**ASSESSED BY:** SC, GA, Z

**SURVEY REACH ID:** WR01  
**TIME:** AM/PM  
**PHOTO ID:** (Camera-Pic #) # 19 + 14

**SITE ID:** (Condition-#) SC-01  
**LAT:** 41° 56' 31"  
**LONG:** 12° 26' 14.0"  
**LMK**

### GPS (Unit ID)

**TYPE:**  
- [X] Road Crossing  
- Railroad Crossing  
- Manmade Dam  
- Beaver Dam  
- Geological Formation  
- Other

**FOR ROAD/RAILROAD CROSSINGS ONLY**

- **SHAPE:**  
  - Arch  
  - Box  
  - Circular  
  - Elliptical  
  - Other

- **BARRESLS:**  
  - Single  
  - Double  
  - Triple  
  - Other

- **MATERIAL:**  
  - Concrete  
  - Metal  
  - Other

- **ALIGNMENT:**  
  - Flow-aligned  
  - Not flow-aligned  
  - Do not know

- **DIMENSIONS:**  
  - (if variable, sketch)
  - Barrel diameter: 2.0 (ft)
  - Height: (ft)
  - Culvert length: 6.0D (ft)
  - Width: (ft)
  - Roadway elevation: 2.0 (ft)

**CONDITION:** (Evidence of...)

- Cracking/chipping/corrosion
- Sediment deposition
- Other (describe):  
  - Downstream scour hole
  - Failing embankment

**CULVERT SLOPE:**  
- Flat  
- Slight (2° - 5°)  
- Obvious (>5°)

**POTENTIAL RESTORATION CANDIDATE**

- [X] Fish barrier removal  
- Culvert repair/replacement  
- Upstream storage retrofit  
- No  
- Local stream repair

**IS SC ACTING AS GRADE CONTROL**

- [X] Yes  
- No  
- Unknown

**EXTENT OF PHYSICAL BLOCKAGE:**

- Total  
- Partial  
- Temporary  
- Unknown

**Cause:**

- Drop too high  
- Flow too shallow  
- Other

**BLOCKAGE SEVERITY:** (circle #)

- 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.

**NOTES/SKETCH:**

**REPORTED TO AUTHORITIES:**

- [X] Yes  
- No
**Reach Level Assessment**

**Survey Reach ID:** 1-84

**Surrounding Land Use:**
- Industrial
- Commercial
- Urban/Residential
- Suburban/Forest
- Institutional
- Golf course
- Park
- Cropland
- Pasture

**Average Conditions (check applicable):**

<table>
<thead>
<tr>
<th>Category</th>
<th>50%-75%</th>
<th>75%-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Flow as %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominant Substrate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Clarity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic Plants in Stream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife in or around Stream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Shading (water surface)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Dynamics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Dimensions (facing downstream)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Present Conditions:**
- Heavy rain
- Steady rain
- Intermittent
- Trace
- Overcast
- Partly cloudy

**Rain in Last 24 Hours:**
- None
- Heavy rain
- Steady rain
- Intermittent

**Surrounding Land Use:**
- Industrial
- Commercial
- Urban/Residential
- Suburban/Forest
- Institutional
- Golf course
- Park
- Cropland
- Pasture

**AQUATIC PLANTS Attached:**
- None
- Some
- Lots

**AQUATIC PLANTS Floating:**
- None
- Some
- Lots

**WILDLIFE IN OR AROUND STREAM:**
- Deer
- Fish
- Beaver
- Snails
- Other:

**STREAM SHADING (water surface):**
- Mostly shaded (>75% coverage)
- Halfway (50%)
- Partially shaded (25%)
- Unshaded (<25%)

**CHANNEL DYNAMICS:**
- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Bed scour
- Bank failure
- Bank scour
- Slope failure
- Channelized

**CHANNEL HEIGHT:**
- LT bank
- RT bank

**CHANNEL WIDTH:**
- Bottom
- Top

**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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

**Notes:** (biggest problem you see in survey reach)

**Reach Sketch and Site Impact Tracking:**

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, SC, UT, TR, MD) as well as any additional features deemed appropriate. Indicate direction of flow.

**REPORTED TO AUTHORITIES:**
- Yes
- No
<table>
<thead>
<tr>
<th>In-Stream Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
</tr>
<tr>
<td>Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobbles or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).</td>
</tr>
</tbody>
</table>

**Vegetative Protection**

(Consider each bank, determine sides by facing downstream)

<table>
<thead>
<tr>
<th></th>
<th>20</th>
<th>19</th>
<th>18</th>
<th>17</th>
<th>16</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Bank Erosion**

(facing downstream)

<table>
<thead>
<tr>
<th></th>
<th>20</th>
<th>19</th>
<th>18</th>
<th>17</th>
<th>16</th>
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<th>14</th>
<th>13</th>
<th>12</th>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Bank</td>
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<td>9</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Floodplain Connection**

<table>
<thead>
<tr>
<th></th>
<th>20</th>
<th>19</th>
<th>18</th>
<th>17</th>
<th>16</th>
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<th>11</th>
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</thead>
<tbody>
<tr>
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<td>12</td>
<td>11</td>
<td></td>
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</tbody>
</table>

**Overall Stream Condition**

<table>
<thead>
<tr>
<th></th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
<td></td>
</tr>
<tr>
<td>Left Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Right Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

**Overall Buffer and Floodplain Condition**

<table>
<thead>
<tr>
<th></th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant floodplain vegetation type is mature forest</td>
<td>Predominant floodplain vegetation type is young forest</td>
<td>Predominant floodplain vegetation type is shrub or old field</td>
<td>Predominant floodplain vegetation type is turf or crop land</td>
<td></td>
</tr>
<tr>
<td>Left Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Right Bank</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

**Sub Total In-stream:** 27 /80 + **Buffer/Floodplain:** 55 /80 = **Total Survey Reach:** 82 /160
<table>
<thead>
<tr>
<th>TYPE:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Mannmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE:</td>
<td>☑️ Arch</td>
<td>☑️ Bottomless</td>
<td>☑️ Box</td>
<td>☑️ Elliptical</td>
<td>☐ Circular</td>
<td>☐ Other:</td>
</tr>
<tr>
<td># BARRELS:</td>
<td>☑️ Single</td>
<td>☐ Double</td>
<td>☐ Triple</td>
<td>☐ Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATERIAL:</td>
<td>☑️ Concrete</td>
<td>☐ Metal</td>
<td>☐ Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT:</td>
<td>☑️ Flow-aligned</td>
<td>☐ Not flow-aligned</td>
<td>☐ Do not know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>Barrel diameter:</td>
<td>4 ft (ft)</td>
<td>Height:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONDITION:</td>
<td>Cracking/chipping/corrosion</td>
<td>☐ Downstream scour hole</td>
<td>☐ Sediment deposition</td>
<td>☐ Failing embankment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULVERT SLOPE:</td>
<td>☑️ Flat</td>
<td>☐ Slight (2°—5°)</td>
<td>☐ Obvious (&gt;5°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>Culvert length:</td>
<td>32 ft (ft)</td>
<td>Width:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POTENTIAL RESTORATION CANDIDATE</td>
<td>☐ Fish barrier removal</td>
<td>☐ Culvert repair/replacement</td>
<td>☐ Upstream storage retrofit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS SC ACTING AS GRADE CONTROL</td>
<td>☑️ No</td>
<td>☐ Yes</td>
<td>☐ Unknown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTENT OF PHYSICAL BLOCKAGE:</td>
<td>☑️ Total</td>
<td>☐ Partial</td>
<td>☐ Temporary</td>
<td>☐ Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAUSE:</td>
<td>☑️ Drop too high</td>
<td>☐ Water Drop:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULVERT SLOPE:</td>
<td>Flat</td>
<td>☐ Slight (2°—5°)</td>
<td>☐ Obvious (&gt;5°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>Culvert length:</td>
<td>32 ft (ft)</td>
<td>Width:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOCKAGE SEVERITY:</td>
<td></td>
<td>☑️ 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.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Water Drop:</td>
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</tr>
<tr>
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<td>Flat</td>
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<td></td>
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</tr>
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<td>Water Drop:</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Survey Reach ID: \[ WR01 \]

### WTRSHD/SUBSID: Walker's Reservoir

### Date: 9/13/18

### Assessed By: George, Jane

### Start Time: 3:10 AM/PM

### Lat: 41° 51' 07.1"  /  Long: 72° 25' 14.4"

### Description: Reach upstream from reservoir

### End Time: 3:35 AM/PM

### Lat: 41° 51' 07.4"  /  Long: 72° 25' 14.9"

### Description: End reach at Culvert

---

### Rain in Last 24 Hours

- None

### Present Conditions

- Heavy rain
- Steady rain
- Intermittent
- Trace
- Overcast
- Partly cloudy

### Surrounding Land Use

- Industrial
- Commercial
- Urban/Residential
- Suburban/Residential
- Forested
- Institutional
- Golf course
- Park
- Crop
- Pasture
- Other: Field

### Average Conditions (Check applicable)

<table>
<thead>
<tr>
<th>Base Flow as %</th>
<th>0-25%</th>
<th>25-50%</th>
<th>50%-75%</th>
<th>75-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Width</td>
<td></td>
<td>25-50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dominant Substrate

- Silt/clay (fine or slick)
- Sand (gritty)
- Gravel (0.1-2.5"
- Cobble (2.5-10"
- Boulder (>10"
- Bedrock

### Water Clarity

- Clear
- Turbid (suspended matter)
- Stained (clear, naturally colored)
- Opaque (milky)
- Other (chemicals, dyes)

### Aquatic Plants in Stream

- Attached: None
- Floating: None

### Wildlife In or Around Stream

- Fish
- Beaver
- Deer
- Snails
- Other: Birds

### Stream Shading (water surface)

- Mostly shaded (≥75% coverage)
- Halfway (≥50%)
- Partially shaded (≥25%)
- Unshaded (<25%)

### Channel Dynamics

- Downcutting
- Widening
- Headcutting
- Aggrading
- Sed. deposition
- Channelized

### Channel Dimensions (Facing Downstream)

- Height: LT bank 2.0 (ft)
- RT bank 2.75 (ft)
- Width: Bottom 14.0 (ft)
- Top 19.0 (ft)

### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

### Notes (biggest problem you see in survey reach)

- Reported to authorities: Yes

---
## OVERALL STREAM CONDITION

<table>
<thead>
<tr>
<th></th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong></td>
<td>Greater than 70% of substrate is favorable for epilithon 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 moving).</td>
<td>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 new falls, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td></td>
<td>20 19 18 17 16</td>
<td>15 14 13 12 11</td>
<td>10 9 8 7 (6)</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

| **VEGETATIVE PROTECTION** | More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or nonwoody macrophytes; vegetative disruption through grazing or moving 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. |
|                          | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 (6) | 5 4 3 2 1 0 |

| **BANK EROSION** | 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 outbreak, 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. |
| Facing downstream | Left Bank: 10 9 | Right Bank: 10 9 | Left Bank: 8 7 6 | Right Bank: 8 7 6 |

| **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 |

## OVERALL BUFFER AND FLOODPLAIN CONDITION

<table>
<thead>
<tr>
<th></th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadsides, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-60 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td></td>
<td>Left Bank: 10 (9)</td>
<td>Right Bank: 10 9</td>
<td>Left Bank: 8 7 6</td>
<td>Right Bank: 8 7 6</td>
</tr>
</tbody>
</table>

| **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 ENCROACHMENT** | 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: 456/80 + Buffer/Floodplain: 456/80 = Total Survey Reach 91/160
Storm Water Outfalls

OT

WATERSHED/SUBSHED: Walker

DATE: 6/3/106

ASSESSED BY: JS, GA, TD

SURVEY REACH ID: WEDS

TIME: 3:35 AM/PM

PHOTO ID: (Camera-Pic #) #/4

SITE ID (Condition-#): OT-01

LAT: 41° 5' 38" " LONG: 72° 25' 42.6" LMK

GPS: (Unit ID)

BANK:

- LT Head
- ART

FLOW:

- None
- Trickle
- Moderate
- Substantial
- Other:

TYPE:

- Closed pipe
- Open channel
- Other:

MATERIAL:

- Concrete
- Metal
- PVC/Plastic
- Brick
- Other:

SHAPE:

- Single
- Circular
- Double
- Elliptical
- Triple
- Other:

DIMENSIONS:

- Diameter: 15 ft
- Width (Top): ______ (in)
- Width (Bottom): ______ (in)

SUBMERGED:

- No
- Partially
- Fully

CONDITION:

- None

ODOR:

- Gas
- Sewage
- Rancid/Sour
- Sulfide
- Other:

DEPOSITS/STAINS:

- None
- Oily
- Flow Line
- Paint
- Other:

VEGGIE DENSITY:

- None
- Normal
- Inhibited
- Excessive
- Other:

PIPE BENTHIC GROWTH:

- None

COLOR:

- Clear
- Brown
- Grey
- Yellow
- Green
- Orange
- Red
- Other:

TURBIDITY:

- None
- Slight Cloudiness
- Cloudy
- Opaque
- Other:

FLOATABLES:

- None
- Sewage (toilet paper, etc.)
- Petroleum (oil sheen)
- Other:

OTHER CONCERNS:

- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

POOL QUALITY:

- None

- No pool
- Good
- Odors
- Colors
- Oils
- Suds
- Algae
- Floatables
- Other:

OTHER:

- Corrosion
- Paint
- Excessive
- Other:

