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Illicit Discharge Detection and Elimination (IDDE) Program

City of Hartford

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1. Introduction

1.1. MS4 Program

The City of Hartford has developed an Illicit Discharge Detection and Elimination (IDDE) program to address the requirements of the Connecticut Department of Energy and Environmental Protection (CTDEEP) *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems*, effective July 1, 2017, hereafter referred to as the "2017 MS4 Permit" or "MS4 Permit."

The MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

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 New Development or Redevelopment
6. Pollution Prevention/Good Housekeeping.

Under Minimum Control Measure 3, the permittee is required to implement an IDDE program to provide the legal authority to prohibit and eliminate illicit discharges to the MS4, find the source of any illicit discharges, eliminate those illicit discharges, and ensure ongoing screening and tracking to prevent and/or eliminate future illicit discharges. The IDDE program must also be recorded in a written (hardcopy or electronic) document and meet the IDDE program requirements specified in the MS4 Permit. This document has been prepared to address these requirements.

A portion of the separate storm sewer system within the City of Hartford is owned and operated by The Metropolitan District (MDC). In accordance with Section 6(b) of the MS4 Permit, the City coordinated with the MDC on the development and implementation of the IDDE Program.

1.2. Geographic Scope of IDDE Program

The MS4 Permit requires municipalities to implement the IDDE program within the Urbanized Area (based on 2010 U.S. Census) and those catchment areas of the MS4 with either Directly Connected Impervious Area (DCIA) of greater than 11% or that discharge directly to impaired waters (i.e. "priority" areas). The entire City of Hartford is within the Urbanized Area and considered to be a priority area.

1.3. Illicit Discharges

An “illicit discharge” is any unpermitted discharge to waters of the state that does not consist entirely of stormwater or uncontaminated ground water except:

(1) certain allowable non-stormwater discharges when such non-stormwater discharges are not significant contributors of pollution to a discharge from an identified MS4, or

(2) discharges authorized under a separate NPDES permit that authorize a discharge to the MS4.

Illicit discharges may take a variety of forms. Illicit discharges may enter the drainage system through direct or indirect connections. Direct connections may be relatively obvious, such as cross-connections of sanitary sewer services to the storm drain system. Indirect illicit discharges may be more difficult to detect or address, such as failing septic systems that discharge untreated domestic wastewater to a ditch within the MS4, or a sump pump that discharges contaminated water on an intermittent basis.

Some illicit discharges are intentional, such as dumping used oil (or other pollutant) into catch basins, a resident or contractor illegally tapping a new sewer lateral into a storm drain pipe to avoid the costs of a sewer connection fee and service, and illegal dumping of yard wastes into surface waters. Some illicit discharges are related to the unsuitability of original infrastructure to the modern regulatory environment. Examples of illicit discharges in this category include connected floor drains in old buildings, as well as sanitary sewer overflows that enter the drainage system. Sump pumps legally connected to the storm drain system may be used inappropriately, such as for the disposal of floor washwater or old household products, in many cases due to a lack of understanding on the part of the homeowner.

Elimination of some discharges may involve substantial cost and effort, such as disconnecting and reconnecting sanitary sewer laterals or replacing leaking sanitary and/or storm sewer lines. Others, such as improving adherence to proper pet waste management practices through public education and by providing pet waste baggies and receptacles, can be accomplished through relatively low-cost efforts.

Regardless of the intention, when not addressed, illicit discharges can be a significant source of pollutants to surface waters, including metals, toxics, oil, grease, solvents, nutrients, and pathogens.

1.4. Allowable Non-Stormwater Discharges

The following categories of non-stormwater discharges are allowed under the MS4 Permit provided: (1) the permittee controls such non-stormwater discharges to the Maximum Extent Practicable (MEP), as required by the MS4 Permit; (2) such non-stormwater discharges do not contribute to a violation of water quality standards; and (3) such non-stormwater discharges are documented in the Stormwater Management Plan and are not significant contributors of pollutants to any identified MS4:

- Uncontaminated groundwater discharges including, but not limited to, pumped ground water, foundation drains, water from crawl space pumps and footing drains
- Irrigation water including, but not limited to, landscape irrigation and lawn watering runoff
- Residual street wash water associated with sweeping
- Discharges or flows from firefighting activities (except training)
- Naturally occurring discharges such as rising ground waters, uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)), springs, diverted stream flows and flows from riparian habitats and wetlands.

If these discharges are identified as significant contributors to the MS4, they must be considered an “illicit discharge” and addressed by the IDDE program (i.e., control these sources so they are no longer significant contributors of pollutants, and/or eliminate them entirely).

1.5. Receiving Waters and Impairments

Table 1-1 lists the impaired waters within the boundaries of the City of Hartford based on the latest version of the State of Connecticut Integrated Water Quality Report produced by CTDEEP every two years. Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1-1. Impaired Waters

Waterbody Name	Segment ID	Category	Impairment and Stormwater Pollutant of Concern	Approved TMDL
Connecticut River	CT4000-00_02	4a	Not Supporting Recreation – E.coli (**bacteria**)	CT Statewide Bacteria TMDL
Park River	CT4400-00_01	4a	Not Supporting Recreation – E.coli (**bacteria**)	CT Statewide Bacteria TMDL
South Branch Park River	CT4400-01_01	4a, 5	Not Supporting Habitat for Fish, Other Aquatic Life and Wildlife; Recreation – E.coli (**bacteria**); Cause Unknown (**Other Pollutant of Concern**)	CT Statewide Bacteria TMDL
South Branch Park River	CT4400-01_02	4a, 5	Not Supporting Habitat for Fish, Other Aquatic Life and Wildlife; Recreation – E.coli (**bacteria**); Cause Unknown (**Other Pollutant of Concern**)	CT Statewide Bacteria TMDL
North Branch Park River	CT4404-00_01	4a	Not Supporting Recreation – E.coli (**bacteria**)	CT Statewide Bacteria TMDL
North Branch Park River	CT4404-00_02	4a, 5	Not Supporting Habitat for Fish, Other Aquatic Life and Wildlife; Recreation – E.coli (**bacteria**); Cause Unknown (**Other Pollutant of Concern**)	CT Statewide Bacteria TMDL

Source: State of Connecticut 2018 Integrated Water Quality Report (CTDEEP).

Category 5 Waters – Available data and/or information indicate that one or more designated uses are not being supported and a TMDL is needed.

