



Park River

Park River (Segment 3), South Branch Park River (Segments 1 and 2)

WATERSHED DESCRIPTION AND MAPS

The Park River watershed covers an area of approximately 5,630 acres in central Connecticut (Figure 1). There are multiple towns located at least partially in the watershed, including the municipalities of Hartford, West Hartford, Newington, and Wethersfield, CT.

The Park River watershed includes three segments impaired for recreation due to elevated bacteria levels. These segments were assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of waterbodies in the watershed (CT DEEP, 2010).

South Branch Park River (Segment 2) (CT4400-01_02) is 2.62 miles long and begins at the confluence with Piper Brook and Trout Brook between the railroad tracks and Route 173 (New Britain Avenue) in West Hartford, continues northeasterly into Hartford, crosses Newfield Avenue and Flatbush Avenue, flows parallel to Brookfield Street near Interstate 84, and ends at the entrance of the South Branch Park River (Segment 1) entrance. South Branch Park River (Segment 1) (CT4400-01_01) is 0.32 miles long completely within an underground pipe and begins at the conduit entrance where South Branch Park River (Segment 2) ends, flows under Pope Park and Park Street, and ends at the confluence with the Park River just east of Laurel Street in Hartford.

Park River (Segment 3) (CT4400-00_01) is 2.39 miles long and begins at the confluence with North Branch Park River just downstream of the Interstate 84 crossing behind the Park Plaza Shopping Center in Hartford, crosses Laurel Street, turns north to cross Sigourney Street, turns east flowing parallel to Capitol Avenue, crosses Interstate 91, and ends at the confluence with the Connecticut River in Hartford. These segments have been altered by human activities, including rerouting and channelization prior to 1985, and current maps may not reflect the true routing of these urban streams.

The impaired segments of Park River have a water quality classification of B. Designated uses include habitat for fish

Impaired Segment Facts

Impaired Segments:

1. South Branch Park River (Segment 1) (CT4400-01_01)
2. South Branch Park River (Segment 2) (CT4400-01_02)
3. Park River (Segment 3) (CT4400-00_01)

Municipality: Hartford, West Hartford

Impaired Segment Length (miles):

4400-00_01 (2.39); 4400-01_01 (0.32); 4400-01_02 (2.62)

Water Quality Classification:
Class B

Designated Use Impairment:
Recreation

Sub-regional Basin Name and Code: Park River, CT4400

Regional Basin: Connecticut

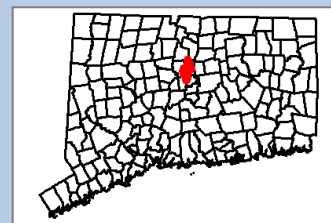
Major Basin: Park

Watershed Area (acres): 5,630

MS4 Applicable? Yes

Applicable Season: Recreation Season (May 1 to September 30)

Figure 1: Watershed location in Connecticut

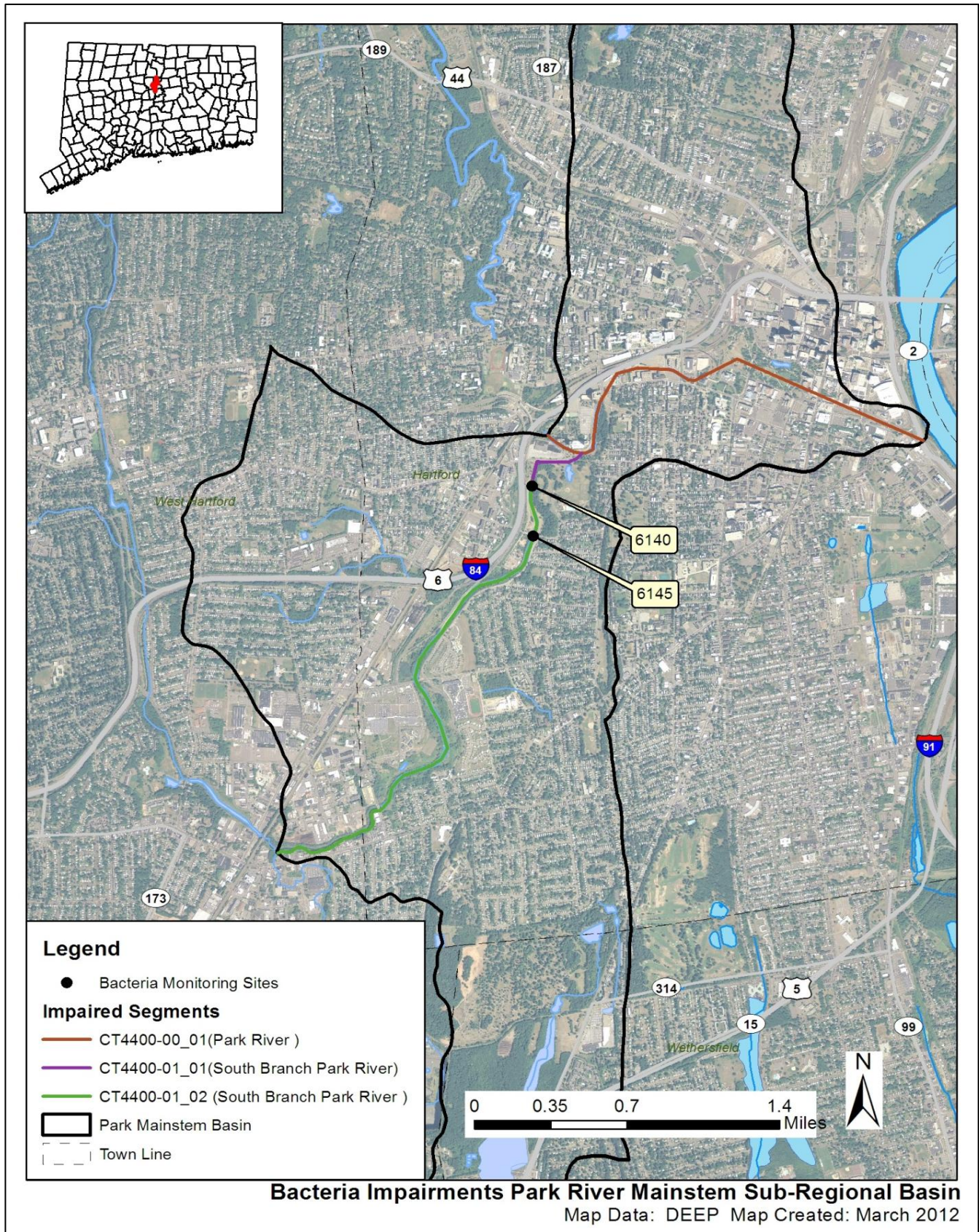


and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. These segments of the river are impaired due to elevated bacteria concentrations, affecting the designated use of recreation. As there are no designated beaches in these segments of Park River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

Table 1: Impaired segments and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT4400-00_01	Park River	From mouth at Connecticut River, US to confluence with North Branch Park River, just DS of I84 crossing at opening of conduit (US of Willow Street crossing).	2.39	NOT	NOT	FULL
CT4400-01_01	South Branch Park River	From mouth at confluence with Park River, US to entrance of conduit (entire segment in pipe underground).	0.32	NOT	NOT	FULL
CT4400-01_02	South Branch Park River	From entrance of conduit (segment-01), US to confluence with Piper and Trout Brooks, between railroad tracks and Route 173 (New Britain avenue).	2.62	NOT	NOT	FULL
<p>Shaded cells indicate impaired segment addressed in this TMDL FULL = Designated Use Fully Supported NOT = Designated Use Not Supported U = Unassessed</p>						