FOR FLOWING ONLY

- Color:
- Turbidity:
- Floatables:
- Other:

OTHER CONCERNS:

- Excess Trash (paper/plastic bags)
- Dumping (bulk)
- Excessive Sedimentation
- Needs Regular Maintenance
- Bank Erosion
- Other:

POTENTIAL RESTORATION CANDIDATE

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- 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:
- Area available:

OUTFALL SEVERITY:

- 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 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.
- Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

4 3 2 1

5

SKETCH/NOTES:

REPORTED TO AUTHORITIES: YES NO
### Reach Level Assessment

**SURVEY REACH ID:**[WRO4]  
**WTRSHD/SUBSHD:**[Walker Reservoir]  
**DTR:**[6/14/108]  
**ASSESS BY:**[JG, GA, RC, JG]  
**START TIME:**[8:52 AM/PM]  
**LMK:**  
**START LAT:**[41° 51' 34.6"]  
**LONG:**[72° 25' 45.5"]  
**END TIME:**[9:41 AM/PM]  
**LMK:**  
**END LAT:**[41° 51' 13.3"]  
**LONG:**[72° 25' 45.5"]  
**DESCRIPTION:**[Short or reach at culvert]  
**ASSIGNED BY:**[JG, GA, RC, JG]  
**TIME:**[8:52 AM/PM]  
**LMK:**  
**END LAT:**[41° 51' 13.3"]  
**LONG:**[72° 25' 45.5"]  
**DESCRIPTION:**[Culvert at ext 67 - T4R2E18]  

<table>
<thead>
<tr>
<th>GPS ID:</th>
<th>LAT/0°09'0&quot;</th>
<th>LONG/°20'36&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### RAIN IN LAST 24 HOURS
- □ Heavy rain  
- □ Steady rain  
- □ None  
- □ Intermittent  
- □ Trace  
- □ Trace  

#### PRESENT CONDITIONS
- □ Heavy rain  
- □ Steady rain  
- □ Intermittent  
- □ Clear  
- □ Trace  
- □ Overcast  
- □ Partly cloudy  

#### SURROUNDING LAND USE:
- □ Industrial  
- □ Commercial  
- □ Golf course  
- □ Park  
- □ Urban/Residential  
- □ Suburban/Res  
- □ Forested  
- □ Institutional  
- □ Golf course  
- □ Other: [DOT Road Comm 07]

#### AVERAGE CONDITIONS (check applicable)

<table>
<thead>
<tr>
<th>BASE FLOW AS %</th>
<th>0-25%</th>
<th>25-50%</th>
<th>50-75%</th>
<th>75-100%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DOMINANT SUBSTRATE</th>
<th>Silt/clay (fine or slick)</th>
<th>Cobble (2.5 — 10&quot;)</th>
<th>Sand (gritty)</th>
<th>Boulder (&gt;10&quot;)</th>
<th>Gravel (0.1-2.5&quot;)</th>
<th>Bed rock</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WATER CLARITY</th>
<th>Clear</th>
<th>Turbid (suspended matter)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Clear</td>
<td>□ Turbid (suspended matter)</td>
</tr>
<tr>
<td></td>
<td>□ Stained (clear, naturally colored)</td>
<td>□ Opaque (milky)</td>
</tr>
<tr>
<td></td>
<td>□ Other (chemicals, dyes)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AQUATIC PLANTS IN STREAM</th>
<th>Attached:</th>
<th>□ none</th>
<th>□ some</th>
<th>□ lots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Floating:</td>
<td>□ none</td>
<td>□ some</td>
<td>□ lots</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WILDLIFE IN OR AROUND STREAM</th>
<th>Evidence of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Fish</td>
</tr>
<tr>
<td></td>
<td>□ Snails</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STREAM SHADING (water surface)</th>
<th>Mostly shaded (≥75% coverage)</th>
<th>□ Halfway (&gt;50%)</th>
<th>□ Partially shaded (≥25%</th>
<th>□ Unshaded (&lt;25%)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CHANNEL DYNAMICS</th>
<th>Downcutting</th>
<th>□ Bed scour</th>
<th>□ Bank failure</th>
<th>□ Bank scour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Widening</td>
<td>□ Bank failure</td>
<td>□ Bank scour</td>
<td>□ Slope failure</td>
</tr>
<tr>
<td></td>
<td>Headcutting</td>
<td>□ Slope failure</td>
<td>□ Sed. deposition</td>
<td>□ Channelized</td>
</tr>
<tr>
<td></td>
<td>□ Aggrading</td>
<td>□ Sed. deposition</td>
<td>□ Channelized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Unknown</td>
<td>□ Channelized</td>
<td>□ Channelized</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHANNEL DIMENSIONS (FACING DOWNSTREAM)</th>
<th>Height: LT bank</th>
<th>□ Top:</th>
<th>□ Width: Bottom</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>REACH ACCESSIBILITY</th>
<th>Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.</th>
<th>Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile area small or distant from stream.</th>
<th>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.</th>
</tr>
</thead>
</table>

| NOTES: (biggest problem you see in survey reach) | □ | □ | □ | □ |

**REACH SKETCH AND SITE IMPACT TRACKING:** 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.

**REPORTED TO AUTHORITIES:** □ Yes □ No
<table>
<thead>
<tr>
<th>OVERALL STREAM CONDITION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong> (May modify criteria based on appropriate habitat regime)</td>
<td>Greater than 70% of substrate favorable for epilithic 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).</td>
<td>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).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong> (score each bank; determine sides by facing downstream)</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.</td>
<td>High flows (greater than bankfull) able to enter floodplain. Stream deeply entrenched.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OVERALL BUFFER AND FLOODPLAIN CONDITION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roads, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td>Left Bank</td>
<td>876</td>
<td>543</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>Right Bank</td>
<td>876</td>
<td>543</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
<tr>
<td>2019181716</td>
<td>1514131211</td>
<td>109876</td>
<td>543210</td>
<td>543210</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
</tr>
<tr>
<td>2019181716</td>
<td>1514131211</td>
<td>109876</td>
<td>543210</td>
<td>543210</td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCROACHMENT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures; some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e., fill material, land development, or man-made structures); significant effect on floodplain function.</td>
</tr>
<tr>
<td>2019181716</td>
<td>1514131211</td>
<td>109876</td>
<td>543210</td>
<td>543210</td>
</tr>
</tbody>
</table>

Sub Total In-stream: 41/80 + Buffer/Floodplain: 35/80 = Total Survey Reach 76/160
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.

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 or localized.

Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

5 4 3 2 1

REPORTED TO AUTHORITIES: □ YES □ NO
# Storm Water Outfalls

**SITE ID (Condition #): OT-01**

**Latitude:** 41° 5' 1'" **Longitude:** 70° 15' 17.1"

**Surveys ID:** WR04

**Date:** 6/14/08 **Assessed by:** Friends

**Time:** 9:05 AM PM **Photo ID:** (Camera-Pic #) /#

## Potential Restoration Candidate

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?
  - Yes __
  - No __
  - Not investigated ___

**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.
- 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.
- Outfall does not have dry weather discharge; staining or appearance of causing any erosion problems.

**Slope:**

<table>
<thead>
<tr>
<th>Number</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**Potential Restoration Candidate:**

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?
  - Yes __
  - No __
  - Not investigated ___

**Sketched Notes:**

---

**Reported to authorities:**

- Yes ___
- No ___

---
**Stream Crossing**

**WATERSHED/SUBSHED:** Adams Reservoir

**DATE:** 6/4/2023

**ASSESSED BY:** F.J. Young

**SURVEY REACH ID:** WRS1

**TIME:** 2:52 PM

**PHOTO ID:** (Camera-Pic #) #1, 2

**SITE ID:** (Condition #) SC-O1

**LAT:** 41° 51' 7.8" N

**LONG:** 72° 25' 42.8" W

**LMK:**

**GPS (Unit ID):**

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>Road Crossing</th>
<th>Railroad Crossing</th>
<th>Manmade Dam</th>
<th>Beaver Dam</th>
<th>Geological Formation</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOR ROAD/RAILROAD CROSSINGS ONLY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHAPE:</td>
<td>Arch</td>
<td>Bottomless</td>
<td>Box</td>
<td>Elliptical</td>
<td>Circular</td>
<td>Other:</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># BARRELS:</td>
<td>Single</td>
<td>Double</td>
<td>Triple</td>
<td>Other:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MATERIAL:</td>
<td>Concrete</td>
<td>Metal</td>
<td>Other:</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>ALIGNMENT:</td>
<td>Flow-aligned</td>
<td>Not flow-aligned</td>
<td>Do not know</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>EXTENT OF PHYSICAL BLOCKAGE:</td>
<td>Total</td>
<td>Partial</td>
<td>Temporary</td>
<td>Unknown</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>CAUSE:</td>
<td>Drop too high</td>
<td>Water Drop: _____ (in)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow too shallow</td>
<td>Water Depth: _____ (in)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONS: (if variable, sketch)</th>
<th>Barrel diameter: 4.5 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height:</td>
<td></td>
</tr>
<tr>
<td>Culvert length: 60 (ft)</td>
<td></td>
</tr>
<tr>
<td>Width:</td>
<td></td>
</tr>
<tr>
<td>Roadway elevation: 30 (ft)</td>
<td></td>
</tr>
</tbody>
</table>

**POTENTIAL RESTORATION CANDIDATE**

- Fish barrier removal
- Culvert repair/replacement
- Upstream storage retrofit
- Local stream repair
- Other: Maintenance to allow passage of fish

**IS SC ACTING AS GRADE CONTROL**

- Yes
- No
- Unknown

**EXTENT OF PHYSICAL BLOCKAGE:**

- Total
- Partial
- Temporary
- Unknown

**CAUSE:**

- Drop too high
- Water Drop: _____ (in)
- Flow too shallow
- Water Depth: _____ (in)
- Other:

**BLOCKAGE SEVERITY:** (circle #)

- 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 visible fish habitat above it; natural barriers such as waterfalls.

**NOTES/SKETCH:**

**REPORTED TO AUTHORITIES**

- Yes
- No
<table>
<thead>
<tr>
<th>Stream Crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Watershed/Subsherd:</strong> Washington Reservoir</td>
</tr>
<tr>
<td><strong>Date:</strong> 01/4/10</td>
</tr>
<tr>
<td><strong>Survey Reach ID:</strong> WR 04</td>
</tr>
<tr>
<td><strong>Photo ID:</strong> (Camera-Pic #) #9,10</td>
</tr>
<tr>
<td><strong>Site ID:</strong> (Condition #) SC-02</td>
</tr>
<tr>
<td><strong>LMK:</strong></td>
</tr>
</tbody>
</table>

**Type:**
- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Mannmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other

**Shape:**
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [ ] Circular
- [ ] Other:

**For Road/Railroad Crossings Only**

**Condition:**
- [ ] Cracking/chipping/corrosion
- [x] Downstream scour hole
- [ ] Sediment deposition
- [ ] Failing embankment
- [ ] Other (describe):

**Bars:**
- [ ] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**Material:**
- [ ] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**
- [ ] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barreldiameter: ____(ft)
- Height: ____(ft)
- Culvert length: ____(ft)
- Width: ____(ft)
- Roadway elevation: ____(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
- [ ] Unknown

**Extent of Physical Blockage:**
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**
- [ ] Drop too high
- [ ] Water Drop: ____ (in)
- [ ] Flow too shallow
- [ ] Water Depth: ____ (in)
- [ ] Other:

**Blockage Severity:**
- [ ] Total
- [ ] 4
- [ ] 3
- [ ] 2
- [ ] 1

**Notes/Sketch:**

**Reported to authorities:**
- [ ] Yes
- [ ] No
## Reach Level Assessment

### Survey Reach ID: RCH 0123

**Survey Reach ID:** RCH 0123  
**Wtrshd/Subshd:** Walker's Des.  
**Date:** 6/1/10  
**Assessed By:** [Signature]

### START

- **Time:** 4:30 AM/PM  
- **LMK:**  
- **Lat:** 41° 51' 09.6"  
- **Long:** 72° 25' 47.8"

**DESCRIPTION:** __________

### END

- **Time:** 5:43 AM/PM  
- **LMK:**  
- **Lat:** 41° 51' 19.6"  
- **Long:** 72° 25' 38.9"

**DESCRIPTION:** __________

---

### Rain in Last 24 Hours

- **Heavy rain**  
- **Steady rain**  
- **Intermittent**  
- **Trace**  
- **Overcast**  
- **Partly cloudy**

### Present Conditions

- **Heavy rain**  
- **Steady rain**  
- **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)

<table>
<thead>
<tr>
<th></th>
<th>0-25%</th>
<th>25-50%</th>
<th>75-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Flow as %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Width</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dominant Substrate

- **Silts/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:** __________

### Aquatic Plants in Stream

- **Attached:**  
  - **None**  
  - **Some**  
  - **Lots**
- **Floating:**  
  - **None**  
  - **Some**  
  - **Lots**

### Wildlife in or Around Stream

- **Fish**  
- **Beaver**  
- **Deer**  
- **Snails**  
- **Other:** __________

### Stream Shading (Water Surface)

- **Mostly shaded (≥75% coverage)**  
- **Halfway (≥50%)**  
- **Partially shaded (≥25%)**  
- **Unshaded (<25%)**

### Channel Dynamics

- **Downcutting**  
- **Widening**  
- **Headcutting**  
- **Aggrading**  
- **Sed. deposition**  
- **Channelized**  
- **Bed scour**  
- **Bank failure**  
- **Bank scour**  
- **Slope failure**