Category 4a Waters – Impaired or threatened for one or more designated uses but a TMDL has been completed.

Section 6.2.4 Illicit Discharges, of the Connecticut Statewide Bacteria TMDL – FINAL September 2012, identifies the following IDDE-related requirements:

- Developing a Storm Sewer Map
- Prohibiting Illicit Discharges
- Developing and Implementing a Plan to Detect and Address Illicit Discharges
- Outreach to Employees, Businesses, and the General Public

1.6. IDDE Program Goals, Framework, and Timeline

The objective of the IDDE program is to systematically find and eliminate sources of non-stormwater discharges to the MS4 and implement procedures to prevent such discharges. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority to prohibit illicit discharges and enforce this prohibition
- Program for citizen reporting of illicit discharges
- Storm system mapping
- Sanitary Sewer Overflow (SSO) elimination
- Assessment and priority ranking of catchments
- Outfall and interconnection screening and sampling
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Follow-up screening
- Employee training.

The IDDE investigation protocol framework is shown in **Figure 1-1**. The required timeline for implementing the IDDE program is shown in **Table 1-2**.

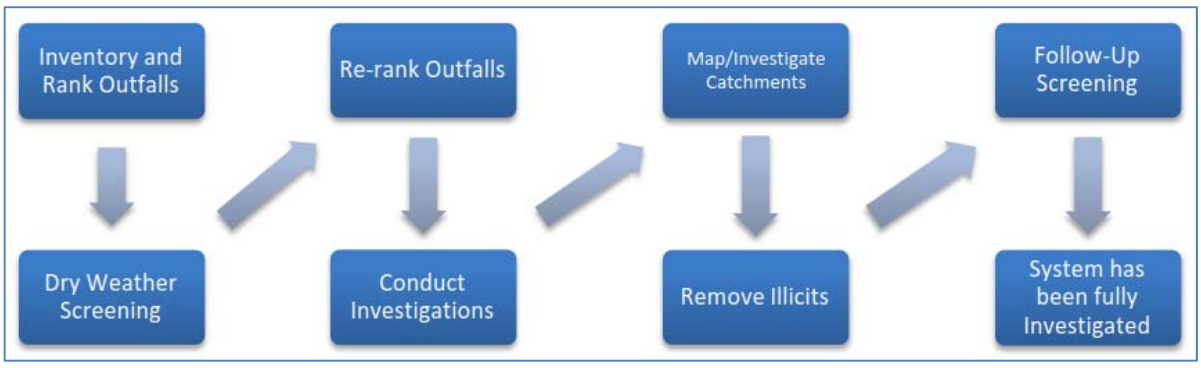


Figure 1-1. IDDE Investigation Procedure Framework

Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Deadline					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10
SSO Inventory (5-year look back)	**Oct 30, 2017**					
Program for Citizen Reporting	**Effective Date**					
Establish IDDE Legal Authority	**July 1, 2018**					
Written IDDE Program	**July 1, 2018**					
Outfall/Interconnection Inventory		**July 1, 2019**				
Map All Stormwater Outfalls		**July 1, 2019**				
Initial Assessment and Priority Ranking of Catchments (update annually)		**July 1, 2019**				
Complete Detailed Storm System Mapping			**July 1, 2020**			
Begin Dry Weather Outfall Screening (high and low priority outfalls)	**July 1, 2018**					
Complete Dry Weather Outfall Screening (high and low priority outfalls)					**July 1, 2022**	
Catchment Investigations – Problem Outfalls (80% and 100% of problem catchments)			**July 1, 2020**		**July 1, 2022**	
Catchment Investigations* – all Problem, High and Low Priority Outfalls						**July 1, 2027**

*For existing 2004 MS4 permittees, catchment investigations must begin with three months of finalization of investigation procedure and no later than 15 months from effective date of permit.

1.7. IDDE Program Accomplishments – 2004 MS4 Permit

The 2004 MS4 Permit required MS4 communities to develop a plan to detect illicit discharges using a combination of storm system mapping, adopting a regulatory mechanism to prohibit illicit discharges and enforce this prohibition, and identifying tools and methods to investigate suspected illicit discharges. MS4s were also required to define how confirmed discharges would be eliminated and how the removal would be documented.

The City of Hartford with assistance from the MDC has completed or implemented the following IDDE program elements consistent with the 2004 MS4 Permit requirements:

- Outfall mapping (in draft version)
- Additional storm system mapping, including the locations of catch basins, manholes and pipe connectivity
- Sanitary Sewer Overflow (SSO) inventory
- Adoption of an illicit discharge ordinance or similar legal authority

2. Authority and Responsibilities

2.1. Legal Authority

The MDC has adopted *Ordinances of The Metropolitan District Relating to Sewers* (revised January 2020) for the portion of the separate storm sewer system owned and operated by the MDC. Section 2N, 2O, and 5 of the ordinance provides the MDC with adequate legal authority to:

- Prohibit illicit discharges
- Investigate suspected illicit discharges
- Eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system
- Implement appropriate enforcement procedures and actions.

The MDC ordinance and related policies are consistent with the MS4 Permit. A copy of Sections 2N, 2O, and 5 of the ordinance is provided in **Appendix A.**

Currently under the City of Hartford Municipal Code, Section 17-4 prohibits the discharge of pollutants, contaminants, etc. with fines and penalties for violations but does not specifically address or define illicit discharges. A copy of the City of Hartford Municipal Code, Section 17-4 is provided in **Appendix A.** For the portion of the separate storm sewer system owned and operated by the City, the City of Hartford will adopt an illicit discharge ordinance or other regulatory mechanism to provide the City with adequate legal authority described above. The ordinance or other regulatory mechanism should be adopted by the end of the permit term (July 1, 2022).

2.2. Statement of Responsibilities

The MDC is the lead agency responsible for implementing the IDDE program pursuant to the provisions of the *Ordinances of The Metropolitan District Relating to Sewers* for the portion of the separate storm sewer system owned and operated by the MDC. The Department of Public Works is the lead municipal agency or

department responsible for implementing the IDDE program for the portion of the separate storm sewer system owned and operated by the City of Hartford. Other agencies, departments, or personnel with responsibility for aspects of the program include:

- Department of Development Services, Planning and Zoning Division – Review plans, issue permits, and inspect projects in accordance with building codes and zoning regulations. Respond to complaints regarding code violations. Inspect, monitor, and cite vacant and/or dangerous buildings.
- Health and Human Services, Environmental Health Division - Investigates and reports on all health hazards, complaints, and nuisances. Issues cease and desist orders for violations of sanitation code. Conducts health inspections of public places.
- Office of Community Engagement tracks Hartford 311 reports which includes citizen reports of illicit discharges.