Figure 2: GIS map featuring general information of the Park River watershed at the sub-regional level



Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the Park River watershed consists of 87% urban area, 11% forest, 2% water, and less than 1% agriculture. South Branch Park River (Segment 2) begins near the commercial development along New Britain Avenue and the industrial development along Dexter Avenue, and flows near dense residential development, the City of Hartford Open Space, recreational fields at Al Prince Technical High School, commercial buildings and parking lots off Flatbush Avenue, Hartford Housing Authority, and Rice Heights Playground with large open fields. South Branch Park River (Segment 2) enters a concrete channel upstream of the Housing Authority along Brookfield Street as the segment nears Interstate 84, passes an automobile junk yard along Wellington Street, and re-enters a concrete channel after the Hamilton Street crossing before entering a conduit in Pope Park. South Branch Park River (Segment 1) is located completely underground in a conduit under Pope Park and Park Street. Park River (Segment 3) also is located completely underground in a conduit, flowing under major commercial areas along Laurel Street, Capitol Avenue, and Sheldon Street. Underground conduits and human alterations make it difficult to determine land use impacts from aerial maps, particularly for South Branch Park River (Segment 1) and Park River (Segment 3).

Figure 3: Land use within the Park River watershed

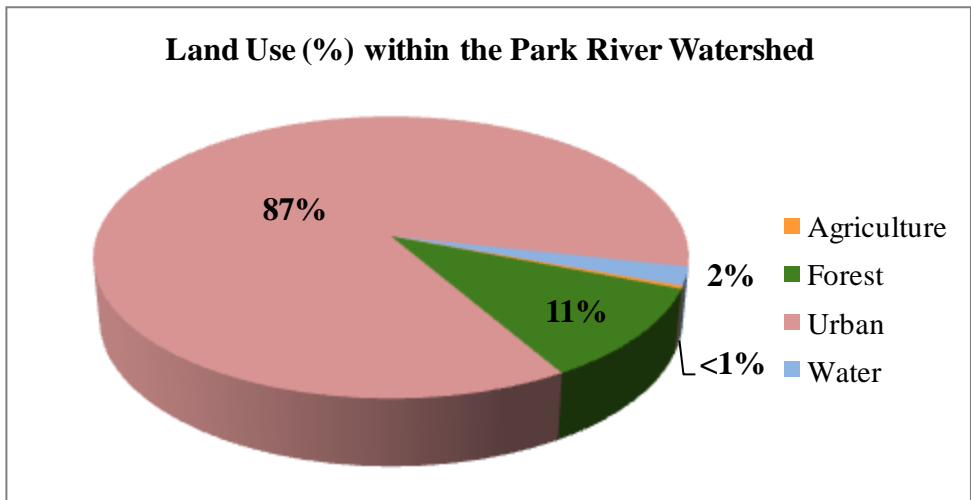
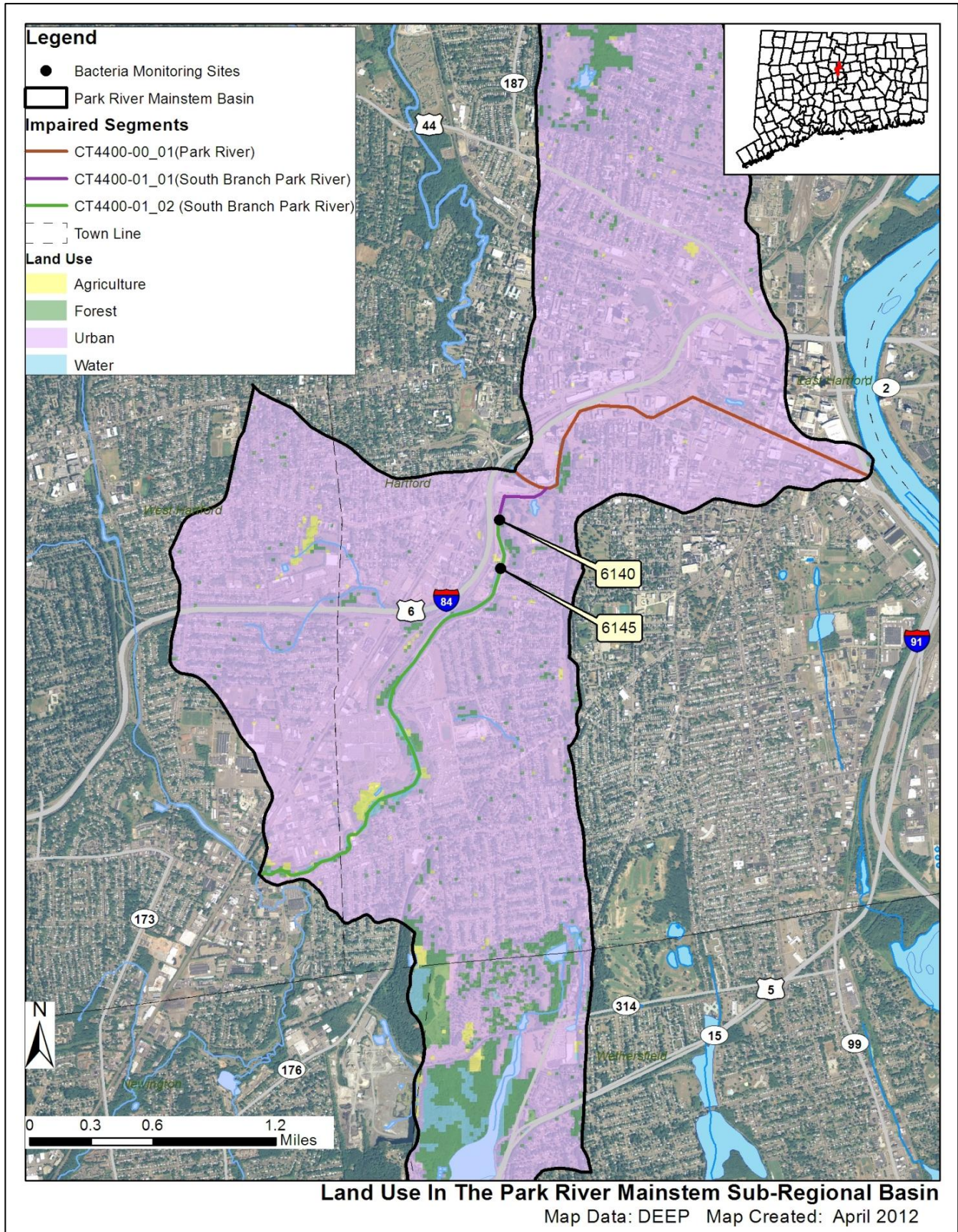


Figure 4: GIS map featuring land use for the Park River watershed at the sub-regional level



WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for the impaired segments in the Park River watershed (stations organized downstream to upstream)

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT4400-01_02	Park River	6140	Park River at Pope Park	Hartford	41.75650	-72.69990
		6145	Hamilton Street bridge	Hartford	41.75300	-72.69980