### Channel Dimensions

- **Height:**  
  - **LT bank:** 2.4 ft  
  - **RT bank:** 2.1 ft
- **Width:**  
  - **Bottom:** 11.6 ft  
  - **Top:** 14.5 ft

### 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. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

### Notes

[Diagram of survey reach showing various features and annotations]

---

**Reported to authorities:**  
- **Yes**  
- **No**
<table>
<thead>
<tr>
<th>OVERALL STREAM CONDITION</th>
<th>Optimal</th>
<th>Suboptimal</th>
<th>Marginal</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN-STREAM HABITAT</strong></td>
<td>Greater than 70% of substrate favorable for epilithic 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).</td>
<td>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 new fall, but not yet prepared for colonization (may rate at high end of scale).</td>
<td>20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.</td>
<td>Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.</td>
</tr>
<tr>
<td><strong>VEGETATIVE PROTECTION</strong></td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN CONNECTION</strong></td>
<td>Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.</td>
<td>Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>OVERALL BUFFER AND FLOODPLAIN CONDITION</strong></td>
<td>Width of buffer zone &gt;50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.</td>
<td>Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.</td>
<td>Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.</td>
<td>Width of buffer zone &lt;10 feet; little or no riparian vegetation due to human activities.</td>
</tr>
<tr>
<td><strong>VEGETATED BUFFER WIDTH</strong></td>
<td>Predominant floodplain vegetation type is mature forest.</td>
<td>Predominant floodplain vegetation type is young forest.</td>
<td>Predominant floodplain vegetation type is shrub or old field.</td>
<td>Predominant floodplain vegetation type is turf or crop land.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN VEGETATION</strong></td>
<td>Even mix of wetland and non-wetland habitats, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
<td>Either all wetland or all non-wetland habitat, no evidence of standing/ponded water.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN HABITAT</strong></td>
<td>No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures.</td>
<td>Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function.</td>
<td>Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function.</td>
<td>Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function.</td>
</tr>
<tr>
<td><strong>FLOODPLAIN ENCROACHMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub Total In-stream: 80 + Buffer/Floodplain: 80 = Total Survey Reach 160
**Storm Water Outfalls**

**Watershed/Subshed:** Walker Reservoir  
**Date:** 6/3/06  
**Assessed By:** J.R.  
**Survey Reach ID:** W005  
**Time:** 5:00 AM/PM  
**Photo ID:** (Camera-Photo #) 6/13 #  
**Site ID (Condition #:)**: OT-01  
**Lat:** 41° 51' 11.4"  
**Long:** 72° 25' 29.1"  
**LMK:**  
**GPS:** (Unit ID)  

**BANK:**  
- □ LT □ RT □ Head  

**Flow:**  
- □ None  
- □ Trickle  
- □ Moderate  
- □ Substantial  
- □ Other:  

**Type:**  
- □ Closed pipe  
- □ Open channel  

**Material:**  
- □ Concrete  
- □ Metal  
- □ PVC/Plastic  
- □ Brick  
- □ Other:  

**Shape:**  
- □ Single  
- □ Circular  
- □ Double  
- □ Elliptical  
- □ Triangular  
- □ Other:  

**Dimensions:**  
- □ Diameter: ___ (in)  
- □ Depth: ___ (in)  
- □ Width (Top): ___ (in)  
- □ "(Bottom): ___ (in)  

**Submerged:**  
- □ No  
- □ Partially  
- □ Fully  

**Condition:**  
- □ None  
- □ Chip/Cracked  
- □ Peeling Paint  
- □ Corrosion  
- □ Other:  

**Odor:**  
- □ No  
- □ Gas  
- □ Sewage  
- □ Rancid/Sour  
- □ Sulphide  
- □ Other:  

**Deposits/Stains:**  
- □ None  
- □ Oily  
- □ Flow Line  
- □ Paint  
- □ Other:  

**Vegetation Density:**  
- □ None  
- □ Normal  
- □ Inhibited  
- □ Excessive  
- □ Other:  

**Pipe Benthic Growth:**  
- □ None  
- □ Brown  
- □ Orange  
- □ Green  
- □ Other:  

**Pooling Quality:**  
- □ No pool  
- □ Good  
- □ Odors  
- □ Colors  
- □ Oils  
- □ Suds  
- □ Algae  
- □ Floatables  
- □ Other:  

**Potential Restoration Candidate:**  
- □ Discharge investigation  
- □ Stream daylighting  
- □ Local stream repair/outfall stabilization  
- □ Storm water retrofit  
- □ Other:  

**For flowing only:**  
- □ Color: □ Clear  
- □ Brown  
- □ Grey  
- □ Yellow  
- □ Green  
- □ Orange  
- □ Red  
- □ Other:  

**Turbidity:**  
- □ None  
- □ Slight Cloudiness  
- □ Cloudy  
- □ Opaque  

**Floatables:**  
- □ None  
- □ Sewage (toilet paper, etc.)  
- □ Petroleum (oil sheen)  
- □ Other:  

**Other concerns:**  
- □ Excess Trash (paper/plastic bags)  
- □ Dumping (bulk)  
- □ Excessive Sedimentation  
- □ Needs Regular Maintenance  
- □ Bank Erosion  
- □ Other:  

**Potential Restoration Candidate:**  
- □ Discharge investigation  
- □ Stream daylighting  
- □ Local stream repair/outfall stabilization  
- □ Storm water retrofit  
- □ 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?  
- □ Yes  
- □ No  
- □ Not investigated  
- □ Land Use description:  
- □ Area available:  

**Outfall severity:**  
- □ 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 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.  
- □ Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.  

**Sketch/Notes:**  
- Very deep cold channel through residential property. Owner states flow comes from upper tunnels/springs. Fresh cuttings of native olive in channel.
Storm Water Outfalls

Watershed/Subshed: Winooski Reservoir

Survey Reach ID: 2W03

Site ID (Condition #): OT-02

Date: 6/3/05

Assessed by: JS 6/7/05

Time: 2:26 AM/PM

Photo ID: (Camera Pic #) 14

Site ID (Condition #): OT-02

Lat: 44° 31' 13.5" "Long: 72° 25' 40.1" "

Storm Water Outfalls

Potential Restoration Candidate

- Discharge investigation
- Stream daylighting
- Local stream repair/outfall stabilization
- Storm water retrofit
- 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?

- Yes
- No
- Not investigated

Land Use description: _____________________
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 stream; discharge appears to be having a significant impact downstream.

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.

Outfall does not have dry weather discharge; staining, or appearance of causing any erosion problems.

5 4 3 2 1

Sketch/Notes:

Reported to authorities:  yes  no
**Stream Crossing**

**Watershed/Subshed:** Wolken's Reservoir

**Date:** 9/3/08

**Assessed By:** 35 B7 6A

**Survey Reach ID:** SC05

**Time:** 5:45 AM/PM

**Photo ID:** (Camera-Pic #)

<table>
<thead>
<tr>
<th>Site ID: (Condition #)</th>
<th>SC-02</th>
<th>Lat 41° 51' 14.6&quot;</th>
<th>Long 72° 25' 36.9&quot;</th>
<th>LMK</th>
<th>GPS (Unit ID)</th>
</tr>
</thead>
</table>

**Site ID:** SC-02

**Lat:** 41° 51' 14.6"

**Long:** 72° 25' 36.9"

**Type:**
- [x] Road Crossing
- [ ] Railroad Crossing
- [ ] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**Shape:**
- [x] Box
- [ ] Bottomless
- [ ] Circular
- [ ] Elliptical
- [ ] Other:

**Barrels:**
- [x] Single
- [ ] Double
- [ ] Triple
- [ ] Other:

**Material:**
- [x] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**
- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barrel diameter: 
- Height: 

**Condition:** (Evidence of...)
- [x] Looks Good

**Culvert Slope:**
- [x] Flat
- [ ] Slight (2° - 5°)
- [ ] Obvious (>5°)

**Culvert Length:**
- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Potential Restoration Candidate:**
- [x] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit
- [ ] Local stream repair
- [ ] Other:

**Is SC acting as grade control:**
- [ ] No
- [x] Yes
- [ ] Unknown

**Extent of Physical Blockage:**
- [x] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

**Cause:**
- [x] Drop too high
- [ ] Water Drop: ___ (in)
- [ ] Flow too shallow
- [ ] Water Depth: ___ (in)
- [ ] Other:

**Blockage Severity:** (circle #)
- [ ] 5
- [ ] 4
- [ ] 3
- [ ] 2
- [ ] 1

**Notes/Sketch:**

[Sketch of stream crossing with vegetation and water flow indicated]

**Reported to authorities:**
- [x] Yes
- [ ] No
Stream Crossing

**Watershed/Subshed:** Walker Reservoir

**Date:** 6/3/106

**Assessed by:** R.W.A

**Site ID:** SC-01

**Lat:** 41° 51' 69.2" **Long:** 72° 25' 41.4"

**Type:** 
- [ ] Road Crossing
- [ ] Railroad Crossing
- [x] Manmade Dam
- [ ] Beaver Dam
- [ ] Geological Formation
- [ ] Other:

**Shape:**
- [ ] Arch
- [ ] Box
- [ ] Bottomless
- [x] Elliptical
- [ ] Circular
- [ ] Other:

**# Barrels:**
- [x] Single
- [x] Double
- [x] Triple
- [ ] Other:

**Material:**
- [x] Concrete
- [ ] Metal
- [ ] Other:

**Alignment:**
- [x] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

**Dimensions:** (if variable, sketch)
- Barbell diameter: __________ (ft)
- Height: __________ (ft)
- Culvert length: __________ (ft)
- Width: __________ (ft)
- Roadway elevation: __________ (ft)

**Potential Restoration Candidate**
- [ ] Fish barrier removal
- [ ] Culvert repair/replacement
- [ ] Upstream storage retrofit
- [ ] Local stream repair
- [ ] Other:

**Is SC acting as grade control?**
- [x] No
- [ ] Yes
- [ ] Unknown

**Extent of Physical Blockage:**
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

If yes for fish barrier
- [ ] Drop too high
- [ ] Flow too shallow
- [ ] Other:

**Cause:**
- Water Drop: _______ (in)
- Water Depth: _______ (in)

**Blockage Severity:** (circle #)
- 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.

**Notes/Sketch:**

---

**REPORTED TO AUTHORITIES**
- [ ] Yes
- [ ] No
APPENDIX B

Upland Assessment Field Forms
### Hotspot Site Investigation

**WATERSHED:**
**SUBWATERSHED:**
**UNIQUE SITE ID:**
**DATE:** 7/6/09
**ASSESSED BY:**
**CAMERA ID:**
**PIC#:**
**MAP GRID:**
**LAT:** ° " LONG ° "
**LMK #**

#### A. SITE DATA AND BASIC CLASSIFICATION

<table>
<thead>
<tr>
<th>Name and Address</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>No name</td>
<td>Commercial</td>
</tr>
<tr>
<td>Sand gravel &amp; concrete</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIC code (if available):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unregulated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NPDES Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic Description of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage/processing of fill &amp; lock</td>
</tr>
</tbody>
</table>

### B. VEHICLE OPERATIONS

**Observed Pollution Source?**

<table>
<thead>
<tr>
<th>B.1. Types of vehicles</th>
<th>B.2. Approximate number of vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet vehicles</td>
<td>School buses</td>
</tr>
</tbody>
</table>

**B.3. Vehicle activities (circle all that apply):**
- Maintained
- Repaired
- Recycled
- Fueled
- Washed
- Stored

**B.4. Are vehicles stored and/or repaired outside?**
- Y
- N
- Can't Tell

**B.5. Is there evidence of spills/leakage from vehicles?**
- Y
- N
- Can't Tell

**B.6. Are uncovered outdoor fueling areas present?**
- Y
- N
- Can't Tell

**B.7. Are fueling areas directly connected to storm drains?**
- Y
- N
- Can't Tell

**B.8. Are vehicles washed outdoors?**
- Y
- N
- Can't Tell

**Observed Pollution Source?**

### C. OUTDOOR MATERIALS

**Observed Pollution Source?**

<table>
<thead>
<tr>
<th>C.1. Are loading/unloading operations present?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
</tr>
</tbody>
</table>

**C.2. Are materials stored outside?**
- Y
- N
- Can't Tell

**C.3. Is the storage area directly or indirectly connected to storm drain (circle one)?**
- Y
- N
- Can't Tell

**C.4. Is staining or discoloration around the area visible?**
- Y
- N
- Can't Tell

**C.5. Does outdoor storage area lack a cover?**
- Y
- N
- Can't Tell

**C.6. Are liquid materials stored without secondary containment?**
- Y
- N
- Can't Tell

**C.7. Are storage containers missing labels or in poor condition (rusting)?**
- Y
- N
- Can't Tell

### D. WASTE MANAGEMENT

**Observed Pollution Source?**

<table>
<thead>
<tr>
<th>D.1. Type of waste (check all that apply):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garbage</td>
</tr>
<tr>
<td>Construction materials</td>
</tr>
</tbody>
</table>

**D.2. Dumpster condition (check all that apply):**
- No cover/Lid is open
- Damaged/poor condition
- Leaking or evidence of leakage (stains on ground)
- Overflowing

**D.3. Is the dumpster located near a storm drain inlet?**
- Y
- N
- Can't Tell

**Observed Pollution Source?**

### E. PHYSICAL PLANT

**Observed Pollution Source?**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 yrs.</td>
<td>Clean</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evidence that maintenance results in discharge to storm drains (staining/discholoration)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
</tr>
</tbody>
</table>

*Index:  O denotes potential pollution source;  denotes confirmed polluter (evidence was seen)*
E2. Parking Lot: Approximate age ___ yrs. Condition: 
- Clean
- Stained
- Dirty
- Breaking up
Surface material
- Paved/Concrete
- Gravel
- Permeable
- Don’t know

E3. Do downspouts discharge to impervious surface? 
- Y
- N
- Don’t know
- None visible
Are downspouts directly connected to storm drains? 
- Y
- N
- Don’t know

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? 
- Y
- N
- Can’t Tell

F. TURF/LANDSCAPING AREAS  N/A (skip to part G)  Observed Pollution Source?

F1. % of site with: Forest canopy ___%  Turf grass ___%  Landscaping ___%  Bare Soil ___%
F2. Rate the turf management status: 
- High
- Medium
- Low
F3. Evidence of permanent irrigation or “non-target” irrigation 
- Y
- N
- Can’t Tell
F4. Do landscaped areas drain to the storm drain system? 
- Y
- N
- Can’t Tell
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? 
- Y
- N
- Can’t Tell

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:
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.