3. Citizen Reporting of Illicit Discharges

The MS4 Permit requires municipalities to develop a program for citizen reporting of illicit discharges. The City of Hartford utilizes the Hartford 311 system to allow for citizen reporting which includes an email address and phone number for submitting comments. The reporting system is described on the City of Hartford's website and in municipal offices. Hartford 311 is a toll-free, non-emergency call center, designed to connect Harford residents, businesses and visitors to City services.

Citizens can report an illicit discharge by phone, e-mail, on-line, 311 APP, or in person. After a citizen reports a concern to the Hartford 311, it is issued a case number and is logged into an advanced tracking system that allows the appropriate department to take ownership and respond appropriately. The status of the concern can be checked by the case number. The Hartford Office of Community Engagement tracks the 311 calls, and the Department of Public Works is responsible for tracking responses to those reports.

The City of Hartford will investigate and eliminate any illicit discharges reported by citizens or organizations, provided such a report incorporates at least a time and location of an observed discharge within that portion of separate storm sewer system owned and operated by the City. The City of Hartford will conduct an inspection of the reported outfalls, manholes or other sites promptly after receiving such a report. The City of Hartford will incorporate the reported outfalls into the IDDE program. Illicit discharges reported by citizens or organizations within that portion of the separate storm sewer system owned and operated by the MDC or on

a State road will be referred to the MDC or CT DOT respectively. Citizen reports and the responses to those reports will be included in the Annual Report.

4. Mapping

The MDC originally developed mapping of the stormwater system to meet the mapping requirements of the 2004 MS4 Permit. The completed elements include the MDC identifying and inspecting catch basins, drain manholes, stormwater pipes, and outfalls and placing them into the MDC's Geographic Information System (GIS). A copy of the existing draft MDC storm system map is provided in **Appendix B**.

The 2017 MS4 Permit requires a revised and more detailed storm system map than was required by the 2004 MS4 Permit. The City is working with the MDC to identify MS4 systems versus combined systems and ownership of the separate storm sewer system. The City of Hartford is responsible for updating the stormwater system mapping for the City-owned and operated portion of the separate storm sewer system pursuant to the MS4 Permit. The City of Hartford will report on the progress towards completion of the storm system map in each annual report. Updates to the stormwater mapping will be included in **Appendix B**.

4.1. Outfall and Interconnection Inventory and Mapping

The City of Hartford will develop an inventory (spreadsheet or database in a format compatible with Microsoft Excel) and mapping at a minimum scale of 1"=2000' and maximum scale of 1"=100' showing all stormwater outfalls[1] located within and owned or operated by the municipality and all interconnections[2] with other MS4s. The map should, if possible, be developed in GIS or comparable digital format (i.e., CAD).

The inventory and map will include the following information for each outfall and interconnection:

- Unique identifier
- Type, material, size (e.g., 24-inch concrete pipe)

[1] **Outfall** means a point source as defined by 40 CFR § 122.2 and in Section 2 of the 2017 MS4 Permit as the point where the MS4 discharges to waters of the state. An outfall does not include open conveyances connecting two separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the state and that are used to convey waters of the state. It is strongly recommended that a permittee inspect all accessible portions of the system as part of this process. Culverts longer than a simple road crossing shall be included unless the permittee can confirm that they are free of any connections and simply convey waters of the state.

[2] **Interconnection** means the point where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the state or to another storm sewer system and eventually to a water of the state.

- Spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Name, water body ID and Surface Water Quality Classification of the immediate surface water body or wetland to which the stormwater runoff discharges
- If the outfall does not discharge directly to a named water body, the name and water body ID of the nearest named water body to which the outfall eventually discharges
- Name of the watershed, including subregional drainage basin number, in which the discharge is located
- Date of most recent inspection
- Physical condition
- Indicators of potential non-stormwater discharges (including presence or evidence of suspect flow and sensory observations such as odor, color, turbidity, floatables, or oil sheen) as of the most recent inspection.

The inventory and mapping should be completed by the end of the permit term (July 1, 2022). The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections. An updated inventory and mapping will be provided in each annual report.

4.2. Detailed System Mapping

A detailed storm system map will be developed for, at a minimum, the portions of the municipality within “priority” areas. The detailed mapping is intended to facilitate the identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges.

The mapping may be produced by hand or computer-aided methods (e.g., GIS or CAD). The required scale and detail of the map will be appropriate to facilitate a rapid understanding of the system by the municipality and CTDEEP. The mapping will also serve as a planning tool for the implementation and phasing of the IDDE program and demonstration of the extent of complete and planned investigations and corrections. The mapping will be updated as necessary to reflect newly discovered information and required corrections or modifications.

The following mapping elements are required:

- Outfalls and receiving waters (previously required by the 2004 MS4 Permit)
- Pipes, catch basins, and/or manholes
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems

- Municipally owned stormwater treatment structures (e.g., detention and retention basins, infiltration systems, bioretention areas, water quality swales, gross particle separators, oil/water separators, or other proprietary systems)
- Catchment delineations for use in priority rankings, or prioritizing BMP retrofits
- Water bodies identified by name and indication of all use impairments as identified on the most recent State of Connecticut Integrated Water Quality Report.

The following mapping elements are required where available:

- Municipal Sanitary Sewer system (if available)
- Municipal combined sewer system (if applicable).

The following mapping elements are recommended:

- Storm sewer material, size (pipe diameter), age
- Sanitary sewer system material, size (pipe diameter), age
- Where a municipal sanitary sewer system exists, properties known or suspected to be served by a septic system, especially in high density urban areas
- Area where the permittee's MS4 has received or could receive flow from septic system discharges
- Seasonal high water table elevations impacting sanitary alignments
- Topography
- Orthophotography
- Alignments, dates and representation of work completed of past illicit discharge investigations
- Locations of suspected confirmed and corrected illicit discharges with dates and flow estimates.

Detailed system mapping will be completed by the end of the permit term (July 1, 2022).