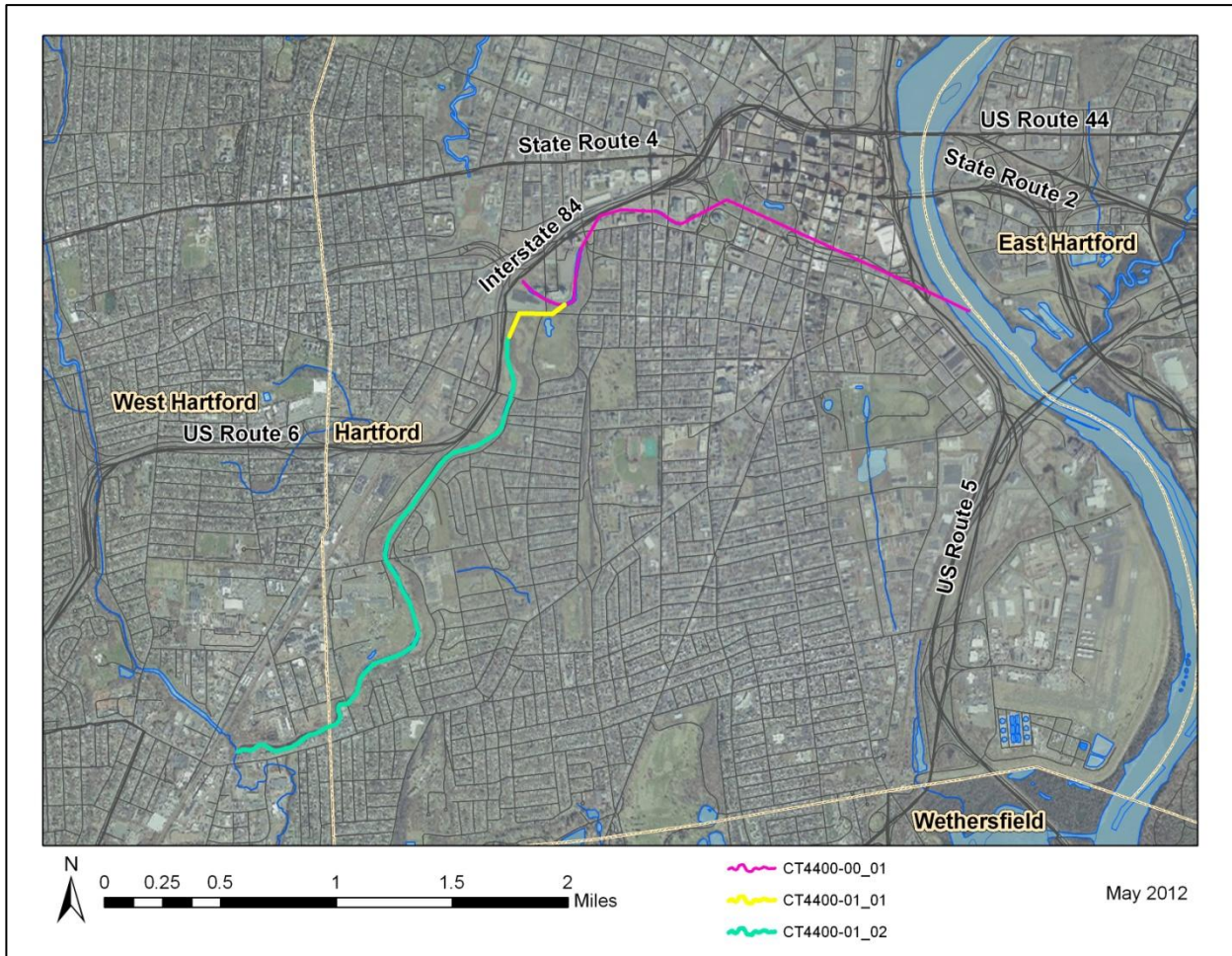
The impaired segments of Park River are Class B freshwater rivers (Figure 5). Their applicable designated uses are habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. Water quality analyses were conducted using data from two sampling locations (Stations 6140 and 6145) in 2010 on South Branch Park River (Segment 2) (CT4400-01_02) (Table 2). Percent reductions from the nearest station (Station 6140) upstream of South Branch Park River (Segment 1) and Park River (Segment 3) were applied since bacteria data is currently not available for these impaired segments. To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sampling days, where appropriate (Table 11).

South Branch Park River (Segment 1) (CT4400-01_01) and Park River (Segment 1) (CT4400-00_01): Percent reductions for these segments were based on the nearest upstream station (Station 6140) on South Branch Park River (Segment 2). Station 6140 exceeded the WQS for *E. coli* for geometric mean and single sample values in 2010. Geometric mean values also exceeded the WQS for *E. coli* during both wet and dry-weather with wet-weather values 21-times dry-weather values (Table 11).

South Branch Park River (Segment 2) (CT4400-01_02): As shown in Table 11, geometric mean and single sample values exceeded the WQS for *E. coli* at both stations in 2010. Geometric mean values were also calculated for wet and dry-weather conditions, and Station 6140 exceeded the WQS for *E. coli* during both wet and dry-weather and Station 6145 exceeded the WQS for *E. coli* during dry-weather only due to insufficient wet-weather data. Wet-weather values were more than 21 times dry-weather values for Station 6140.

Due to the elevated bacteria measurements presented in Table 11, these segments of Park River did not meet CT's bacteria WQS, were identified as impaired, and were placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with State WQS.