Index Rating for Accumulation in Gutters

<table>
<thead>
<tr>
<th>Clean</th>
<th>Filthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td></td>
</tr>
<tr>
<td>Organic material</td>
<td></td>
</tr>
<tr>
<td>Litter</td>
<td></td>
</tr>
</tbody>
</table>

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)
- Potential 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)

Follow-up Action:
- Refer for immediate enforcement
- 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
- Onsite non-residential retrofit
- Pervious area restoration; complete PAA sheet and record
- Schedule a review of storm water pollution prevention plan

Unique Site ID here:

Notes:
- Follow needed - private industry
- pipes & debris in yard
- large dirt piles
- SW practices unknown
- Sump pits or drains
Tucker Brook
- Branford Subdivision
- Public opportunity
- Storm sewer - alternate conduit if more present.

Some likely town-owned since part of subdivision
small DVC pipes discharging to V.S. storm line.
**Hotspot Site Investigation**

**WATERSHED:**_Trailer___ **SUBWATERSHED:**_LVFL1_ **UNIQUE SITE ID:**_L42-H51-01_

**DATE:**_7/16/08_ **ASSESSED BY:**__ **CAMERA ID:**_ Pic#:

**MAP GRID:**_Lat 41° 41' 37" Long 72° 28' 53"_ **LMK #

---

### A. SITE DATA AND BASIC CLASSIFICATION

- **Name and Address:** Highway Garage - City of<br>  
- **Category:** Commercial □ Industrial □ Miscellaneous
  □ Institutional □ Municipal □ Golf Course
  □ Transport-Related □ Marina
  □ Animal Facility
- **SIC code (if available):** N/A
- **Basic Description of Operation:** Directly Large Garage salt & sand storage

---

### B. VEHICLE OPERATIONS □ N/A (Skip to part C)

- **Types of vehicles:** □ Fleet vehicles □ School buses □ Other: (check)
- **Approximate number of vehicles:** N/A

---

### B2. Approximate number of vehicles:

- **Vehicle activities (circle all that apply):** Maintained □ Repaired □ Recycled □ Fueled □ Washed □ Stored

---

### B3. Vehicle activities (circle all that apply):

- **Are vehicles stored and/or repaired outside?** □ Y □ N □ Can't Tell
  - **Are these vehicles lacking runoff diversion methods?** □ Y □ N □ Can't Tell
- **Is there evidence of spills/leakage from vehicles?** □ Y □ N □ Can't Tell
- **Are uncovered outdoor fueling areas present?** □ Y □ N □ Can't Tell
- **Are fueling areas directly connected to storm drains?** □ Y □ N □ Can’t Tell
- **Are vehicles washed outdoors?** □ Y □ N □ Can’t Tell

---

### C. OUTDOOR MATERIALS □ N/A (Skip to part D)

- **Are loading/unloading operations present?** □ Y □ N □ Can’t Tell
  - **If yes, are they uncovered and draining towards a storm drain inlet?** □ Y □ N □ Can’t Tell
- **Are materials stored outside?** □ Y □ N □ Can’t Tell
  - **If yes, are they Liquid □ Solid □**
  - **Where are they stored?** □ grass/dirt area □ concrete/asphalt □ bermed area
- **Is the storage area directly or indirectly connected to storm drain (circle one)?** □ Y □ N □ Can’t Tell
- **Is staining or discoloration around the area visible?** □ Y □ N □ Can’t Tell
- **Does outdoor storage area lack a cover?** □ Y □ N □ Can’t Tell
- **Are liquid materials stored without secondary containment?** □ Y □ N □ Can’t Tell
- **Are storage containers missing labels or in poor condition (rusting)?** □ Y □ N □ Can’t Tell

---

### D. WASTE MANAGEMENT □ N/A (Skip to part E)

- **Type of waste (check all that apply):** □ Garbage □ Construction materials □ Hazardous materials
- **Dumpster condition (check all that apply):** □ No cover/Lid is open □ Damaged/poor condition □ Leaking or evidence of leakage (stains on ground) □ Overflowing
- **Is the dumpster located near a storm drain inlet?** □ Y □ N □ Can’t Tell
  - **If yes, are runoff diversion methods (berms, curbs) lacking?** □ Y □ N □ Can’t Tell

---

### E. PHYSICAL PLANT □ N/A (Skip to part F)

- **Building: Approximate age:** □ 0 years. **Condition of surfaces:** □ Clean □ Stained □ Dirty □ Damaged
  - **Evidence that maintenance results in discharge to storm drains (staining/discholoration)?** □ Y □ N □ Don’t know

---

*Index: □ denotes potential pollution source; □ denotes confirmed polluter (evidence was seen)*
E2. Parking Lot: Approximate age 7 yrs. Condition: ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☒ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don’t know
E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don’t know ☒ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☒ Don’t know
E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☒ N ☐ Can’t Tell

F1. TURF/LANDSCAPING AREAS ☐ N/A (skip to part G)
F1. % of site with: Forest canopy ☐ % Turf grass ☐ % Landscaping ☐ % Bare Soil ☐ %
F2. Rate the turf management status: ☒ High ☐ Medium ☐ Low
F3. Evidence of permanent irrigation or “non-target” irrigation ☐ Y ☒ N ☐ Can’t Tell
F4. Do landscaped areas drain to the storm drain system? ☒ Y ☐ N ☐ Can’t Tell
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☒ N ☐ Can’t Tell

G. STORM WATER INFRASTRUCTURE ☐ N/A (skip to part H)
G1. Are storm water treatment practices present? ☐ Y ☒ N ☐ Unknown If yes, please describe:
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.

Index Rating for Accumulation in Gutters

<table>
<thead>
<tr>
<th>Clean</th>
<th>Filthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td>☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5</td>
</tr>
<tr>
<td>Organic material</td>
<td>☐ 1 ☑ 2 ☐ 3 ☐ 4 ☒ 5</td>
</tr>
<tr>
<td>Litter</td>
<td>☐ 1 ☐ 2 ☐ 3 ☑ 4 ☒ 5</td>
</tr>
</tbody>
</table>

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) ☐ Potential 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)

Follow-up Action:
☐ Refer for immediate enforcement
☐ 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
☒ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record
Unique Site ID here:
☐ Schedule a review of storm water pollution prevention plan

Notes: Cow Don Facility
**Hotspot Site Investigation**

**HSI**

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<th><strong>SUBWATERSHED:</strong></th>
<th><strong>UNIQUE SITE ID:</strong></th>
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<td>Walker</td>
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<th><strong>LONG:</strong></th>
<th><strong>LMK #</strong></th>
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</thead>
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<td>-122° 25' 45&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**A. SITE DATA AND BASIC CLASSIFICATION**

- **Name and Address:** ____________________________
- **Category:** [ ] Commercial [ ] Industrial [ ] Miscellaneous
  - [ ] Institutional [ ] Municipal [ ] Golf Course
  - [ ] Transport-Related [ ] Marina [ ] Animal Facility
- **SIC code (if available):** ____________
- **NPDES Status:** [ ] Regulated [ ] Unregulated [ ] Unknown

**B. VEHICLE OPERATIONS** [ ] N/A (Skip to part C)

| **B1. Types of vehicles:** | [ ] Fleet vehicles [ ] School buses [ ] Other: ____________ |

**B2. Approximate number of vehicles:** 150

| **B3. Vehicle activities (circle all that apply):** | Maintained [ ] Repaired [ ] Recycled [ ] Fueled [ ] Washed [ ] Stored [ ] Parking |

| **B4. Are vehicles stored and/or repaired outside?** | [ ] Y [ ] N [ ] Can't Tell |

| **B5. Is there evidence of spills/leakage from vehicles?** | [ ] Y [ ] N [ ] Can't Tell |

| **B6. Are uncovered outdoor fueling areas present?** | [ ] Y [ ] N [ ] Can't Tell |

| **B7. Are fueling areas directly connected to storm drains?** | [ ] Y [ ] N [ ] Can't Tell |

**B8. Are vehicles washed outdoors?** [ ] Y [ ] N [ ] Can't Tell

- Does the area where vehicles are washed discharge to the storm drain? [ ] Y [ ] N [ ] Can't Tell

**C. OUTDOOR MATERIALS** [ ] N/A (Skip to part D)

| **C1. Are loading/unloading operations present?** | [ ] Y [ ] N [ ] Can't Tell |

| **C2. Are materials stored outside?** | [ ] Y [ ] N [ ] Can't Tell |

| **C3. Is the storage area directly or indirectly connected to storm drain (circle one)?** | [ ] Y [ ] N [ ] Can't Tell |

| **C4. Is staining or discoloration around the area visible?** | [ ] Y [ ] N [ ] Can’t Tell |

| **C5. Does outdoor storage area lack a cover?** | [ ] Y [ ] N [ ] Can’t Tell |

| **C6. Are liquid materials stored without secondary containment?** | [ ] Y [ ] N [ ] Can’t Tell |

| **C7. Are storage containers missing labels or in poor condition (rusting)?** | [ ] Y [ ] N [ ] Can’t Tell |

**D. WASTE MANAGEMENT** [ ] N/A (Skip to part E)

| **D1. Type of waste (check all that apply):** | [ ] Garbage [ ] Construction materials [ ] Hazardous materials |

| **D2. Dumpster condition (check all that apply):** | [ ] No cover/Lid is open [ ] Damaged/poor condition [ ] Leaking or evidence of leakage (stains on ground) [ ] Overflowing |

| **D3. Is the dumpster located near a storm drain inlet?** | [ ] Y [ ] N [ ] Can’t Tell |

| **D4. Are runoff diversion methods (berms, curbs) lacking?** | [ ] Y [ ] N [ ] Can’t Tell |

**E. PHYSICAL PLANT** [ ] N/A (Skip to part F)

| **E1. Building:** Approximate age: ____________ yrs. | Condition of surfaces: [ ] Clean [ ] Stained [ ] Dirty [ ] Damaged |

| **Evidence that maintenance results in discharge to storm drains (staining/discoloration)?** | [ ] Y [ ] N [ ] Don’t know |

*Index: O denotes potential pollution source; □ denotes confirmed polluter (evidence was seen)*
**Follow-up Action:**
- Refer for immediate enforcement
- 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
- Onsite non-residential retrofit
- Pervious area restoration; complete PAA sheet and record

**Notes:**
- "SW runoff from parking lot directly enters wetland area and likely contains oil and sediments & salts. Retrofit possible with large buffer."
1/16/06

Horseshot

Current position: 41°31'11" 72°25'45"

DOT commitments: WR submitted

Drainage overland to SE corner

Discharge to wetland

Wide grass strip between curb & wetland could be used for swale
**Hotspot Site Investigation**

### Watershed: Thacker  
**Subwatershed:** Gages  
**Unique Site ID:** GB-HSI-02

**Date:** 7/16/19  
**Assessed By:** EMB  
**Camera ID:**  
**Pic#:**

**Map Grid:** Lat 41° 51' 30" Long 72° 25' 01"  
**LMK#:**

### A. Site Data and Basic Classification

**Name and Address:**

Dari Farms Ice Cream  
**Category:**

- [ ] Commercial  
- [ ] Industrial  
- [ ] Miscellaneous  
- [ ] Institutional  
- [ ] Municipal  
- [ ] Golf Course  
- [ ] Transport-Related  
- [ ] Marina  
- [ ] Animal Facility

**SIC code (if available):**

**Basic Description of Operation:** Distribution Center

**NPDES Status:**

- [ ] Regulated  
- [ ] Unregulated  
- [ ] Unknown

### B. Vehicle Operations [N/A (Skip to part C)]

**Observed Pollution Source?**

- [ ]

**B1. Types of vehicles:**

- [ ] Fleet vehicles  
- [ ] School buses  
- [ ] Other: cars/trucks/lot

**B2. Approximate number of vehicles:**

[ ] 18 vehicles  
[ ] 40 commuter vehicles

**B3. Vehicle activities (circle all that apply):**

- [ ] Maintained  
- [ ] Repaired  
- [ ] Recycled  
- [ ] Fueled  
- [ ] Washed  
- [ ] Stored

**B4. Are vehicles stored and/or repaired outside?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**B5. Is there evidence of spills/leakage from vehicles?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**B6. Are uncovered outdoor fueling areas present?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**B7. Are fueling areas directly connected to storm drains?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**B8. Are vehicles washed outdoors?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**Observed Pollution Source?**