5. Sanitary Sewer Overflow Inventory

The 2017 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm sewer system. SSOs are discharges of untreated sanitary wastewater from a municipal sanitary sewer that can contaminate surface waters, cause water quality problems and property damage, and threaten public health. SSOs can be caused by blockages, line breaks, sewer defects that allow stormwater and groundwater to overload the system, power failures, improper sewer design, and vandalism.

The MDC completed an inventory of SSOs that have discharged to the MS4 in the five years prior to the effective date of the 2017 MS4 Permit (July 1, 2012) to current (**Table 5-1**). The inventory includes all SSOs that occurred during wet or dry weather resulting from inadequate conveyance capacities or where interconnectivity of the storm and sanitary sewer infrastructure allows for transfer of flow between systems.

Upon detection of an SSO, the MDC will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, the MDC will provide written notice to CTDEEP within five (5) days of becoming aware of the SSO occurrence.

The inventory in **Table 5-1** will be updated by the MDC annually. The SSO inventory will be included in the annual report, including the status of mitigation and corrective measures to address each identified SSO.

Table 5-1. SSO Inventory

Location (Lat long/ street crossing /address and receiving water)	**Date and duration of occurrence**	**Discharge to MS4 or surface water**	**Estimated volume discharged**	**Known or suspected cause / Responsible party**	**Corrective measures planned and completed** (include dates)	**Sampling data** (if applicable)
Brainard Road	11/18/2013 Duration unknown	MS4	1,250 gallons	Water main break adjacent to RHWPCF sludge force main	RHWPCF sludge force main shutdown to make necessary repairs. Made permanent repairs to sludge force main and water main	None
Near 505 Farmington Ave	10/7/2015 Duration unknown	MS4	700 gallons	Contractor Error	Contactor ceased decanting operations. MDC flushed area and drain with hydrant water	None

6. Catchment Assessment and Priority Ranking

The MS4 Permit requires an assessment and priority ranking of catchments in terms of their potential to have illicit discharges and SSOs and the related public health significance. The ranking will determine the priority order for screening of outfalls and interconnections, catchment investigations for evidence of illicit discharges, and provides the basis for determining permit milestones.

6.1. Catchment Delineations

A catchment is the area that drains to an individual outfall or interconnection. Catchments will be delineated to define contributing areas for investigation of potential sources of illicit discharges. Catchments are typically delineated based on topographic contours and mapped drainage infrastructure, where available. As indicated in Section 4.2, catchment delineations will be completed as part of the detailed system mapping.

Larger-scale watershed boundaries available from CTDEEP or local watershed organizations, such as CTDEEP Local Basin boundaries, may be used instead of individual outfall catchment areas to support the initial assessment and priority ranking of catchments. Required updates to the catchment assessment and priority ranking will incorporate refined catchment details as they become available.

6.2. Assessment and Priority Ranking of Catchments

The City of Hartford Department of Public Works and the MDC will complete an initial illicit discharge potential assessment and priority ranking of catchments in their respective portions of the separate storm sewer system based on existing information, including the outfall and interconnection inventory and mapping. The initial assessment and priority ranking should be completed by the end of the term of the permit (July 1, 2022).

An updated assessment and priority ranking will be provided in each annual report thereafter, including a listing of all catchments and the results of the ranking for each catchment. The assessment and priority ranking will be updated annually based on catchment delineations, the results of dry weather screening, and other relevant information.

Catchments associated with outfalls and interconnections will be classified into one of the following categories:

1. **Excluded Catchments**: Catchments with no potential for illicit discharges. This category is limited to:
    - Roadway drainage in undeveloped areas with no dwellings and no sanitary sewers
    - Drainage for athletic fields, parks or undeveloped green space and associated parking without services
    - Cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

2. **Problem Catchments**: Catchments with known or suspected contributions of illicit discharges based on existing information. This category includes any catchments where previous outfall/interconnection screening indicates likely sewer input. Likely sewer input indicators are any of the following:
    - Olfactory or visual evidence of sewage,
    - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
    - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

    Screening and sampling is not required for Problem Catchments. Problem Catchments must be scheduled for catchment investigation. Following the initial ranking of catchments, subsequent rankings shall not add any catchments to the Problem Catchment category.

3. **High Priority Catchments**: Catchments that have not been classified as Problem Catchments and that are:
    - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds
    - Determined by the permittee as high priority based on outfall/interconnection screening and catchment characteristics assessment.

    Any catchment where outfall/interconnection screening indicates likely sewer input as described under Item 1, Problem Catchments, shall be ranked at the top of the High Priority Catchments category and scheduled for catchment investigation.

4. **Low Priority Catchments**: Catchments determined by the permittee as low priority based on outfall/interconnection screening (see Section 7) and catchment characteristics assessment (see below).

Catchments will be ranked into the above priority categories (except for excluded catchments, which may be excluded from the IDDE program) based on the following characteristics of the defined initial catchment areas, where information is available. Additional relevant characteristics, including location-specific characteristics, may be considered but must be documented in the IDDE program.

- **Previous screening results** – previous screening/sampling results indicate likely sewer input (see criteria above for Problem Catchments).
- **Past discharge complaints and reports.**
- **Poor dry weather receiving water quality** – the following guidelines are recommended to identify waters as having a high illicit discharge potential:
    - Exceeding water quality standards for bacteria
    - Ammonia levels above 0.5 mg/l
    - Surfactants levels greater than or equal to 0.25 mg/l.
- **Density of generating sites** – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.
- **Age of development and infrastructure** – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.
- **Sewer conversion** – Contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.
- **Historic combined sewer systems** – Contributing catchment areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.
- **Culverted streams** – Any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.
- **Water bodies** that receive a discharge from the MS4 and are drinking water supplies, shell fishing areas, beaches or waters used for contact recreation.
- **Impaired water bodies** that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have

the potential to contain the pollutant identified as the cause of the water quality impairment.

Table 6-1 is a catchment assessment and priority ranking matrix that will be used to document the catchment assessment and priority ranking process once the City and the MDC identify ownership of the separate storm sewer system.