Figure 5: Aerial map of the impaired segments of Park River



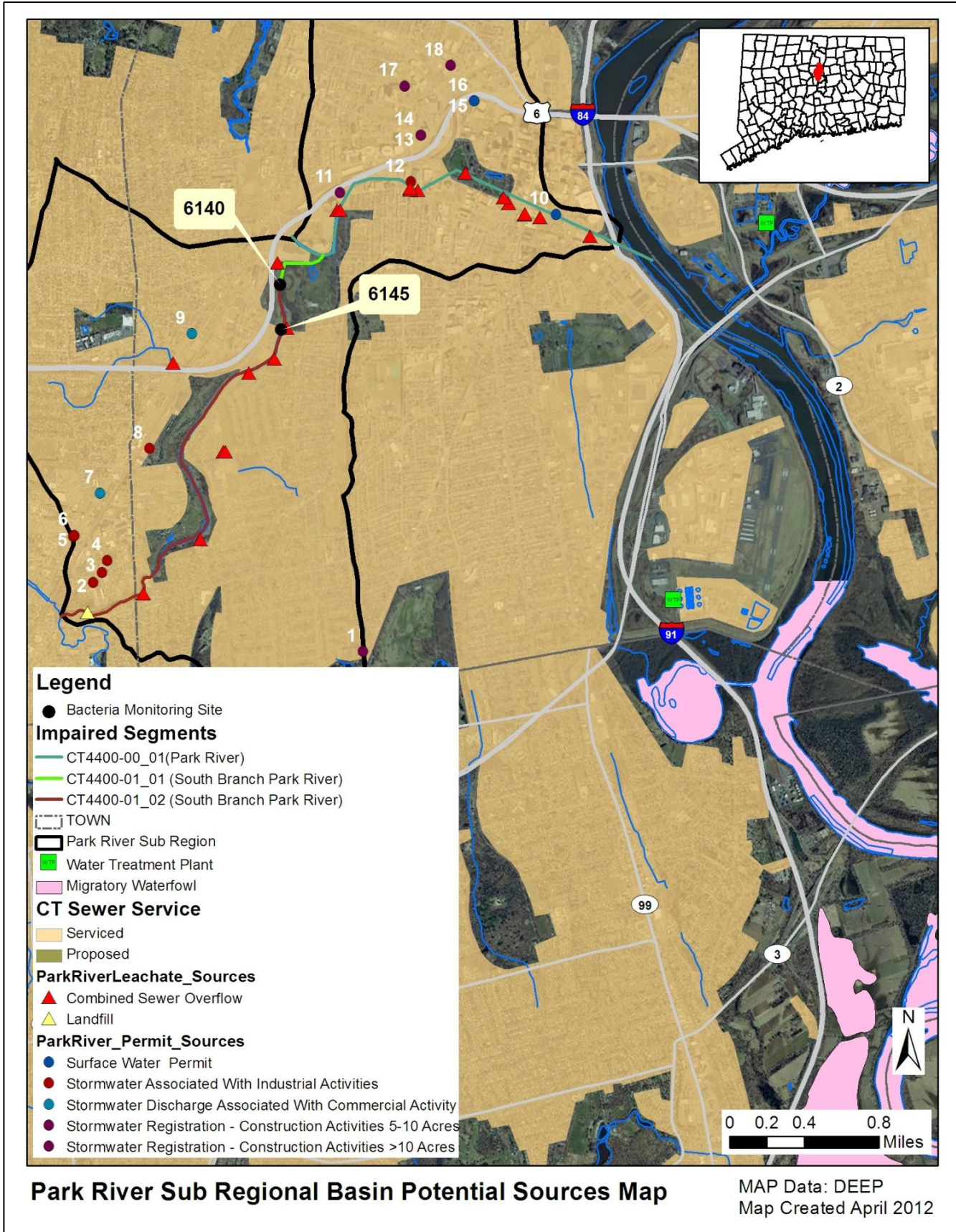
POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the Park River watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody are presented in Table 3 and Figure 6. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segments. Further monitoring and investigation will confirm listed sources and discover additional ones. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources in the Park River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
Park River (Segment 1) CT4400-00_01	x	x	x	x		x	x	
South Branch Park River (Segment 1) CT4400-01_01		x	x	x		x	x	
South Branch Park River (Segment 2) CT4400-01_02	x	x	x	x		x	x	x

Figure 6: Potential sources in the Park River watershed at the sub-regional level



The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. A list of active permits in the watershed is included in Table 5. Additional investigation and monitoring could reveal the presence of additional discharges in the watershed. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type. When available, bacteria data results from these permitted sources are listed in Table 6.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	2
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	2
GSI	Stormwater Associated with Industrial Activity	8
GSM	Part B Municipal Stormwater MS4	2
GSN	Stormwater Registration – Construction	6
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	0

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the Park River watershed. Bacteria data from 2001-2003 from several of these industrial permitted facilities are included in Table 6. Although Connecticut does not have a recreation WQS for fecal coliform bacteria, multiple samples were high, exceeding 5,000 colonies/100 mL, including Colt’s Manufacturing Company (GSI000546), Danny Corporation/Metal Management (GSI000683), Safety-Kleen Corporation (GSI000652), and Nutmeg Chrome Corporation (GSI000396). Permitted sources discharging directly to the impaired segments are a potential source of bacterial contamination to Park River. Figure 6 also identified multiple CSOs along the impaired segments. Overflowing CSOs will deposit raw sewage with high levels of bacteria into receiving water. More information on CSOs can be found in the core TMDL document (Section 6.2.5).

Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this

location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the Park River watershed

Town	Client	Permit ID	Permit Type	Site Name	Address	Map #
Hartford	The Hartford Steam Company	CT0004014	Surface Water Permit	The Hartford Steam Company	60 Columbus Boulevard	10
Hartford	Capitol District Energy Center Congeneration Associates	CT0026522	Surface Water Permit	Capitol District Energy Center Congeneration Associates	490 Capitol Avenue	16
Hartford	The Stop & Shop Supermarket Company LLC	GSC000092	Stormwater Discharge Associated With Commercial Activity	Super Stop & Shop Store #634	150 New Park Avenue	9
Hartford	Connecticut Army National Guard	GSI000284	Stormwater Associated With Industrial Activities	Hartford Armory and OMS #8A	360 Broad Street	12
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Stormwater Associated With Industrial Activities	Colt's Manufacturing Company, Inc.	545 New Park Avenue	6
Hartford	Danny Corp.	GSI000683	Stormwater Associated With Industrial Activities	Danny Corp.	500 Flatbush Avenue	8
Hartford	Capitol District Energy Center Congeneration Associates	GSI001947	Stormwater Associated With Industrial Activities	Capitol District Energy Center Congeneration Associates	490 Capitol Avenue	15
Hartford	City of Hartford	GSM000062	Part B Municipal Stormwater MS4	Hartford, City of	MS4	N/A
Hartford	Testa Corp.	GSN001833	Stormwater Registration - Construction Activities 5-10 Acres	Demolition Of Former Mass Mutual Facilities	140 Garden Street	17
Hartford	Baltazar Constructors, Inc.	GSN002071	Stormwater Registration - Construction Activities 5-10 Acres	Burton Street Drain Separation Project	Between Albany and Homestead Avenues	11
Hartford	Cedar Hill Cemetery Association	GSN002092	Stormwater Registration - Construction Activities >10 Acres	Cedar Hill Cemetery Association	453 Fairfield Avenue	1
Hartford	CB Utility Co., Inc.	GSN002206	Stormwater Registration - Construction Activities 5-10 Acres	Farmington Avenue Water Main & Storm Drain Stub	Farmington Avenue	13

Table 5: Permitted facilities within the Park River watershed (continued)

Town	Client	Permit ID	Permit Type	Site Name	Address	Map #
Hartford	CB Utility Co., Inc.	GSN002206	Stormwater Registration - Construction Activities 5-10 Acres	Farmington Avenue Water Main & Storm Drain Stub	Farmington Avenue	14
Hartford	GM2 Associates (Consultant), PDS Engineering & Construction, Inc.	GSN002242	Stormwater Registration - Construction Activities 5-10 Acres	Quirk Middle School	85 Edwards Street	18
West Hartford	Home Depot U.S.A., Inc.	GSC000196	Stormwater Discharge Associated With Commercial Activity	Home Depot #6210	503 New Park Avenue	7
West Hartford	Nutmeg Chrome Corp.	GSI000396	Stormwater Associated With Industrial Activities	Nutmeg Chrome Corporation	111 Vanderbilt Avenue	4
West Hartford	Flame Treating and Engineering Co.	GSI000414	Stormwater Associated With Industrial Activities	Flame Treating & Engineering Company	702 Oakwood Avenue	3
West Hartford	Envirocycle, LLC	GSI001835	Stormwater Associated With Industrial Activities	Envirocycle	25 Brixton Road	2
West Hartford	Colt Defense LLC	GSI001910	Stormwater Associated With Industrial Activities	Colt Defense LLC	547 New Park Avenue	5
West Hartford	Town of West Hartford	GSM000001	Part B Municipal Stormwater MS4	West Hartford, Town of	MS4	N/A

Table 6: Industrial permits in the Park River watershed and available fecal coliform data (colonies/100mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform.