- [ ]

### C. Outdoor Materials [N/A (Skip to part D)]

**Observed Pollution Source?**

- [ ]

**C1. Are loading/unloading operations present?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**If yes, are they uncovered and draining towards a storm drain inlet?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**C2. Are materials stored outside?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**Where are they stored?**

- [ ] Liquid  
- [ ] Solid

**Description:**

- [ ]

**C3. Is the storage area directly or indirectly connected to storm drain (circle one)?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**C4. Is staining or discoloration around the area visible?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**C5. Does outdoor storage area lack a cover?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**C6. Are liquid materials stored without secondary containment?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**C7. Are storage containers missing labels or in poor condition (rusting)?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

### D. Waste Management [N/A (Skip to part E)]

**Observed Pollution Source?**

- [ ]

**D1. Type of waste (check all that apply):**

- [ ] Garbage  
- [ ] Construction materials  
- [ ] Hazardous materials

**D2. Dumpster condition (check all that apply):**

- [ ] No cover/Lid is open  
- [ ] Damaged/poor condition  
- [ ] Leaking or evidence of leakage (stains on ground)  
- [ ] Overflowing

**D3. Is the dumpster located near a storm drain inlet?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

**If yes, are runoff diversion methods (berms, curbs) lacking?**

- [ ] Y  
- [ ] N  
- [ ] Can't Tell

### E. Physical Plant [N/A (Skip to part F)]

**Observed Pollution Source?**

- [ ]

**E1. Building: Approximate age:**

- [ ] 5 yrs

**Condition of surfaces:**

- [ ] Clean  
- [ ] Stained  
- [ ] Dirty  
- [ ] Damaged

**Evidence that maintenance results in discharge to storm drains (staining/discholoration)?**

- [ ] Y  
- [ ] N  
- [ ] Don't know

*Index: O denotes potential pollution source; □ denotes confirmed polluter (evidence was seen)*

A-5
**E2. Parking Lot:** Approximate age ___ yrs. Condition: [ ] Clean [ ] Stained [ ] Dirty [ ] Breaking up  
Surface material [ ] Paved/Concrete [ ] Gravel [ ] Permeable [ ] Don’t know  

**E3.** Do downspouts discharge to impervious surface? [x] Y [ ] N [ ] Don’t know [ ] None visible  
Are downspouts directly connected to storm drains? [ ] Y [ ] N [ ] Don’t know

**E4.** Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? [ ] Y [ ] N [ ] Can’t Tell

**F. TURF/LANDSCAPING AREAS**  
<table>
<thead>
<tr>
<th>Observed Pollution Source?</th>
</tr>
</thead>
</table>

**F1.** % of site with:  
- Forest canopy ____%  
- Turf grass ____%  
- Landscaping ____%  
- Bare Soil ____%

**F2.** Rate the turf management status: [ ] High [ ] Medium [ ] Low

**F3.** Evidence of permanent irrigation or “non-target” irrigation [ ] Y [ ] N [ ] Can’t Tell

**F4.** Do landscaped areas drain to the storm drain system? [x] Y [ ] N [ ] Can’t Tell

**F5.** Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? [ ] Y [ ] N [ ] Can’t Tell

**G. STORM WATER INFRASTRUCTURE**  
| Observed Pollution Source? |

**G1.** Are storm water treatment practices present? [ ] Y [ ] N [ ] Unknown  
If yes, please describe: __________________________

**G2.** Are private storm drains located at the facility? [ ] Y [ ] N [ ] Unknown  
Is trash present in gutters leading to storm drains? [ ] Y [ ] N  
If so, complete the index below.

**Index Rating for Accumulation in Gutters**

<table>
<thead>
<tr>
<th>Index Rating for Accumulation in Gutters</th>
</tr>
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<tbody>
<tr>
<td>Clean</td>
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<tr>
<td>Sediment</td>
</tr>
<tr>
<td>Organic material</td>
</tr>
<tr>
<td>Litter</td>
</tr>
</tbody>
</table>

**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) [ ]  
- Potential 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) [ ]

**Follow-up Action:**

- Refer for immediate enforcement
- 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
- Onsite non-residential retrofit
- Pervious area restoration; complete PAA sheet and record
  Unique Site ID here: _________________________
- Schedule a review of storm water pollution prevention plan

**Notes:**
**Hotspot Site Investigation**

**Warshed:** Tank

**SUBWATERSHED:**

**DATE:** 7/16/08

**ASSESSED BY:** KB OB

**CAMERA ID:** PIC:

**MAP GRID:**

<table>
<thead>
<tr>
<th>LAT</th>
<th>LONG</th>
</tr>
</thead>
</table>
| 41° 51' 38" | 70° 25' 15"

**LMK #**

**A. SITE DATA AND BASIC CLASSIFICATION**

**Name and Address:** Industrial Park West

**Category:**
- Commercial
- Industrial
- Miscellaneous
- Institutional
- Municipal
- Golf Course
- Transport-Related
- Marina
- Animal Facility

**SIC code (if available):**

**Basic Description of Operation:** Office Building - Garber Technologies

**NPDES Status:**
- Regulated
- Unregulated
- Unknown

**BI. Types of vehicles:**
- Fleet vehicles
- School buses
- Other: Commuter vehicles

**B2. Approximate number of vehicles:** 100

**B3. Vehicle activities (circle all that apply):**
- Maintained
- Repaired
- Recycled
- Fueled
- Washed
- Stored

**B4. Are vehicles stored and/or repaired outside?**
- Y
- N
- Can't Tell

**B5. Is there evidence of spills/leakage from vehicles?**
- Y
- N
- Can't Tell

**B6. Are uncovered outdoor fueling areas present?**
- Y
- N
- Can't Tell

**B7. Are fueling areas directly connected to storm drains?**
- Y
- N
- Can't Tell

**B8. Are vehicles washed outdoors?**
- Y
- N
- Can't Tell

Does the area where vehicles are washed discharge to the storm drain?
- Y
- N
- Can't Tell

**B. VEHICLE OPERATIONS**

**C. OUTDOOR MATERIALS**

**D. WASTE MANAGEMENT**

**E. PHYSICAL PLANT**

**F. Observed Pollution Source?**

---

**INDEX**

*Index: O denotes potential pollution source; [ ] denotes confirmed polluter (evidence was seen)*
Hotspot Site Investigation

   Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don’t know

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don’t know ☐ None visible
   Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don’t know

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can’t Tell

F. TURF/LANDSCAPING AREAS: ☐ N/A (skip to part G)

F1. % of site with: Forest canopy ___% Turf grass ___% Landscaping ___% Bare Soil ___%

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low

F3. Evidence of permanent irrigation or “non-target” irrigation ☐ Y ☐ N ☐ Can’t Tell

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can’t Tell

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can’t Tell

G. STORM WATER INFRASTRUCTURE: ☐ N/A (skip to part H)

G1. Are storm water treatment practices present? ☐ Y ☐ N ☐ Unknown If yes, please describe:

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.

   Index Rating for Accumulation in Gutters
   ____________________________
   Clean | Filthy
   Sediment ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
   Organic material ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
   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) ☐ Potential 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)

Follow-up Action:
☐ Refer for immediate enforcement
☐ 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
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record

Unique Site ID here:
☐ Schedule a review of storm water pollution prevention plan

Notes:

Stormwater detention basin could be installed

Sediment could be removed
1/16/03  G энер Dike - Stormwater Retrofit

- Existing Basin, No Sed Forebay
- Significant Sed. Accumulation
- Inlet not identified

o Quiet, a riprap channel, full of trees & shrubs

Recall that erosion was present downstream

Good potential candidate for maintenance & retrofit
**WATERSHED:** Tanker  
**SUBWATERSHED:** Clark  
**UNIQUE SITE ID:** CB-ksi-01

**DATE:** 7/16/08  
**ASSESSED BY:** KB, DB  
**CAMERA ID:** PIC#

**MAP GRID:**  
**LAT °**  
**"LONG °"**  
**LMK #

### A. SITE DATA AND BASIC CLASSIFICATION

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<th>Category:</th>
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</tr>
<tr>
<td>ft. 30</td>
<td>☐ Institutional ☐ Municipal ☐ Golf Course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ Transport-Related ☐ Marina ☐ Animal Facility</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIC code (if available):</th>
<th>Basic Description of Operation:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>prepare</td>
</tr>
</tbody>
</table>

**NPDES Status:** ☐ Regulated  
☐ Unregulated  
☐ Unknown

**B. VEHICLE OPERATIONS**

<table>
<thead>
<tr>
<th>Types of vehicles:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☒ Fleet vehicles</td>
<td></td>
</tr>
<tr>
<td>☐ School buses</td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximate number of vehicles:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>prepare trucks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle activities (circle all that apply):</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Maintained  
☐ Repaired  
☐ Recycled  
☐ Fueled  
☐ Washed  
☐ Stored |  |

<table>
<thead>
<tr>
<th>Are vehicles stored and/or repaired outside?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☐ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are these vehicles lacking runoff diversion methods?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Is there evidence of spills/leakage from vehicles?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are uncovered outdoor fueling areas present?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are fueling areas directly connected to storm drains?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☐ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are vehicles washed outdoors?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☐ Can't Tell |  |

<table>
<thead>
<tr>
<th>Does the area where vehicles are washed discharge to the storm drain?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☐ Can't Tell |  |

### C. OUTDOOR MATERIALS

<table>
<thead>
<tr>
<th>Are loading/unloading operations present?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are materials stored outside?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☒ Can't Tell |  |

| Are these materials ☐ Liquid ☐ Solid  
Description: |  |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>prepare</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where are they stored?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ grass/dirt area  
☒ concrete/asphalt  
☐ bermed area |  |

<table>
<thead>
<tr>
<th>Is the storage area directly or indirectly connected to storm drain (circle one)?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Is staining or discoloration around the area visible?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Does outdoor storage area lack a cover?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☒ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are liquid materials stored without secondary containment?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☒ N  
☐ Can't Tell |  |

<table>
<thead>
<tr>
<th>Are storage containers missing labels or in poor condition (rusting)?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☒ Can't Tell |  |

### D. WASTE MANAGEMENT

<table>
<thead>
<tr>
<th>Type of waste (check all that apply):</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Garbage  
☐ Construction materials  
☐ Hazardous materials |  |

<table>
<thead>
<tr>
<th>Dumpster condition (check all that apply):</th>
<th></th>
</tr>
</thead>
</table>
| ☐ No cover/Lid is open  
☐ Damaged/poor condition  
☒ Leaking or evidence of leakage (stains on ground)  
☐ Overflowing |  |

<table>
<thead>
<tr>
<th>Is the dumpster located near a storm drain inlet?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☐ Can't Tell |  |

<table>
<thead>
<tr>
<th>If yes, are runoff diversion methods (berms, curbs) lacking?</th>
<th></th>
</tr>
</thead>
</table>
| ☒ Y  
☐ N  
☐ Can't Tell |  |

### E. PHYSICAL PLANT

<table>
<thead>
<tr>
<th>Building: Approximate age:</th>
<th></th>
</tr>
</thead>
</table>
| ☐ 20-40 yrs.  
☐ 40-60 yrs.  
☐ 60-90 yrs.  
☒ 90+ yrs. |  |

<table>
<thead>
<tr>
<th>Condition of surfaces:</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Clean  
☐ Stained  
☐ Dirty  
☐ Damaged |  |

<table>
<thead>
<tr>
<th>Evidence that maintenance results in discharge to storm drains (staining/discholoration)?</th>
<th></th>
</tr>
</thead>
</table>
| ☐ Y  
☐ N  
☒ Don't know |  |

*Index: ○ denotes potential pollution source; □ denotes confirmed polluter (evidence was seen)*
Follow-up Action:
☐ Refer for immediate enforcement
☐ 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
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record

Unique Site ID here:
☐ Schedule a review of storm water pollution prevention plan

Notes:
## A. Neighborhood Characterization

**Neighborhood/Subdivision Name:**

**Neighborhood Area (acres):**

- **Homeowners Association?**
  - **Y** Yes
  - **N** No
  - **Unknown** If yes, name and contact information:

  **Residential (circle average single family lot size):**
  - **Single Family Attached (Duplexes, Row Homes)**: <1/4 1/4 1/2 1/3 acre
  - **Single Family Detached**: <1/4 1/4 1/2 1 acre
  - **Multifamily (Apts, Townhomes, Condos)**
  - **Mobile Home Park**

**Estimated Age of Neighborhood:**

**Percent of Homes with Garages:**

**Percent of Homes with Basements:**

**INDEX:**

<table>
<thead>
<tr>
<th><strong>B. Yard and Lawn Conditions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B1. % of lot with impervious cover</strong></td>
</tr>
<tr>
<td><strong>B2. % of lot with grass cover</strong></td>
</tr>
<tr>
<td><strong>B3. % of lot with landscaping (e.g., mulched bed areas)</strong></td>
</tr>
<tr>
<td><strong>B4. % of lot with bare soil</strong></td>
</tr>
</tbody>
</table>

*Note: B1 through B4 must total 100%

**B5. % of lot with forest canopy** | 10 |

**B6. Evidence of permanent irrigation or “non-target” irrigation**

- **High:**
- **Med:**
- **Low:**

**B7. Proportion of total neighborhood turf lawns with following management status:**

| **B8. Outdoor swimming pools?** | Y | N | Can’t Tell | Estimated # |
|--------------------------------|
| **B9. Junk or trash in yards?** | Y | N | Can’t Tell |

**C. Driveways, Sidewalks, and Curbs**

| **C1. % of driveways that are impervious** | N/A |
|---------------------------------------------|
| **C2. Driveway Condition**
  - **Clean**
  - **Stained**
  - **Dirty**
  - **Breaking up** |

| **C3. Are sidewalks present?**
  - **Y** Yes
  - **N** No
  - 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

| **C4. Is curb and gutter present?**
  - **Y** Yes
  - **N** No
  - 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** |

*INDEX: O denotes potential pollution source; $\Diamond$ denotes a neighborhood restoration opportunity*
### D. ROOFTOPS

| D1. Downspouts are directly connected to storm drains or sanitary sewer |   |
| D2. Downspouts are directed to impervious surface | 10 |
| D3. Downspouts discharge to pervious area | 0 |
| D4. Downspouts discharge to a cistern, rain barrel, etc. |   |

*Note: Cl 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 |
| E2. Storm water pond? | Y | N |
| E3. Open Space? | Y | N |

- **Catch basins inspected?** Y | N
- **Condition:** Clean | Dirty
- **Storm drain inlets?** Y | N
- **Storm water pond?** Y | N
- **Is it a wet pond or dry pond?** Y | N
- **Is it overgrown?** Y | N
- **What is the estimated pond area?** <1 acre | about 1 acre | >1 acre
- **Open Space?** Y | N
- **If yes, is pet waste present?** Y | N
- **Dumping?** Y | N

### 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

**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)

**Describe Recommended Actions:**

> Better landscaping and increased pervious areas.