Table 6-1. Catchment Assessment and Priority Ranking Matrix

Catchment ID	Receiving Water	Previous Screening Results Indicate Likely Sewer Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Density of Generating Sites [4]	Age of Development/ Infrastructure [5]	Historic Combined Sewers or Septic? [6]	Culverted Streams? [7]	Additional Characteristics	Score	Priority Ranking
Information Source		Catchment inspections and sample results	GIS Maps	Municipal Staff	Impaired Waters List	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Municipal Staff, GIS Maps	GIS and Storm System Maps	Other		
Scoring Criteria		Yes = 3 (Problem Catchment) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	High = 3 Medium = 2 Low = 1	High = 3 Medium = 2 Low = 1	Yes = 3 No = 0	Yes = 3 No = 0	TBD		
Sample 1	XYZ River	3	0	2	0	2	1	0	3	None	11	Problem
Sample 2	XYZ Lake	0	3	0	3	1	2	0	3	None	15	High Priority
Sample 3	XYZ Stream	0	0	2	0	1	1	0	0	None	4	Low Priority

Scoring Criteria:

[1] Previous screening results indicate likely sewer input if any of the following are true:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

[2] Catchments that discharge to or in the vicinity of any of the following areas: public beaches, recreational areas, drinking water supplies, or shellfish beds

[3] Receiving water quality based on latest version of State of Connecticut Integrated Water Quality Report.

- Poor = Waters with approved TMDLs (Category 4a Waters) where illicit discharges have the potential to contain the pollutant identified as the cause of the impairment
- Fair = Water quality limited waterbodies that receive a discharge from the MS4 (Category 5 Waters)
- Good = No water quality impairments

[4] Generating sites are institutional, municipal, commercial, or industrial sites with a potential to contribute to illicit discharges (e.g., car dealers, car washes, gas stations, garden centers, industrial manufacturing, etc.)

[5] Age of development and infrastructure:

- High = Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old
- Medium = Developments 20-40 years old
- Low = Developments less than 20 years old

[6] Areas once served by combined sewers and but have been separated, or areas once served by septic systems but have been converted to sanitary sewers.

[7] Any river or stream that is culverted for distance greater than a simple roadway crossing.

7. Outfall and Interconnection Screening and Sampling

The 2017 MS4 Permit requires screening and sampling of outfalls and interconnections from the MS4 in dry and wet weather for evidence of illicit discharges and SSOs, including:

- Baseline outfall and interconnection screening (dry weather)
- Confirmatory screenings (dry and/or wet weather depending on catchment characteristics)
- Follow-up screening (dry and/or wet weather depending on catchment).

The City of Hartford and the MDC are responsible for conducting dry and wet weather outfall and interconnection screening and sampling for their respective portions of the separate storm sewer system.

7.1. Dry and Wet Weather Rainfall Criteria

For the purposes of outfall screening and sampling, dry and wet weather conditions are defined as follows:

- **Dry Weather** – dry weather screening and sampling shall proceed when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period.
- **Wet Weather** – wet weather screening and sampling shall occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall. There is no specific rainfall amount that will trigger sampling, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred. Sampling during the initial period of discharge ("first flush") will be avoided. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

Note that wet weather criteria for impaired waters outfall monitoring pursuant to Section 6(i) of the MS4 Permit are different than the above wet weather criteria for outfall screening and sampling.

For purposes of determining dry and wet weather conditions, the City of Hartford will use precipitation data from The Weather Underground website at: https://www.wunderground.com/weather/us/ct/hartford/41.76,-72.68

The remainder of this section is focused on dry weather screening & sampling. Wet weather screening and sampling is discussed further in the context of catchment investigations, including confirmatory and follow-up screening in Section 8.

7.2. Dry Weather Screening/Sampling

Dry weather flow is a common indicator of potential illicit connections. The 2017 MS4 Permit requires all outfalls/interconnections (excluding Problem and Excluded Catchments) to be screened (i.e., visually inspected) for the presence of dry weather flow. Dry weather outfall screening and sampling may take place when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period.

7.2.1. General Procedure

The dry weather outfall screening and sampling procedure consists of the following general steps:

- Identify outfall(s) to be screened/sampled based on outfall inventory and initial catchment priority ranking.
- Conduct the outfall inspection during dry weather:
  - Mark and photograph the outfall.
  - Record the inspection information and outfall characteristics (using paper forms or digital form using a tablet or similar device) (see form in **Appendix C**).
  - Look for and record visual/olfactory evidence of pollutants in flowing outfalls including odor, color, turbidity, and floatable matter (suds, bubbles, excrement, toilet paper or sanitary products). Also observe outfalls for deposits and stains, vegetation, and damage to outfall structures.
- If an outfall is inaccessible or submerged, proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results. If an interconnection is inaccessible or submerged, perform screening at the first accessible location within the permittee's system upgradient of the interconnection.
- If flow is observed, sample and test the flow following the procedures described in the following sections.
- If no flow is observed, but evidence of illicit discharges exists (illicit discharges are often intermittent or transitory), revisit the outfall during dry weather within one week of the initial observation, if practicable, to perform a second dry weather screening and sample any observed flow. Other techniques can be used to detect intermittent or transitory flows including conducting inspections during evenings or weekends and checking for the presence of optical brighteners.
- Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.
- Include all screening data in the annual report.

7.2.2. Field Equipment

Table 7-1 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 7-1. Field Equipment – Dry Weather Outfall Screening and Sampling

Equipment	Use/Notes
Clipboard	For organization of field sheets and writing surface
Field Sheets	Field sheets for both dry weather inspection and Dry weather sampling should be available with extras
Chain of Custody Forms	To ensure proper handling of all samples
Pens/Pencils/Permanent Markers	For proper labeling
Nitrile Gloves	To protect the sampler as well as the sample from contamination
Flashlight/headlamp w/batteries	For looking in outfalls or manholes, helpful in early mornings as well
Cooler with Ice	For transporting samples to the laboratory
Digital Camera	For documenting field conditions at time of inspection
Personal Protective Equipment (PPE)	Reflective vest, Safety glasses and boots at a minimum
GPS Receiver	For taking spatial location data
Water Quality Sonde	If needed, for sampling conductivity, temperature, pH
Water Quality Meter	Hand held meter, if available, for testing for various water quality parameters such as ammonia, surfactants and chlorine
Test Kits	Have extra kits on hand to sample more outfalls than are anticipated to be screened in a single day
Label Tape	For labeling sample containers
Sample Containers	Make sure all sample containers are clean. Keep extra sample containers on hand at all times. Make sure there are proper sample containers for what is being sampled for (i.e., bacteria requires sterile containers).
Pry Bar or Pick (J-hook)	For opening catch basins and manholes when necessary
Sandbags	For damming low flows in order to take samples
Small Mallet or Hammer	Helping to free stuck manhole and catch basin covers
Utility Knife	Multiple uses
Measuring Tape	Measuring distances and depth of flow
Safety Cones	Safety
Hand Sanitizer	Disinfectant/decontaminant
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas

Equipment	Use/Notes
Sampling Pole/Dipper/Sampling Cage	For accessing hard to reach outfalls and manholes

7.2.3. Sample Collection and Analysis

If flow is present during a dry weather outfall inspection, a sample will be collected and analyzed for the required permit parameters[3] listed in **Table 7-2**. The general procedure for collection of outfall samples is as follows:

- Fill out all sample information on sample bottles and field sheets (see **Appendix C** for Sample Labels and Field Sheets)
- Put on protective gloves (nitrile/latex/other) before sampling
- Collect sample with dipper or directly in sample containers. If possible, collect water from the flow directly in the sample bottle. Be careful not to disturb sediments.
- If using a dipper or other device, triple rinse the device with distilled water and then in water to be sampled (not for bacteria sampling)
- Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (see **Table 7-2**)
- Place laboratory samples on ice for analysis of bacteria and pollutants of concern
- Fill out chain-of-custody form (**Appendix C**) for laboratory samples
- Deliver samples to the laboratory
- Dispose of used test strips and test kit ampules properly
- Decontaminate all testing personnel and equipment

Field test kits or field instrumentation are permitted for all parameters except indicator bacteria and any pollutants of concern. Field kits need to have appropriate detection limits and ranges. **Table 7-2** lists various field test kits and field instruments that can be used for outfall sampling associated with the 2017 MS4 Permit parameters, other than indicator bacteria and any pollutants of concern. Analytical procedures and user's manuals for field test kits and field instrumentation are provided in **Appendix D**.

[3] Other potentially useful parameters, although not required by the MS4 Permit, include **fluoride** (indicator of potable water sources in areas where water supplies are fluoridated), **potassium** (high levels may indicate the presence of sanitary wastewater), and **optical brighteners** (indicative of laundry detergents).

Table 7-2. Outfall Screening Sampling Parameters and Analysis Methods

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach N1-8 Hach™ Ammonia Test Strips
Surfactants (Detergents)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2
Chlorine	CHEMetrics™ V-2000, K-2513 Hach™ Pocket Colorimeter™ II	Hach CN-66F
Conductivity	CHEMetrics™ I-1200 YSI Pro30 YSI EC300A Oakton 450	NA
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Salinity	YSI Pro30 YSI EC300A Oakton 450	NA
Indicator Bacteria: *E. coli* (freshwater) or Enterococcus (saline water)	EPA certified laboratory procedure (40 CFR § 136)	NA
Pollutants of Concern[1]	EPA certified laboratory procedure (40 CFR § 136)	NA

[1] Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, the sample must be analyzed for the pollutant(s) of concern identified as the cause of the water quality impairment.

Testing for indicator bacteria and any pollutants of concern must be conducted using analytical methods and procedures found in 40 CFR § 136.[4] Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136. **Table 7-3** lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters.

Table 7-3. Required Analytical Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Analytical Method	Detection Limit	Max. Hold Time	Preservative
Ammonia	**EPA**: 350.2, **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2, No preservative required if analyzed immediately
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	Analyze within 15 minutes	None Required
Temperature	**SM**: 2550B	*NA*	Immediate	None Required
Specific Conductance	**EPA**: 120.1, **SM**: 2510B	0.2 µs/cm	28 days	Cool ≤6°C
Salinity	**SM**: 2520	-	28 days	Cool ≤6°C
Indicator Bacteria: *E.coli (freshwater)*	**EPA**: 1603 **SM**: 9221B, 9221F , 9223 B **Other**: Colilert®, Colilert-18®	**EPA**: 1 cfu/100mL **SM**: 2 MPN/100mL **Other**: 1 MPN/100mL	6 hours	Cool ≤6°C, 0.0008% $Na_2S_2O_3$ (sodium thiosulfate)

EPA = EPA Methods SM = Standard Methods

[4] 40 CFR § 136: http://www.ecfr.gov/cgi-bin/text-idx?SID=b3b41fdea0b7b0b8cd6c4304d86271b7&mc=true&node=pt40.25.136&rgn=div5

7.3. Interpreting Outfall Sampling Results

Outfall analytical data can be used to help identify the major type or source of discharge. **Table 7-4** shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

Table 7-4. Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 µS/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2017 MS4 Permit)
Indicator Bacteria *E.coli (freshwater)*	The geometric mean of the five most recent samples taken during the same bathing season shall not exceed 126 colonies per 100 ml and no single sample taken during the bathing season shall exceed 235 colonies per 100 ml for designated swimming areas, 410 colonies per 100 ml for non-designated swimming areas, and 576 colonies per 100 ml for all other uses.

Catchments are considered highly likely to contain illicit discharges from sanitary sources when either of the following combinations of sampling results is detected:

- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

Catchments with outfall screening results that meet the above criteria shall be ranked at the top of the High Priority Catchments category for investigation.

8. Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to investigate the source of the potential discharge within the outfall catchment area. Common catchment investigation techniques include, but are not limited to:

- Review of maps, historic plans, and records
- Manhole inspection
- Dry and wet weather sampling
- Video inspection
- Smoke testing
- Dye testing.

This section outlines a systematic procedure to investigate outfall catchments and identify the source(s) of potential illicit discharges. Information and data collected as part of the catchment investigations will be reported in each annual report.

8.1. System Vulnerability Factors

The Department of Public Works will review relevant mapping and historic plans and records to identify areas within the catchment with higher potential for illicit connections for the portion of the separate storm sewer system owned and operated by the City. The following information will be reviewed:

- Plans related to the construction of the drainage network
- Prior work on the storm drains
- Health Department or other municipal data on septic system failures or required upgrades
- Records related to septic system breakouts, SSOs, and sanitary sewer surcharges
- MDC Storm Drainage Mapping

Based on the review of this information, the presence of any of the following **System Vulnerability Factors (SVFs)** will be identified for each catchment. SVFs indicate a risk of sanitary or septic system inputs to the MS4 under wet weather conditions.

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages.
- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs.

- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints.
- Common or twin-invert manholes serving storm and sanitary sewer alignments.
- Common trench construction serving both storm and sanitary sewer alignments.
- Crossings of storm and sanitary sewer alignments.
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system.
- Areas formerly served by combined sewer systems.
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations.
- Any storm drain infrastructure greater than 40 years old in medium and densely developed areas.

A SVF inventory will be documented for each catchment (see **Table 8-1**), retained as part of this written IDDE program, and included in the annual report.

Table 8-1. Outfall Catchment System Vulnerability Factor (SVF) Inventory

Catchment ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	9 SSO Potential In Event of System Failures	10 Sanitary and Storm Drain Infrastructure >40 years Old
Catchment 1	XYZ River	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Presence/Absence Evaluation Criteria:

1. History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
2. Common or twin-invert manholes serving storm and sanitary sewer alignments
3. Common trench construction serving both storm and sanitary sewer alignments
4. Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
5. Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
6. Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
7. Areas formerly served by combined sewer systems
8. Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations
9. Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
10. Any sanitary sewer and storm drain infrastructure greater than 40 years old

8.2. Dry Weather Investigation (Manhole Inspections)

In the portion of the separate storm sewer system owned and operated by the City of Harford, the City will implement a dry weather storm drain network investigation that involves systematically and progressively observing, sampling and evaluating key junction manholes in the MS4 to determine the approximate location of suspected illicit discharges.

The Department of Public Works will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the storm system map, and catchment delineations will be refined based on the field investigation, where necessary. The SVF inventory will also be updated based on information obtained during the field investigations, where necessary.

Several important terms related to the dry weather manhole inspection program are defined by the MS4 Permit as follows:

- Junction Manhole is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.
- Key Junction Manholes are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

For all catchments identified for investigation, during dry weather, field crews will systematically inspect **key junction manholes** for evidence of illicit discharges and confirm or identify potential system vulnerability factors. This program involves progressive inspection and sampling at manholes in the storm drain network to isolate and eliminate illicit discharges.

The manhole inspection methodology will be conducted in one of two ways (or a combination of both):

(1) By working progressively up from the outfall and inspecting key junction manholes along the way, or

(2) By working progressively down from the upper parts of the catchment toward the outfall and inspecting key junction manholes along the way.

For most catchments, manhole inspections will proceed from the outfall, then moving up into the system. However, the decision to move up or down the system depends on the nature of the drainage system and the surrounding land use and the availability of information on the catchment and drainage system. Moving up the system can begin immediately when an illicit discharge is detected at an outfall, and only a map of the storm drain system is required. Moving down the system requires more advance preparation and reliable drainage system information on the upstream segments of the storm drain system, but may be more efficient if the sources of illicit discharges are believed to be located in the upstream portions of the catchment area. Once a manhole inspection methodology has been selected, investigations will continue systematically through the catchment.

Inspection of key junction manholes will proceed as follows:

- Manholes will be opened and inspected for visual and olfactory evidence of illicit connections. A sample field inspection form is provided in Appendix C.
- If flow is observed, a sample will be collected and analyzed at a minimum for ammonia, chlorine, and surfactants. Field kits can be used for these analyses. Sampling and analysis will be in accordance with procedures outlined in Section 7. Additional indicator sampling may assist in determining potential sources.
- Where sampling results or visual or olfactory evidence indicate potential illicit discharges, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources.
- Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges can be isolated to a pipe segment between two manholes.
- If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

8.3. Wet Weather Investigation (Outfall Sampling)

Where at least one System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The Department of Public Works will be responsible for implementing the wet weather outfall sampling program and making updates as necessary within the portion of the separate storm sewer system owned and operated by the City.

Outfalls will be inspected and sampled under wet weather conditions, to the extent necessary, to determine whether wet weather-induced high flows in sanitary sewers result in discharges of sanitary flow to the MS4.

Wet weather outfall sampling will proceed as follows:

- At least one wet weather sample will be collected at the outfall for the same parameters required during dry weather screening (refer to Table 7-3 and Table 7-4).
- Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall.
- There is no specific rainfall amount that will trigger sampling, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred.
- Sampling during the initial period of discharge (“first flush”) will be avoided.
- To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high. Refer to Section 7.1 for information on weather tracking.
- If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in Section 8.4.
- If wet weather outfall sampling does not identify evidence of illicit discharges, and no evidence of an illicit discharge is found during dry weather manhole inspections, catchment investigations will be considered complete.

8.4. Source Isolation and Confirmation

Once the source of an illicit discharge is approximated between two manholes, more detailed investigation techniques will be used to isolate and confirm the

source of the illicit discharge. The following methods may be used in isolating and confirming the source of illicit discharges:

- Sandbagging
- Smoke Testing
- Dye Testing
- CCTV/Video Inspections
- Optical Brightener Monitoring
- IDDE Canines.

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) for these and other IDDE methods are provided in **Appendix F**.

Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections within the portion of the separate storm sewer system owned and operated by the City, the Department of Public Works will notify property owners in the affected area. Smoke testing notification will include hanging notifications for single family homes, businesses and building lobbies for multi-family dwellings.

8.4.1. Sandbagging

This technique can be particularly useful when attempting to isolate intermittent illicit discharges or those with very little perceptible flow. The technique involves placing sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) within outlets to manholes to form a temporary dam that collects any intermittent flows that may occur. Sandbags are typically left in place for 48 hours, and should only be installed when dry weather is forecast. If flow has collected behind the sandbags/barriers after 48 hours it can be assessed using visual observations or by sampling. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. Finding appropriate durations of dry weather and the need for multiple trips to each manhole makes this method both time-consuming and somewhat limiting.

8.4.2. Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole

and air is then forced through the system. Test personnel are placed in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sanitary sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sanitary sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous.

It should be noted that smoke may cause minor irritation of respiratory passages. Residents with respiratory conditions may need to be monitored or evacuated from the area of testing altogether to ensure safety during testing.

8.4.3. Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, and sinks and observing nearby storm drains and sewer manholes as well as stormwater outfalls for the presence of the dye. Similar to smoke testing, it is important to inform local residents and business owners. Police, fire, and local public health staff should also be notified prior to testing in preparation of responding to citizen phone calls concerning the dye and their presence in local surface waters.