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #23	09/20/01	100
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #23	06/05/02	100
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #23	05/01/03	100
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #24	09/20/01	800
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #24	06/05/02	1,300
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #24	05/01/03	100

Table 6: Industrial permits in the Park River watershed and available fecal coliform data (colonies/100mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform. (continued)

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #28	09/20/01	10,600
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #28	06/05/02	1,100
Hartford	Colt's Manufacturing Company, Inc.	GSI000546	Trout Brook	MH #28	05/01/03	100
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #1	10/15/01	3,700
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #1	06/04/02	2,520
Hartford	Danny Corp. / Metal Management	GSI000683	Park River	Outfall #1	05/21/03	3,700
Hartford	Danny Corp. / Metal Management	GSI000683	Park River	Outfall #1	07/09/03	2,600
Hartford	Danny Corp. / Metal Management	GSI000683	Park River	Outfall #1	08/01/03	180
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #2	10/15/01	1,200
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #2	06/04/02	2,220
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #4	10/15/01	7,000
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #4	06/04/02	4,600
Hartford	Danny Corp. / Metal Management	GSI000683	Park River	Outfall #4	05/21/03	90
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #7	10/15/01	3,500
Hartford	Danny Corp. / Metal Management	GSI000683	North Branch Park River	Outfall #7	08/29/02	>2000
Newington	All Waste, Inc./Lalco	GSI000432	Park River	D005	09/25/01	50
Newington	All Waste, Inc./Lalco	GSI000432	Park River	D002	09/04/01	150
West Hartford	Safety-Kleen Corp.	GSI000652	Park River	SW-1	09/04/01	52,000
West Hartford	Safety-Kleen Corp.	GSI000652	Park River	SW-1	09/22/02	6,800
West Hartford	Safety-Kleen Corp.	GSI000652	Park River	SW-1	09/19/03	>1000

Table 6: Industrial permits in the Park River watershed and available fecal coliform data (colonies/100mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform. (continued)

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
West Hartford	Nutmeg Chrome Corporation	GSI000396	South Branch Park River	CB-end of driveway	09/14/01	5,800
West Hartford	Nutmeg Chrome Corporation	GSI000396	South Branch Park River	CB-end of driveway	10/11/02	450
West Hartford	Flame Treating & Engineering Company	GSI000414	Park River	Outfall 1	09/25/01	10
West Hartford	Flame Treating & Engineering Company	GSI000414	Park River	Outfall 1	11/06/02	100

Municipal Stormwater Permitted Sources

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s) together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

The impaired segments of the Park River watershed are located within the Town of West Hartford and the City of Hartford. These municipalities have designated urban areas, as defined by the U.S. Census Bureau, and are required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP) (Figure 7). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit required municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants as well as to protect water quality. The MS4 permit is discussed further in the “TMDL Implementation Guidance” section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP’s website (http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Multiple MS4 outfalls have been sampled for *E. coli* bacteria in the watershed (Table 7). In West Hartford, seven MS4 outfalls were sampled from 2004-2009. In Hartford, one outfall was sampled from 2006-2009. All outfalls in West Hartford and Hartford exceeded the single sample water quality standard of 410 colonies/100 mL on at least one sample date.

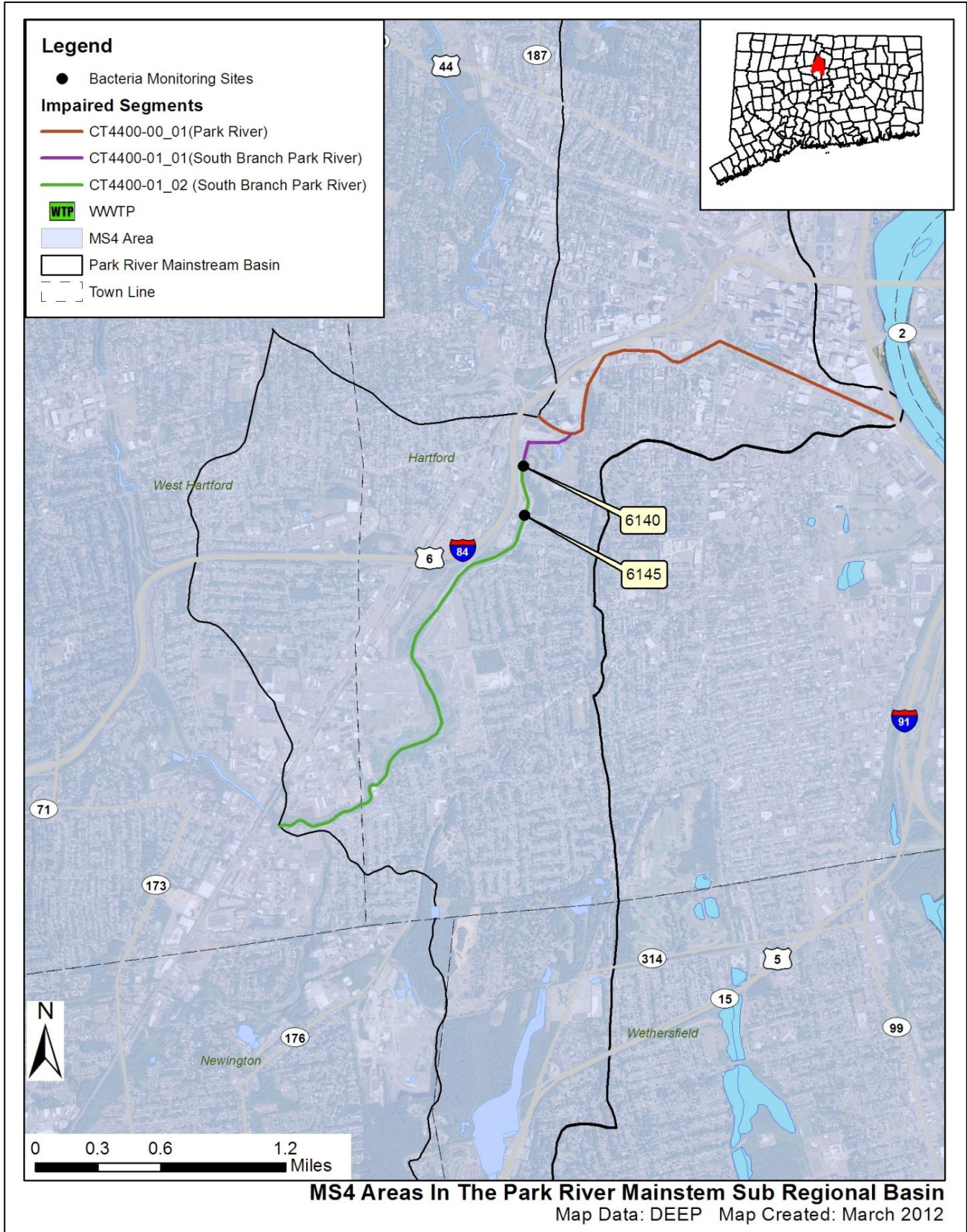
Table 7: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Park River