### 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)

### NOTES:
Neighborhood Source Assessment

**Watershed:** Tuckerhoen  
**Subwatershed:** Tucker  
**Unique Site ID:** TB-NSA-01

**Date:** 7/16/08  
**Assessed By:**  
**Camera ID:**  
**Pic#:**

### A. Neighborhood Characterization

- **Neighborhood/Subdivision Name:**  
- **Neighborhood Area (acres):** 106
- **Homeowners Association:**  
  - **Residential:**  
    - **Single Family Attached (Duplexes, Row Homes):**  
    - **Single Family Detached:**
      - **< ¼ ¼ ½ ½ acre:**  
      - **> ½ acre:**  
    - **Multifamily (Apts, Townhomes, Condos):**  
    - **Mobile Home Park:**
- **Estimated Age of Neighborhood:** [ ] years
- **Percent of Homes with Garages:** [ ]
- **With Basements:** [ ]
- **Sewer Service:**
  - **El Y El N Unknown**
- **Sewer Service:**
  - **El Y El N Unknown**
- **Index of Infill, Redevelopment, and Remodeling:**
  - **El No Evidence**
  - **< 5% of units**  
  - **> 10%**
- **Bi. % of lot with impervious cover**  
- **B2. % of lot with grass cover**  
- **B3. % of lot with landscaping (e.g., mulched bed areas)**  
- **B4. % of lot with bare soil**
  - **Note: B1 through B4 must total 100%**
- **B5. % of lot with forest canopy**  
- **B6. Evidence of permanent irrigation or “non-target” irrigation**
- **High:** [ ]
- **Med:** [ ]
- **Low:** [ ]
- **B7. Proportion of total neighborhood turf lawns with following management status:**
  - **Low:** [ ]
  - **Med:** [ ]
  - **High:** [ ]
- **B8. Outdoor swimming pools:**
  - **El Y El N Can’t Tell**
- **Estimated #:** [ ]
- **B9. Junk or trash in yards:**
  - **El Y El N Can’t Tell**

### B. Yard and Lawn Conditions

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Percentage</th>
<th>Comments/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1. % of lot with impervious cover</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>B2. % of lot with grass cover</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>B3. % of lot with landscaping (e.g., mulched bed areas)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>B4. % of lot with bare soil</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>B5. % of lot with forest canopy</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>B6. Evidence of permanent irrigation or “non-target” irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B7. Proportion of total neighborhood turf lawns with following management status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B8. Outdoor swimming pools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B9. Junk or trash in yards</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### C. Driveways, Sidewalks, and Curbs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Percentage</th>
<th>Comments/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. % of driveways that are impervious</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td>C2. Driveway Condition</td>
<td>Clean</td>
<td>Stained</td>
</tr>
<tr>
<td>C3. Are sidewalks present?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>What is the distance between the sidewalk and street?</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>Is pet waste present in this area?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>C4. Is curb and gutter present?</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

*INDEX: O denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity
### D. ROOFTOPS

<table>
<thead>
<tr>
<th>Description</th>
<th>NSA Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1. Downspouts are directly connected to storm drains or sanitary sewer</td>
<td></td>
</tr>
<tr>
<td>D2. Downspouts are directed to impervious surface</td>
<td></td>
</tr>
<tr>
<td>D3. Downspouts discharge to pervious area</td>
<td></td>
</tr>
<tr>
<td>D4. Downspouts discharge to a cistern, rain barrel, etc.</td>
<td></td>
</tr>
<tr>
<td>*Note: C1 through C4 should total 100%</td>
<td></td>
</tr>
<tr>
<td>D5. Lawn area present downslope of leader for rain garden?</td>
<td>Y</td>
</tr>
</tbody>
</table>

### E. COMMON AREAS

<table>
<thead>
<tr>
<th>Description</th>
<th>NSA Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1. Storm drain inlet? Y N If yes, are they stenciled? Y N Condition: Clean Dirty</td>
<td></td>
</tr>
<tr>
<td>Catch basins inspected? Y N If yes, include Unique Site ID from SSD sheet:</td>
<td></td>
</tr>
<tr>
<td>E2. Storm water pond? Y N Is it a wet pond or dry pond? Y N Is it overgrown?</td>
<td></td>
</tr>
<tr>
<td>What is the estimated pond area? 1 acre.x &gt; 1 acre</td>
<td></td>
</tr>
<tr>
<td>E3. Open Space? Y N If yes, pet waste present? Y N dumping? Y N</td>
<td></td>
</tr>
<tr>
<td>Buffers/floodplain present? Y N If yes, encroachment evident? Y N</td>
<td></td>
</tr>
</tbody>
</table>

### 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

**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)

**Described Recommended Actions:**

*Found pond along Yale & Chatham Drs. Although too small for entire neighborhood, other ponds throughout may be large enough for whole neighborhood.*

**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)

*Pond could be retrofitted.
See stream assessment forms.*

**NOTES:**
### A. NEIGHBORHOOD CHARACTERIZATION

<table>
<thead>
<tr>
<th>Neighborhood/Subdivision Name:</th>
<th>M. Lemon Apts</th>
</tr>
</thead>
<tbody>
<tr>
<td>If unknown, address (or streets) surveyed:</td>
<td></td>
</tr>
<tr>
<td>Homeowners Association?</td>
<td>☑ Y ☐ N ☐ Unknown</td>
</tr>
<tr>
<td>Residential (circle average single family lot size):</td>
<td>☑ Single Family Attached (Duplexes, Row Homes)</td>
</tr>
<tr>
<td>Estimated Age of Neighborhood:</td>
<td>8 years</td>
</tr>
<tr>
<td>Percent of Homes with Garages:</td>
<td>☑ 80%</td>
</tr>
<tr>
<td>Sewer Service?</td>
<td>☑ Y ☐ N</td>
</tr>
<tr>
<td>Index of Infill, Redevelopment, and Remodeling</td>
<td>☑ No Evidence</td>
</tr>
</tbody>
</table>

### B. YARD AND LAWN CONDITIONS

| B1. % of lot with impervious cover | 50 |
| B2. % of lot with grass cover | 30 |
| B3. % of lot with landscaping (e.g., mulched bed areas) | 20 |
| B4. % of lot with bare soil | 0 |

*Note: B1 through B4 must total 100%

| B5. % of lot with forest canopy | 20 |
| B6. Evidence of permanent irrigation or "non-target" irrigation | ☑ |
| B7. Proportion of total neighborhood turf lawns with following management status: |  |
| High: | ☑ |
| Med: |  |
| Low: |  |

### C. DRIVEWAYS, SIDEWALKS, AND CURBS

| C1. % of driveways that are impervious | ☑ N/A |
| C2. Driveway Condition | ☑ Clean ☑ Stained ☑ Dirty ☐ Breaking up |
| C3. Are sidewalks present? | ☑ Y ☐ N |
| C4. Is curb and gutter present? | ☑ Y ☑ N |
| C5. Is pet waste present in this area? | ☑ Y ☑ N ☐ N/A |

*INDEX*: ☑ denotes potential pollution source; ☑ denotes a neighborhood restoration opportunity
D. ROOFTOPS

D1. Downspouts are directly connected to storm drains or sanitary sewer  

D2. Downspouts are directed to impervious surface

D3. Downspouts discharge to pervious area

D4. Downspouts discharge to a cistern, rain barrel, etc.

*Note: Cl 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 

Catch basins inspected? Y N If yes, include Unique Site ID from SSD sheet: NSA - C1

E2. Storm water pond? Y N Is it a wet pond or dry pond? 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

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 (Check and in previous

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)
☑ 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)

Describe Recommended Actions:

Roof gardens for downspouts

NOTES:
### A. NEIGHBORHOOD CHARACTERIZATION

<table>
<thead>
<tr>
<th>Neighborhood/Subdivision Name:</th>
<th>Neighborhood Area (acres):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13 (acres)</td>
</tr>
</tbody>
</table>

If unknown, address (or streets) surveyed: [Unfilled]

Homeowners Association? [Y] N [Unknown]

Residential (circle average single family lot size):

- [Y] Single Family Attached (Duplexes, Row Homes) <1/4
- [Y] Single Family Detached <1/4

- [Y] Multifamily (Apts, Townhomes, Condos) 1 >1 acre
- [N] Mobile Home Park

Estimated Age of Neighborhood: 50 years

Percent of Homes with Garages: [X] % With Basements [Y] %

Sewer Service? [N] Y N

Record percent observed for each of the following indicators, depending on applicability and/or site complexity:

<table>
<thead>
<tr>
<th>Index of Infill, Redevelopment, and Remodeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>[□ No Evidence] [□ &lt;5% of units] [□ 5-10%] [□ &gt;10%]</td>
</tr>
</tbody>
</table>

### B. YARD AND LAWN CONDITIONS

<table>
<thead>
<tr>
<th>B1. % of lot with impervious cover</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2. % of lot with grass cover</td>
<td>40</td>
</tr>
<tr>
<td>B3. % of lot with landscaping</td>
<td>10</td>
</tr>
<tr>
<td>B4. % of lot with bare soil</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: B1 through B4 must total 100%*

| B5. % of lot with forest canopy | 10 |
| B6. Evidence of permanent irrigation or “non-target” irrigation |

<table>
<thead>
<tr>
<th>B7. Proportion of total neighborhood turf lawns with following management status:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[□ Low] [□ Med] [□ High]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B8. Outdoor swimming pools?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Y] Can’t Tell Estimated #</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B9. Junk or trash in yards?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[X] Can’t Tell</td>
</tr>
</tbody>
</table>

### C. DRIVEWAYS, SIDEWALKS, AND CURBS

<table>
<thead>
<tr>
<th>C1. % of driveways that are impervious</th>
</tr>
</thead>
<tbody>
<tr>
<td>[□ N/A] [□ N/A]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C2. Driveway Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean [□] [□ N/A]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C3. Are sidewalks present?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[□ Y] [□ N] [□] If yes, are they on one side of street [□] or along both sides [□]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C4. Is curb and gutter present?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[□ Y] [□ N] [□] If yes, check all that apply:</td>
</tr>
<tr>
<td>[□] Clean and Dry</td>
</tr>
<tr>
<td>[□] Flowing or standing water</td>
</tr>
<tr>
<td>[□] Long-term car parking</td>
</tr>
</tbody>
</table>

*INDEX: [○] denotes potential pollution source; [◊] denotes a neighborhood restoration opportunity*
### D. ROOFTOPS

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1. Downspouts are directly connected to storm drains or sanitary sewer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2. Downspouts are directed to impervious surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3. Downspouts discharge to pervious area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4. Downspouts discharge to a cistern, rain barrel, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Cl through C4 should total 100%*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D5. Lawn area present downgradient of leader for rain garden?</td>
<td>Y N</td>
</tr>
</tbody>
</table>

### E. COMMON AREAS

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E1. Storm drain inlets? Y N</td>
<td>If yes, are they stenciled? Y N</td>
<td>Condition: Clean Dirty</td>
<td></td>
</tr>
<tr>
<td>E2. Catch basins inspected? Y N</td>
<td>If yes, include Unique Site ID from SSD sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3. Storm water pond? Y N</td>
<td>Is it a wet pond or dry pond? Y N</td>
<td>Is it overgrown? Y N</td>
<td></td>
</tr>
<tr>
<td>E4. What is the estimated pond area? &lt; 1 acre about 1 acre &gt; 1 acre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E5. Open Space? Y N</td>
<td>If yes, is pet waste present? Y N</td>
<td>Dumping? Y N</td>
<td></td>
</tr>
<tr>
<td>E6. Buffers/floodplain present: Y N</td>
<td>If yes, is encroachment evident? Y N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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 X Sediment
- Other

#### Recommended Actions

- **Specific Action**
  - [ ] Onsite retrofit potential?
  - [X] Better lawn/landscaping practice?
  - [ ] Better management of common space?
  - [X] Pond retrofit?
  - [ ] Multi-family Parking Lot Retrofit?
  - [ ] Other action(s)