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Hartford	HAR-4 - Kane Brook culvert	Commercial	Park River	11/12/04	1,600
Hartford	HAR-5 - Cemetery Brook conduit outfall	Residential	Park River	11/12/04	6,200
Hartford	HFD 1 - Love Lane	Residential	Park River	08/25/06	10,000
Hartford	HFD 1 - Love Lane	Residential	Park River	12/10/08	2,000
Hartford	HFD 1 - Love Lane	Residential	Park River	06/09/09	7,000
Hartford	HFD 1 - Newfield Avenue and Dexter Street	Residential	South Branch Park River	09/11/09	210,000
Hartford	HFD 2 - Woodland Drive	Residential	Park River	12/10/08	6,000
Hartford	HFD 2 - Woodland Drive	Residential	Park River	06/09/09	10,000
Hartford	HFD 4 - Olive Street	Commercial	Park River	08/25/06	10,000

Table 7: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Park River (continued)

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Hartford	HFD 4 - Olive Street	Commercial	Park River	12/10/08	1,850
Hartford	HFD 4 - Olive Street	Commercial	Park River	06/09/09	10,000
Hartford	HFD 5 - Shorty's Way	Residential	Park River	08/25/06	35,000
Hartford	HFD 5 - Shorty's Way	Residential	Park River	12/10/08	250
Hartford	HFD 5 - Shorty's Way	Residential	Park River	06/09/09	1,000
West Hartford	Outfall #6 Park Road Kennedy Brook	Commercial	South Branch Park River	09/14/06	>2,000
West Hartford	Outfall #6 Park Road Kennedy Brook	Commercial	South Branch Park River	10/24/07	2,000
West Hartford	Outfall #6 Park Road Kennedy Brook	Commercial	South Branch Park River	09/12/08	2,000
West Hartford	Outfall #6 Park Road Kennedy Brook	Commercial	South Branch Park River	07/21/09	>24,200
Shaded cells indicate an exceedance of single-sample based water quality criteria (410 colonies/100 mL)					

Figure 7: MS4 areas of the Park River watershed



Non-point Sources

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the Park River watershed are described below.

Stormwater Runoff from Developed Areas

The majority of the Park River watershed is developed with approximately 87% considered urban. Much of that area is concentrated around the impaired segments in the City of Hartford (Figures 4 and 9). Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al.*, 2000).

The entire Park River watershed is characterized by greater than 16% impervious cover as the impaired segments flow through dense commercial and residential areas (Figures 8 and 9). Water quality data taken at Station 6140 along South Branch Park River (Segment 2) were consistently high, especially during wet weather, which suggests that stormwater runoff may be a source of bacteria to Park River (Table 11).

Figure 8: Range of impervious cover (%) in the Park River watershed

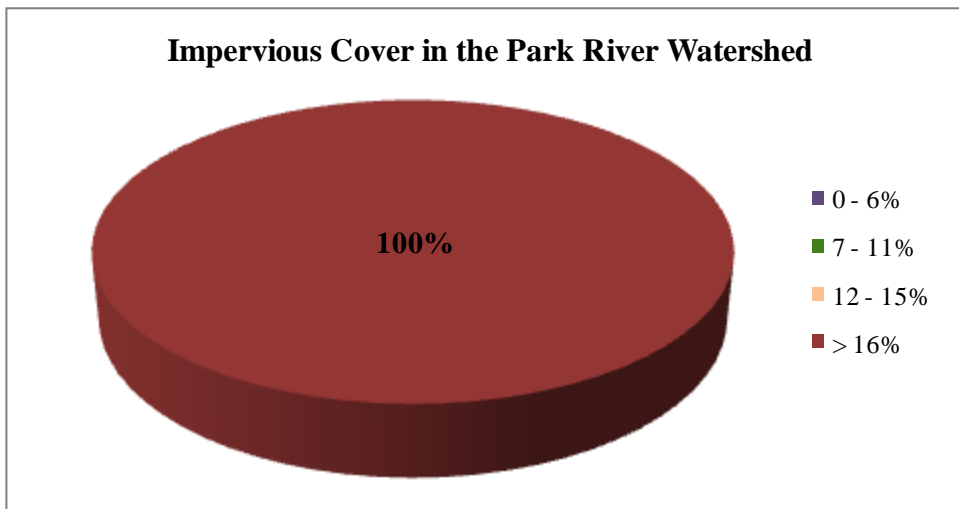
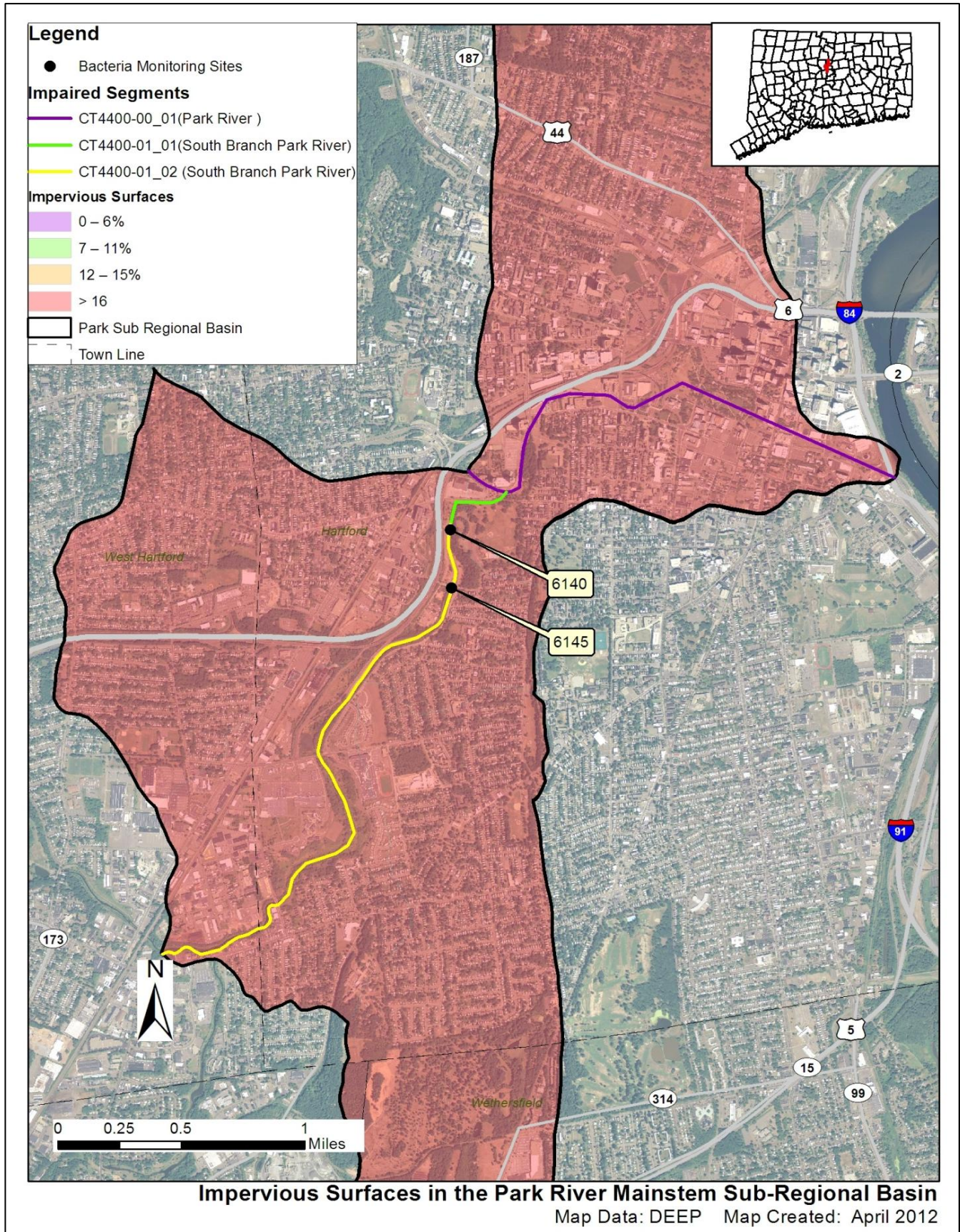