#### Describe Recommended Actions:

Detention pond for storm drains is possible

### Initial Assessment

#### NSA Pollution Severity Index

- [ ] Severe (More than 10 circles checked)
- [ ] High (5 to 10 circles checked)
- [X] 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)
- [X] Low (Fewer than 3 diamonds checked)

### NOTES:

A-4
Neighborhood Source Assessment

**WATERSHED:** Turkey  
**SUBWATERSHED:** Gages  
**UNIQUE SITE ID:** NSA-01

**DATE:** 7/16/08  
**ASSESSED BY:** KB, DB  
**CAMERA ID:**

**PIC#:** 2444

### A. NEIGHBORHOOD CHARACTERIZATION

- **Neighborhood/Subdivision Name:** Valley View or Andrews Way  
- **Neighborhood Area (acres):** 55

If unknown, address (or streets) surveyed:

- **Homeowners Association?** □ Y □ N □ Unknown  
- **Residential (circle average single family lot size):**
  - □ Single Family Attached (Duplexes, Row Homes)  
  - □ Single Family Detached  
  - □ Multifamily (Apts, Townhomes, Condos)

- **Estimated Age of Neighborhood:** 25 years  
- **Percent of Homes with Garages:** 97%  
- **With Basements:** 10%

**Sewer Service?** □ Y □ N □ Unknown

- **Index of Infill, Redevelopment, and Remodeling:**
  - □ No Evidence  
  - □ <5% of units  
  - □ 5-10%  
  - □ >10%

- **Record percent observed for each of the following indicators depending on applicability and/or site complexity:**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1. % of lot with impervious cover</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>B2. % of lot with grass cover</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>B3. % of lot with landscaping (e.g., mulched bed areas)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>B4. % of lot with bare soil</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>B5. % of lot with forest canopy</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
| B6. Evidence of permanent irrigation or “non-target” irrigation | High: 90  
| B7. Proportion of total neighborhood turf lawns with following management status: | Med: 10  
| B8. Outdoor swimming pools? □ Y □ N □ Can’t Tell  
| B9. Junk or trash in yards? □ Y □ N □ Can’t Tell |

### B. YARD AND LAWN CONDITIONS

- **C1. % of driveways that are impervious:** □ N/A  
- **C2. Driveway Condition:** □ Clean □ Stained □ Dirty □ Breaking up

### C. DRIVEWAYS, SIDEWALKS, AND CURBS

- **C3. Are sidewalks present?** □ Y □ N  
  - □ Spotless □ Covered with lawn clippings/leaves □ Receiving ‘non-target’ irrigation

- **C4. Is curb and gutter present?** □ Y □ N
  - □ Clean and Dry □ Flowing or standing water □ Long-term car parking □ Sediment
  - □ Organic matter, leaves, lawn clippings □ Trash, litter, or debris □ Overhead tree canopy

* INDEX: ○ denotes potential pollution source; ◊ denotes a neighborhood restoration opportunity

---

**A-3**
**Neighborhood Source Assessment**

### D. ROOFTOPS

<table>
<thead>
<tr>
<th>D1. Downspouts are directly connected to storm drains or sanitary sewer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D2. Downspouts are directed to impervious surface</td>
<td>25</td>
</tr>
<tr>
<td>D3. Downspouts discharge to pervious area</td>
<td></td>
</tr>
<tr>
<td>D4. Downspouts discharge to a cistern, rain barrel, etc.</td>
<td>25</td>
</tr>
</tbody>
</table>

*Note: C1 through C4 should total 100%*

| D5. Lawn area present downgradient of leader for rain garden? |   |

### E. COMMON AREAS

<table>
<thead>
<tr>
<th>E1. Storm drain inlets?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E2. Storm water pond?</td>
<td></td>
</tr>
<tr>
<td>E3. Open Space?</td>
<td></td>
</tr>
</tbody>
</table>

**Catch basins inspected:**

- Y N If yes, include Unique Site ID from SSD sheet:

**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 [ ] about 1 acre [ ] >1 acre

**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

### 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

**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)

**Describe Recommended Actions:**

*Roadway improvements*

### Initial Assessment

**NSA Pollution Severity Index**

- [ ] Severe (More than 10 circles checked)
- [ ] High (5 to 10 circles checked)
- [ ] Moderate (Fewer than 5 circles checked)
- [x] 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)

### NOTES:
<table>
<thead>
<tr>
<th><strong>WATERSHED:</strong></th>
<th><strong>SUBWATERSHED:</strong></th>
<th><strong>UNIQUE SITE ID:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tani</td>
<td>GB</td>
<td>GB-HSI-01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DATE:</strong></th>
<th><strong>ASSESSEDBY:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7/16/06</td>
<td>K2/DB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MAP GRID</strong></th>
<th><strong>RAIN IN LAST 24 HOURS</strong></th>
<th><strong>Pic #</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### A. LOCATION

**A1. Street names or neighborhood surveyed:** Industrial Park West

**A2. Adjacent land use:**
- Residential
- Commercial
- Industrial
- Municipal
- Transport-Related

**A3. Corresponding HSI or NSA field sheet? If so, circle HSI or NSA and record its Unique Site ID here:**

### B. STREET CONDITIONS

**B1. Road Type:**
- Arterial
- Collector
- Local
- Alley
- Other: __________

**B2. Condition of Pavement:**
- New
- Good
- Cracked
- Broken

**B3. Is on-street parking permitted?**
- Y
- N

**B4. Are large cul-de-sacs present?**
- Y
- N

**B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.**

<table>
<thead>
<tr>
<th>Index Rating for Accumulation in Gutters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Sediment</td>
</tr>
<tr>
<td>Organic Material</td>
</tr>
<tr>
<td>Litter</td>
</tr>
</tbody>
</table>

### C. STORM DRAIN INLETS AND CATCH BASINS

**C1. Type of storm drain conveyance:**
- open
- enclosed
- mixed

**C2. Percentage of inlets with catch basin storage:**
- N/A

**Sample 1-2 catch basins per NSA/HSI**

<table>
<thead>
<tr>
<th>Catch basin #1</th>
<th>Catch basin #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>Longitude</td>
</tr>
<tr>
<td>41° 31' 26''</td>
<td>72° 25' 15''</td>
</tr>
<tr>
<td>41° 31' 35''</td>
<td>72° 25' 17''</td>
</tr>
</tbody>
</table>

**LMK #:**
- Picture #: 101-3667

**Current Condition:**
- Wet
- Dry

**Condition of Inlet:**
- Clear
- Obstructed

**Litter Accumulation:**
- Y
- N

**Organics Accumulation:**
- Y
- N

**Sediment Accumulation:**
- Y
- N

**Sediment Depth (in feet):**
- ≤ 0.5 ft.

**Water Depth:**
- ≤ 0.2 ft.

**Evidence of oil and grease:**
- Y
- N

**Sulfur smell:**
- Y
- N

**Accessible to vacuum truck:**
- Y
- N

### D. NON-RESIDENTIAL PARKING LOT (>2 acres)

**D1. Approximate size:** 10 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

**D5. On-site retrofit potential:**
- Excellent
- Good
- Poor
### F. Municipal Pollutant Reduction Strategies

<table>
<thead>
<tr>
<th>E1. Degree of pollutant accumulation in the system:</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
</table>

**E2. Rate the feasibility of the following pollution 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
  - Moderate
  - Low

### Catch Basin Sketches

**#1**

**#2**

**Notes:**
**Streets and Storm Drains (SSD)**

**WATERSHED:** JAMS  
**SUBWATERSHED:** CT  
**UNIQUE SITE ID:** SSD-01

**DATE:** 7/16/03  
**ASSESSED BY:** KB/DB  
**CAMERA ID:**

**MAP GRID**

**RAIN IN LAST 24 HOURS** Y N  
**PIC #**

### A. LOCATION

A1. Street names or neighborhood surveyed: Clark Ed Juneswin Parks

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

### B. STREET CONDITIONS

B1. Road Type: Arterial Collector Local Alley Other:


B3. Is on-street parking permitted Y N If yes, approximate number of cars per block:

B4. Are large cul-de-sacs present? Y N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.  

<table>
<thead>
<tr>
<th>Clean</th>
<th>Filthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Organic Material</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Litter</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

### C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: open enclosed mixed

C2. Percentage of inlets with catch basin storage: N/A

**Sample 1-2 catch basins per NSA/HSI**

<table>
<thead>
<tr>
<th>C3. Catch basin #1</th>
<th>C4. Catch basin #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>41° 50' 17&quot;</td>
</tr>
<tr>
<td>Longitude</td>
<td>77° 27' 11&quot;</td>
</tr>
<tr>
<td>LMK #</td>
<td>101-3716</td>
</tr>
<tr>
<td>Current Condition</td>
<td>Wet Dry</td>
</tr>
<tr>
<td>Condition of Inlet</td>
<td>Clear Obstructed</td>
</tr>
<tr>
<td>Litter Accumulation</td>
<td>Y N</td>
</tr>
<tr>
<td>Organics Accumulation</td>
<td>Y N</td>
</tr>
<tr>
<td>Sediment Accumulation</td>
<td>Y N</td>
</tr>
<tr>
<td>Sediment Depth (in feet)</td>
<td>ft.</td>
</tr>
<tr>
<td>Water Depth</td>
<td>0.5 ft.</td>
</tr>
<tr>
<td>Evidence of oil and grease</td>
<td>Y N</td>
</tr>
<tr>
<td>Sulfur smell</td>
<td>Y N</td>
</tr>
<tr>
<td>Accessible to vacuum truck</td>
<td>Y N</td>
</tr>
</tbody>
</table>

### 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? Y N If yes, describe:

D5. On-site retrofit potential: Excellent Good Poor
F. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

E1. Degree of pollutant accumulation in the system: [ ] High [x] Medium [ ] Low [ ] None

E2. Rate the feasibility of the following pollution prevention strategies:

- Street Sweeping: [x] High [ ] Moderate [ ] Low
- Storm Drain Stenciling: [ ] High [ ] Moderate [x] Low
- Catch Basin Clean-outs: [ ] High [x] Moderate [ ] Low
- Parking Lot Retrofit Potential: [ ] High [x] Moderate [ ] Low

CATCH BASIN SKETCHES

#1

#2

Notes:

- [x] Water in CB E
  - higher level than stream surface & not streaming

- [x] Severe erosion at outfall
  - Dry weather flow
  - Pipe projecting
  - 3' gully depth
  - 4' gully width
  - ~25' length no stream

- Source is a wetland
  - Area adjacent to ind. bldgs. no piping
**Watershed:** Tanu  
**Subwatershed:** LTR  
**Unique Site ID:** LTR-NSA-01

**Date:** 7/16/06  
**Assessed By:** KB/DB  
**Camera ID:**  
**Rain in Last 24 Hours:** Y N  
**Pic #:**

### A. Location

A1. Street names or neighborhood surveyed:  

Campbell Dr.

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

B3. Is on-street parking permitted? Y N  
If yes, approximate number of cars per block: ________

B4. Are large cul-de-sacs present? Y N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.

<table>
<thead>
<tr>
<th>Index Rating for Accumulation in Gutters</th>
<th>Clean</th>
<th>Filthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Organic Material</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Litter</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### C. Storm Drain Inlets and Catch Basins

C1. Type of storm drain conveyance:  
- Open  
- Enclosed  
- Mixed

C2. Percentage of inlets with catch basin storage:  
- N/A  
- Unknown

Sample 1-2 catch basins per NSA/HSI

<table>
<thead>
<tr>
<th>C3. Catch basin #1</th>
<th>C4. Catch basin #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>41° 49' 32&quot;</td>
</tr>
<tr>
<td>Longitude</td>
<td>72° 29' 02&quot;</td>
</tr>
<tr>
<td>LMK #</td>
<td></td>
</tr>
<tr>
<td>Picture #</td>
<td></td>
</tr>
</tbody>
</table>

- Current Condition:  
  - Wet  
  - Dry

- Condition of Inlet:  
  - Clear  
  - Obstructed

- Litter Accumulation:  
  - Y  
  - N

- Organic Matter Accumulation:  
  - Y  
  - N

- Sediment Accumulation:  
  - Y  
  - N

- Sediment Depth (in feet):  
  - 1 ft.

- Water Depth:  
  - 0 ft.

- Evidence of oil and grease:  
  - Y  
  - N

- Sulfur smell:  
  - Y  
  - N

- Accessible to vacuum truck:  
  - Y  
  - N

### 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? Y N  
If yes, describe: ____________________________

D5. On-site retrofit potential:  
- Excellent  
- Good  
- Poor
### 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:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Sweeping:</td>
<td></td>
<td>[x]</td>
<td></td>
</tr>
<tr>
<td>Storm Drain Stenciling:</td>
<td>[x]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catch Basin Clean-outs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking Lot Retrofit Potential:</td>
<td></td>
<td></td>
<td>[x]</td>
</tr>
</tbody>
</table>

### Catch Basin Sketches

- **#1**
- **#2**

### Notes:
### A. LOCATION

- **Street names or neighborhood surveyed:**
  - High Power Trail Park

- **Adjacent land use:**
  - [x] Residential

- **Corresponding HSI or NSA field sheet?**
  - [ ] Yes

### B. STREET CONDITIONS

- **Road Type:**
  - [ ] Arterial

- **Condition of Pavement:**
  - [ ] New

- **Is on-street parking permitted?**
  - [x] Yes

- **Are large cul-de-sacs present?**
  - [ ] Yes

- **Is trash present in curb and gutter?**
  - [ ] Yes

- **Type of storm drain conveyance:**
  - [ ] Open

### C. STORM DRAIN INLETS AND CATCH BASINS

#### Sample 1-2 catch basins per NSA/HSI

<table>
<thead>
<tr>
<th>C3. Catch basin #1</th>
<th>C4. Catch basin #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>Longitude</td>
</tr>
<tr>
<td>44° 50' 50&quot;</td>
<td>41° 50' 57&quot;</td>
</tr>
<tr>
<td>Longitude</td>
<td>Latitude</td>
</tr>
<tr>
<td>72° 26' 46&quot;</td>
<td>72° 26' 54&quot;</td>
</tr>
<tr>
<td>LMK #</td>
<td>Picture #</td>
</tr>
<tr>
<td></td>
<td>101-3710</td>
</tr>
<tr>
<td>Condition of Inlet</td>
<td>Current Condition</td>
</tr>
<tr>
<td>Clear</td>
<td>Wet</td>
</tr>
<tr>
<td>Obstructed</td>
<td>Dry</td>
</tr>
<tr>
<td>Litter Accumulation</td>
<td>Y</td>
</tr>
<tr>
<td>Organic Material</td>
<td>Y</td>
</tr>
<tr>
<td>Sediment Accumulation</td>
<td>Y</td>
</tr>
<tr>
<td>Sediment Depth (in feet)</td>
<td>1 ft.</td>
</tr>
<tr>
<td>Water Depth</td>
<td>0.5 ft.</td>
</tr>
<tr>
<td>Evidence of oil and grease</td>
<td>Y</td>
</tr>
<tr>
<td>Sulfur smell</td>
<td>Y</td>
</tr>
<tr>
<td>Accessible to vacuum truck</td>
<td>Y</td>
</tr>
</tbody>
</table>

### D. NON-RESIDENTIAL PARKING LOT (>2 acres)

- **Approximate size:**
  - 

- **Lot Utilization:**
  - [ ] Full

- **Overall condition of Pavement:**
  - [ ] Smooth (no cracks)

- **Is lot served by a storm water treatment practice?**
  - [ ] Yes

- **On-site retrofit potential:**
  - [ ] Excellent
### E Municipal Pollutant Reduction Strategies

**E1.** Degree of pollutant accumulation in the system: [ ] High [X] Medium [ ] Low [ ] None

**E2.** Rate the feasibility of the following pollution prevention strategies:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Sweeping</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[X]</td>
</tr>
<tr>
<td>Storm Drain Stenciling</td>
<td>[ ]</td>
<td>[X]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Catch Basin Clean-outs</td>
<td>[X]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Parking Lot Retrofit Potential</td>
<td>[ ]</td>
<td>[X]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

### Catch Basin Sketches

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Sketch 1" /></td>
<td><img src="image2.png" alt="Sketch 2" /></td>
</tr>
</tbody>
</table>

### Notes:

[No notes provided]
Streets and Storm Drains

**A. LOCATION**

- A1. Street names or neighborhood surveyed:
  - Mt. Vernon Apartments

- A2. Adjacent land use:
  - Residential [X]
  - 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-WE-01

**B. STREET CONDITIONS**

- B1. Road Type:
  - Arterial [ ]
  - Collector [X]
  - Local [ ]
  - Alley [ ]
  - Other: 

- B2. Condition of Pavement:
  - New [ ]
  - Good [X]
  - Cracked [ ]
  - Broken [ ]

- B3. Is on-street parking permitted?
  - Y [X]
  - N [ ]
  - If yes, approximate number of cars per block: 25

- B4. Are large cul-de-sacs present?
  - Y [X]
  - N [ ]

- B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.
  - Sediment: 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]
  - Organic Material: 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]
  - Litter: 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

**C. STORM DRAIN INLETS AND CATCH BASINS**

- C1. Type of storm drain conveyance:
  - Open [ ]
  - Enclosed [X]
  - Mixed [ ]

- C2. Percentage of inlets with catch basin storage:
  - N/A [ ]

**Sample 1-2 catch basins per NSA/HSI**

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>41°56'59&quot;</td>
<td>11°51'06&quot;</td>
</tr>
<tr>
<td>12°26'26&quot;</td>
<td>72°26'27&quot;</td>
</tr>
</tbody>
</table>

- C3. Catch basin #1
  - Current Condition: Wet [ ] Dry [X]
  - Condition of Inlet: Clear [X]
  - Litter Accumulation: Y [X]
  - Organics Accumulation: Y [X]
  - Sediment Accumulation: Y [X]
  - Sediment Depth (in feet): 2.5 ft.
  - Water Depth: 1 ft.
  - Evidence of oil and grease: Y [X]
  - Sulfur smell: Y [X]
  - Accessible to vacuum truck: Y [X]

- C4. Catch basin #2
  - Current Condition: Wet [X] Dry [ ]
  - Condition of Inlet: Clear [X]
  - Litter Accumulation: Y [X]
  - Organics Accumulation: Y [X]
  - Sediment Accumulation: Y [X]
  - Sediment Depth (in feet): 1 ft.
  - Water Depth: 0 ft.
  - Evidence of oil and grease: Y [X]
  - Sulfur smell: Y [X]
  - Accessible to vacuum truck: Y [X]

**D. NON-RESIDENTIAL PARKING LOT (>2 acres)**

- D1. Approximate size:

- 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 [X]
  - N [ ]
  - If yes, describe:

- D5. On-site retrofit potential:
  - Excellent [ ]
  - Good [ ]
  - Poor [ ]
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:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>☐ High ☐ Moderate ☐ Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Sweeping</td>
<td>☒ High</td>
</tr>
<tr>
<td>Storm Drain Stenciling</td>
<td>☒ High</td>
</tr>
<tr>
<td>Catch Basin Clean-outs</td>
<td>☒ High</td>
</tr>
<tr>
<td>Parking Lot Retrofit Potential</td>
<td>☐ High ☐ Moderate ☒ Low</td>
</tr>
</tbody>
</table>

CATCH BASIN SKETCHES

#1

Notes:
Pic # 3708: 415 small catch area draining behind Building (41 50 57:3) 72 76 19.0, leaf litter & debris in woods.
### 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: 


B3. Is on-street parking permitted? Y ☑ N If yes, approximate number of cars per block: 0

B4. Are large cul-de-sacs present? Y ☑ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.

<table>
<thead>
<tr>
<th>Category</th>
<th>Clean</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Material</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Litter</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Index Rating for Accumulation in Gutters

### C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: Open ☑ Enclosed ☐ Mixed ☐

C2. Percentage of inlets with catch basin storage: 50 ☑ N/A

Sample 1-2 catch basins per NSA/HSI

<table>
<thead>
<tr>
<th>Catch basin #1</th>
<th>Catch basin #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>41° 51' 59&quot;</td>
</tr>
<tr>
<td>Longitude</td>
<td>71° 7' 35&quot;</td>
</tr>
</tbody>
</table>

LMK #

<table>
<thead>
<tr>
<th>Condition</th>
<th>Wet</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Sediment</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Litter</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Organic</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Sulfur</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>Accessible to vacuum truck</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

### D. NON-RESIDENTIAL PARKING LOT (>2 acres)

D1. Approximate size: N/A

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
E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

<table>
<thead>
<tr>
<th>E1. Degree of pollutant accumulation in the system:</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2. Rate the feasibility of the following pollution prevention strategies:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street Sweeping:</td>
<td>✖ High</td>
<td>Moderate</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Storm Drain Stenciling:</td>
<td>✖ High</td>
<td>Moderate</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Catch Basin Clean-outs:</td>
<td></td>
<td>✖ Moderate</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Parking Lot Retrofit Potential:</td>
<td></td>
<td>High</td>
<td>Moderate</td>
<td>✖ Low</td>
</tr>
</tbody>
</table>

CATCH BASIN SKETCHES

#1

#2

Notes:
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
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 Subdivision Regulations

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.

- **Section 5 - Standards for Maps and Plans:** 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.

- **Section 6.1.3 - General Improvements, Open Space to be Dedicated:** 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:
  - 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
  - Unconsolidated Aquifers and Aquifer Protection Areas
  - Areas indicated for future community facility needs
  - Existing open areas and significant cultural and natural resources
  - Potential open space system
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- 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

• Section 6.1.3.2 - General Improvements, Location of Open Space: 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 identified 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.

• Section 6.1.3.3 - General Improvements, Size of Open Space: 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.

• Section 6.1.3.4.3 - General Improvements, Open Space Standards: 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.

• Section 6.4 - Lot Grading and Drainage: 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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- **Section 6.5.1.1 - Street Grading and Improvement:** 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.

- **Section 6.6.6 - Cul-de-sac or Dead-End:** 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.

- **Section 6.7.1 - Design Standards, Road Width:** 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.

- **Section 6.7.2 - Design Standards, Curbs:** 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.

- **Section 6.9.1 - Drainage and Storm Sewers, General Requirements:** 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.

- **Section 6.9.2.2 - Drainage and Storm Sewers, Location of Stormwater Facilities:** 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.
- **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.

- **Section 6.9.3 - Drainage and Storm Sewers, Drainage Design**: 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.

- **Section 6.12.1 - Sidewalks**: 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.

- **Section 6.14 - Certified Erosion and Sediment Control Plan**: 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.
• **Section 6.14.3 - Erosion and Sediment Control Plan**: 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.

• **Section 6.14.6 - Conditions Relating to Soil Erosion and Sediment Control**: 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.

• **Section 13 - Rear Lots**: 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.

• **Section 3.4 - General Provisions, Collection and Disposal of Storm Drainage**: 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).

• **Section 3.18 - General Provisions, Building Above or Below Center Line of Road**: 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.
• **Section 3.25 - General Provisions, Sidewalks**: Sidewalks shall be installed for all new developments in all areas, unless waived by a three-quarters vote of all members of the Commission.

• **Sections 4.1 through 4.25 - Use Districts, Setbacks and Lot Dimensions**: 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.

• **Section 7 - Cluster Development**: 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.

• **Section 12 - Off-street Parking and Loading**: 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 ratios 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 development, thereby avoiding the situation where unnecessary parking is not constructed if future phases of development do not occur.
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.

- **Section 18 – Activities Requiring a Certified Erosion and Sediment Control Plan**: 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.

- **Section 19 – Rear Lots**: 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
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.

- **Section 2 - Definitions, Regulated Activity:** 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:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Upland Review Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland and Watercourse</td>
<td>100 ft.</td>
</tr>
<tr>
<td>Hockanum River, Ogden Brook, Tankerhoosen River, Gage's Brook, Railroad Brook, Walker Reservoir West, Walker Reservoir East, and Valley Falls Pond</td>
<td>200 ft.</td>
</tr>
<tr>
<td>Other</td>
<td>Agency Discretion*</td>
</tr>
</tbody>
</table>

*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.

- **Section 2 - Definitions, Significant Activity:** 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 result 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.

- **Section 4.3.2 - Fee Schedule:** 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.
• **Section 4.3.4 - Application Procedure**: 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 extent 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.

• **Section 4.5 - Evaluation of Proposed Activities**: 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.

• **Watercourse Buffers**: 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.
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 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.

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
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 quality 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 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 DEP-funded 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
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 Attachment
B 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.
Furthermore, 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 of 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
Manual includes such an LID credit system. Attachment C 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 site 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).
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.


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 Attachment D.
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?
  - 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.
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
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)\(^1\), 8-2 (a)\(^2\), 8-25\(^3\), and 22a-36 to 22a-45 inclusive\(^4\), and 8-2(b)\(^5\) 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

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\(^1\) 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.

\(^2\) Regulations: The zoning commission is authorized to adopt regulations “…to secure safety from …flood and other dangers; to promote health and the general welfare…”

\(^3\) 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…”

\(^4\) The Inland Wetlands and Watercourses Act.

\(^5\) “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.


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.
"Drainage area" means an area that contributes runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.

"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.

"Exemption" means those land development activities that are not subject to the stormwater management requirements contained in this ordinance.

"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.

"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.

"Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.

"Grading" means any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled or any combination thereof.

"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.

"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.

"Infiltration" means the passage or movement of water into the soil surface.

"Off-site stormwater management" means the design and construction of a facility necessary to control stormwater from more than one development.

"On-site stormwater management" means the design and construction of systems necessary to control stormwater within an immediate development.

"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.

"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.

"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.

"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.
"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.

"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.

"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.

"Watershed" means the total drainage area contributing runoff to a single point.

"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 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 of 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) Geotechnical 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:
   1. Vegetation or filter media;
   2. 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 into 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
   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
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 **not** 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 subtract 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.

4. 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 environmentally-sensitive 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:
a. 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 pre-
development peak flow rate. This Standard may be waived under certain conditions, as

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

D. Emergency Outlet Sizing - size the emergency outlet to safely pass the post-
development 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 pre-
development 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 up-
gradient 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 set forth below.]

Hydrologic Group Volume to Recharge (x Total Impervious Area)

<table>
<thead>
<tr>
<th>Hydrologic Group</th>
<th>Volume to Recharge x Total Impervious Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.6 inches of runoff</td>
</tr>
<tr>
<td>B</td>
<td>0.35 inches of runoff</td>
</tr>
<tr>
<td>C</td>
<td>0.25 inches of runoff</td>
</tr>
<tr>
<td>D</td>
<td>0.10 inches of runoff</td>
</tr>
</tbody>
</table>

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 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)
l. 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.]