Figure 9: Impervious cover (%) for the Park River sub-regional watershed



Illicit Discharges and Insufficient Septic Systems

As shown in Figure 6, most of the watershed is serviced by sanitary sewers, and there are multiple CSOs located along the impaired segments in Hartford (Figure 6). Sewer system leaks and other illicit discharges may be contributing bacteria to the impaired segments of Park River.

Portions of Park River also rely on onsite wastewater treatment systems, such as septic systems. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters. In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The City of Hartford has a full-time health director (http://www.hartford.gov/Human_services/default.htm). The Town of West Hartford is part of the West Hartford-Bloomfield Health District (<http://www.westhartford.org/whcares/TownDepartments/HealthDistrict/Health1.htm>).

As shown in Table 11, geometric mean values during dry-weather exceeded the WQS for *E. coli* at Stations 6140 and 6145 along South Branch Park River (Segment 2). The area surrounding these stations is serviced by sanitary sewer systems and septic systems, which may indicate that bacteria from leaky pipes or insufficient septic tanks are a source of bacterial contamination to the impaired segments of Park River. The particularly high exceedances at Station 6140 along South Branch Park River (Segment 2) during wet-weather also suggest that point discharges from overflowing CSOs may be a significant source of bacterial contamination.

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Park River watershed represent another potential source of bacteria to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001).

Geese and other waterfowl are known to congregate in open areas including recreational fields, agricultural crop fields, and golf courses. There are several open spaces near the impaired segments, including the City of Hartford Open Space, A.I. Prince Technical High School recreational fields, Rice Heights Playground, and Pope Park. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can lead to habitat destruction as a result of overgrazing on wetland and riparian plants

Also, dense residential development surrounds much of the impaired segments of Park River (Figure 4). When not disposed properly, waste from domestic animals such as dogs can enter surface waters either directly or indirectly through stormwater infrastructure. Therefore, pet waste may also be contributing to bacteria concentrations in Park River.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Agricultural land use makes up less than 1% of the Park River watershed. No major

agricultural areas were identified as potential sources of bacterial contamination to the impaired segments of Park River.

Additional Sources

As shown in Figure 6, a landfill was identified at the beginning of South Branch Park River (Segment 2) in West Hartford. There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in Park River. Further monitoring and investigation will confirm listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

Land Use/Landscape

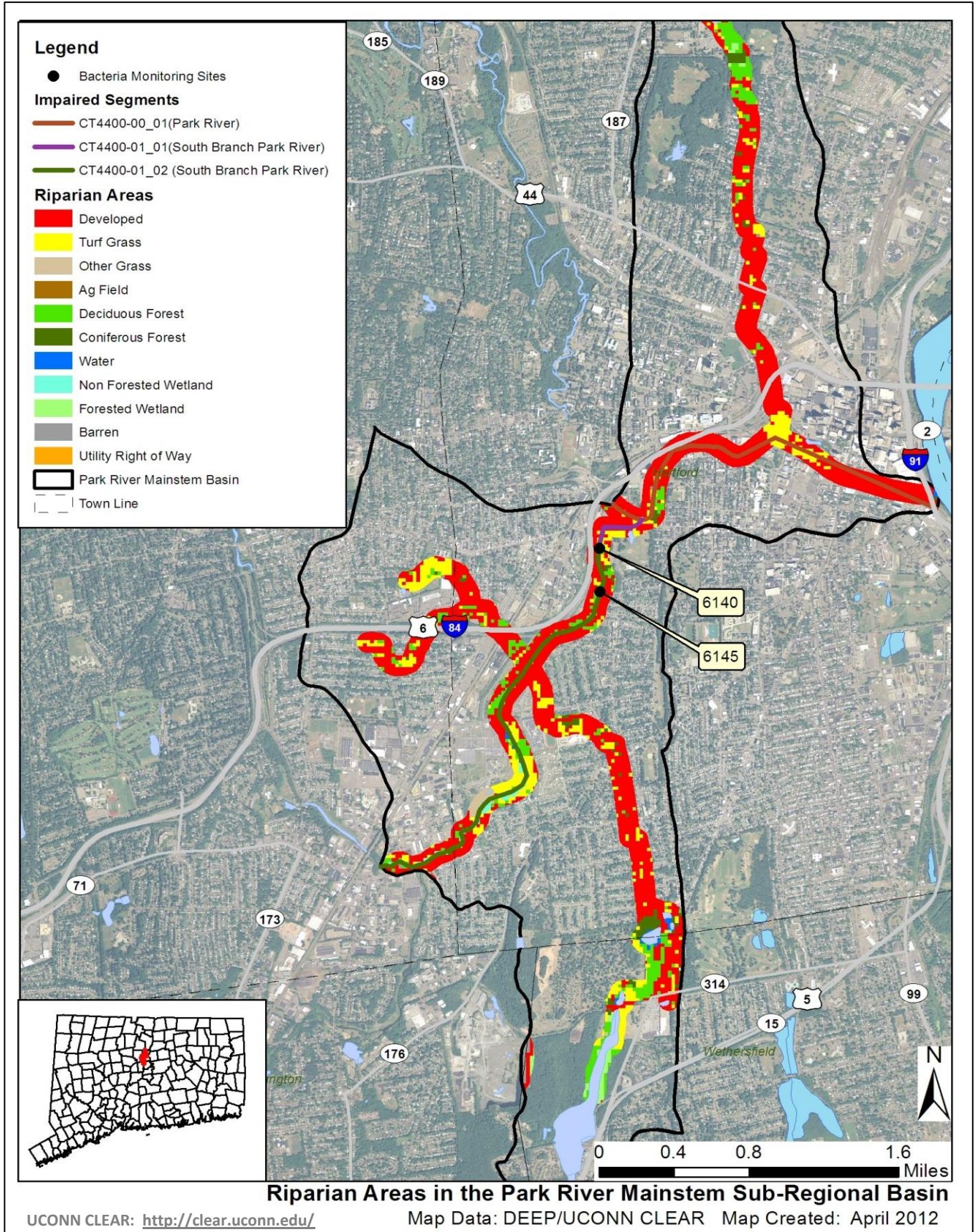
Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and adjoining uplands is gradual and not always well-defined. However, riparian zones differ from uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their unique soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (<http://clear.uconn.edu/>) which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. Land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

The majority of the riparian zone for the impaired segments of Park River is characterized by developed land use with some forested and turf/grass areas (Figure 10). Developed areas within the riparian zone likely contribute pollutants such as bacteria to the waterbody since the natural riparian buffer cannot treat stormwater runoff from impervious surfaces.

Figure 10: Riparian buffer zone information for the Park River watershed



CURRENT MANAGEMENT ACTIVITIES

As indicated previously, the Town of West Hartford and the City of Hartford are regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the State. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) to reduce the discharge of pollutants in stormwater to improve water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in the new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each municipality is required to submit an annual update outlining the steps they are taking to meet the six minimum measures. All updates that address bacterial contamination in the watershed are summarized in Tables 8 and 9.

Table 8: Summary of MS4 requirement updates related to the reduction of bacterial contamination from West Hartford, CT (Permit #GSM000001)

Minimum Measure	West Hartford 2007 Annual Report
Public Outreach and Education	1) Provided online links to CT DEEP's MS4 outreach materials.
	2) Public awareness bulletins of new large constructions projects delivered with tax bills.
Public Involvement and Participation	1) Held public meetings for new development projects, which included storm water reviews.
Illicit Discharge Detection and Elimination	1) Conducted stormwater outfall sampling at six locations.
Construction Site Stormwater Runoff Control	1) Conducted strict review of new Blue Back Square (West Hartford Center) and housing condo construction projects.
Post Construction Stormwater Management	1) Conducted annual water samplings at the Public Works Department site.
Pollution Prevention and Good Housekeeping	1) Labeled catch basins that drain to watercourses.
	2) Cleaned 2,833 catch basins.
	3) Swept all town roads.

Table 9: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Hartford, CT (Permit #GSM000062)

Minimum Measure	City of Hartford 2010 Annual Report
Public Outreach and Education	1) Distributing stormwater brochures to city residents. 2) Distributing information regarding stormwater BMP 3) Developed stormwater videos which aired on local access TV. 4) Participated in CT River Watershed Council's Source to the Sound Cleanup.
Public Involvement and Participation	1) Participated in CT River Watershed Council's Source to the Sound Cleanup. 2) Sponsored/coordinated hazardous waste collection events.
Illicit Discharge Detection and Elimination	1) Inspecting nine outfalls for illicit discharges. 2) Distributing literature regarding illicit discharges.
Construction Site Stormwater Runoff Control	1) Assessed training needs of inspection staff relative to runoff controls measures.
Post Construction Stormwater Management	No updates.
Pollution Prevention and Good Housekeeping	1) Cleaned and repaired catch basins throughout city. 2) Performed significant street cleaning; up to 3 times per week. 3) Performed stormwater training of key city staff.

RECOMMENDED NEXT STEPS

As shown above, the City of Hartford and the Town of West Hartford have developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the impaired segments in Park River and have been prioritized below.

1) Identify areas along the Park River to implement Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, the City of Hartford and the Town of West Hartford are MS4 communities regulated by the MS4 program. Since 87% of the watershed is considered urban and the area surrounding the impaired segments has an impervious cover greater than 16%, stormwater runoff is likely contributing bacteria to the waterbodies. To identify specific areas that are contributing bacteria to the impaired segments, the towns should continue to conduct wet-weather sampling at stormwater outfalls that discharge directly to Park River. To treat stormwater runoff, the towns should also identify areas along the developed sections of Park River, particularly along the impaired segments, to install BMPs that encourage stormwater to infiltrate the ground before entering Park River. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

2) Implement a program to evaluate the sanitary sewer system.

Most of the Park River watershed surrounding the impaired segments relies on a municipal sewer system (Figure 6). Hartford and West Hartford should develop a program that evaluates the sanitary sewer system and reduces leaks and overflows. This program should include periodic inspections of the sewer line. As a primary source of bacterial contamination, CSO elimination or reduction should be the focus of water quality improvement initiatives in the Park River watershed.

3) Continue monitoring of permitted sources.

Previous sampling of industrial discharges and MS4 outfalls has shown elevated levels of bacteria, an indicator of bacterial pollution (Tables 6 and 7). Further monitoring will provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the

Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 10 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the Park River Watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 10. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use

Class	Bacteria Source	Instantaneous <i>E. coli</i> (#/100mL)						Geometric Mean <i>E. coli</i> (#/100mL)	
		WLA ⁶			LA ⁶			WLA ⁶	LA ⁶
	Recreational Use	1	2	3	1	2	3	All	All
B ⁴	Non-Stormwater NPDES	235	410	576				126	
	CSOs	235	410	576				126	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235 ⁷	410 ⁷	576 ⁷				126 ⁷	
	Stormwater (non-MS4)				235 ⁷	410 ⁷	576 ⁷		126 ⁷
	Wildlife direct discharge				235 ⁷	410 ⁷	576 ⁷		126 ⁷
	Human or domestic animal direct discharge ⁵				235	410	576		126

- (1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.
- (2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.
- (3) **All Other Recreational Uses.**
- (4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)
- (5) Human direct discharge = swimmers
- (6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations

- (7) Replace numeric value with “natural levels” if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

4) Develop a system to monitor septic systems.

Portions of the impaired segments rely on septic systems (Figure 6). If not already in place, Hartford and West Hartford should establish a program to ensure that existing septic systems are properly operated and maintained. For instance, communities can create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe could also be adopted. Towns can develop programs to assist citizens with the replacement and repair of older and failing systems.

5) Evaluate municipal education and outreach programs regarding animal waste.

As most of the Park River watershed is developed, any education and outreach program should highlight the importance of not feeding waterfowl and wildlife and managing waste from horses, dogs, and other pets. Municipalities and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of Park River that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in Park River and can harm human health and the environment. Animal wastes should be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-use areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 11: South Branch Park River (Segment 2) Bacteria Data

Waterbody ID: CT4400-01_02*Characteristics:* Freshwater, Class B, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply*Impairment:* Recreation (*E. coli* bacteria)*Water Quality Criteria for E. coli:*

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

*Percent Reduction to meet TMDL:*Geometric Mean: **91%**Single Sample: **98%***Data:* 2010 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle**Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on South Branch Park River (Segment 2) with annual geometric means calculated**

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6140	Park River at Pope Park	5/7/2010	150	dry	1072
6140	Park River at Pope Park	5/12/2010	2800	wet	
6140	Park River at Pope Park	5/20/2010	710	dry	
6140	Park River at Pope Park	5/25/2010	460	dry	
6140	Park River at Pope Park	5/27/2010	24000	wet	
6140	Park River at Pope Park	6/8/2010	460	dry	
6145	Hamilton Street bridge	5/20/2010	640	dry	1364* (91%)
6145	Hamilton Street bridge	5/25/2010	395 [†]	dry	
6145	Hamilton Street bridge	5/27/2010	24001* (98%)	wet	
6145	Hamilton Street bridge	6/8/2010	570	dry	

Shaded cells indicate an exceedance of water quality criteria[†]Average of two duplicate samples**** Weather conditions for selected data taken from Hartford because local station had missing data*****Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all monitoring stations on South Branch Park River (Segment 2)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6140	Park River at Pope Park	2010	2	4	1072	8198	387
6145	Hamilton Street bridge	2010	1	3	1364	NA	524

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at Hartford Bradley International Airport.

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