A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). One person is inside the building, while the others are stationed at the appropriate storm sewer and sanitary sewer manholes (which should be opened) and/or outfalls. The person inside the building adds dye into a plumbing fixture (i.e., toilet or sink) and runs a sufficient amount of water to move the dye through the plumbing system. The person inside the building then radios to the outside crew that the dye has been dropped, and the outside crew watches for the dye in the storm sewer and sanitary sewer, recording the presence or absence of the dye.

The test can be relatively quick (about 30 minutes per test), effective (results are usually definitive), and inexpensive. Dye testing is best used when the likely source of an illicit discharge has been narrowed down to a few specific houses or businesses.

8.4.4. CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

8.4.5. Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests there is a possible illicit discharge or insufficient removal through adsorption in nearby septic systems or wastewater treatment. Optical brightener monitoring can be done in two ways. The most common, and least expensive, methodology involves placing a cotton pad in a wire cage and securing it in a pipe, manhole, catch basin, or inlet to capture intermittent dry weather flows. The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period. A second methodology uses handheld fluorometers to detect optical brighteners in water sample collected from outfalls or ambient surface waters. Use of a fluorometer, while more quantitative, is typically more costly and is not as effective at isolating intermittent discharges as other source isolation techniques.

8.4.6. IDDE Canines

Dogs specifically trained to smell human related sewage are becoming a cost-effective way to isolate and identify sources of illicit discharges. While not widespread at the moment, the use of IDDE canines is growing as is their accuracy. The use of IDDE canines is not recommended as a standalone practice for source identification; rather it is recommended as a tool to supplement other conventional methods, such as dye testing, in order to fully verify sources of illicit discharges.

8.5. Illicit Discharge Removal

When the specific source of an illicit discharge is identified within the portion of the separate storm sewer system owned and operated by the City, the City of Hartford will exercise its authority as necessary to require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s)
- A description of the discharge
- The method of discovery

- Date of discovery
- Date of elimination, mitigation or enforcement action
- Estimate of the volume of flow removed.

8.5.1. Confirmatory Outfall Screening

Within one year of removal of all identified illicit discharges and SSO sources within a catchment area, confirmatory outfall or interconnection screening will be conducted. The confirmatory screening will be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening will be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment will be scheduled for additional investigation. Confirmatory screening is not required in catchments where no illicit discharges or System Vulnerability Factors have been identified and no previous screening indicated suspicious flows.

8.6. Follow-up Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be scheduled for follow-up screening within five years, or sooner based on the catchment's illicit discharge priority. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 7** of this document. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in **Section 8.1**. All sampling results will be reported in the annual report.

8.7. Illicit Discharge Prevention Procedures

The City of Hartford will implement the following mechanisms and procedures to assist in the prevention of illicit discharges and SSOs in the portion of the separate storm sewer system owned and operated by the City:

- Spill response and prevention procedures including identification of spills, reporting procedures, containment procedures, and documentation.
- Public awareness (may be part of the education program required by Subsection 2 of the MS4 Permit).
- Reporting hotlines and training of public employees involved in the IDDE program on way to identify potential illicit discharges and SSOs.

9. Training

Annual IDDE training will be made available to all Department of Public Works employees involved in the IDDE program. This training will, at a minimum, include information on how to identify illicit discharges and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records will be maintained in **Appendix E**. The frequency and type of training will be included in the annual report.

10. Progress Reporting

The progress and success of the IDDE program will be evaluated on an annual basis. The evaluation will be documented in the annual report and will include the following indicators of program progress:

- Measures that demonstrate efforts to locate illicit discharges
- Number of illicit discharges identified and removed
- Percent and area in acres of the catchment area served by the MS4 evaluated using the catchment investigation procedure
- Number of dry weather outfall inspections/screenings
- Number of wet weather outfall inspections/sampling events
- Number of enforcement notices issued
- All dry weather and wet weather screening and sampling results
- Estimate of the volume of sewage removed, as applicable
- Number of employees trained annually.

The success of the IDDE program will be measured by the IDDE activities completed within the required permit timelines.

Appendix A

Legal Authority (IDDE Ordinance)

- City of Hartford Municipal Code Section 17-4
- Ordinances of The Metropolitan District Relating to Sewers Section 2N, 2O, and 5

City of Hartford Municipal Code

Chapter 17 – Health and Sanitation

Sec. 17-4. – Discharge of pollutants, contaminants, etc.; penalty.

It shall be unlawful for any person to directly or indirectly cause pollution and contamination of any land or waters of the city through the discharge, spillage, seepage, filtration or otherwise of oil or any petroleum or chemical liquid or product which pollution or contamination will result in either damages to the environment or containment and removal costs. Each day's failure to correct such pollution or contamination shall constitute a separate offense.

A person who violates any provision of this section, shall be summoned or brought to community court pursuant to P.A. 97-199. A person who is summoned or brought before the community court cannot invoke any of the appeal rights provided by section 1-5 of the Hartford Municipal Code. The superior court judge assigned to the community court may impose a penalty of community service, a fine up to ninety dollars ($90.00) or a jail sentence of up to twenty-five (25) days to any person who is convicted of violating any provision of this section.

(Code 1977, § 24-20; Ord. No. 27-97, 11-24-97)

https://library.municode.com/ct/hartford/codes/code_of_ordinances?nodeId=PTIIMUCO_CH17HESA_ARTIINGE_S17-4DIPOCOETPE

Ordinances of The Metropolitan District Relating to Sewers

Section S2 – Use of Sewers

Sec. S2n – Use of Storm Drains

Storm water drains, also referred to as storm drains, storm sewers, conduits or similar terms, are in general intended to be used for conveying surface and storm waters from streets, yards and other ground surfaces, from roofs and other places. They may also be used for conveying subsoil drainage waters, the flow of natural springs, ground water, surplus from flowing wells, clean cooling water as defined in Section S1b(5) of this ordinance, and, subject to approval by the Manager, inoffensive industrial wastes.

Sec. S2o – Prohibited Discharge into Storm Drains

No person shall discharge or permit to be discharged from property under his control into a storm drain any waste or water which is polluted with organic or other matter which can decay, which is odorous, oily or unsightly or for any other reason is likely to or does give offense or cause damage or injury to nearby persons or property when discharged into an open natural stream. No waste water which is

poisonous to persons, animals or fish, when discharged into a natural stream, shall be discharged through any storm drain. No coarse rubbish, sticks, large solids, offal, feathers, straw, cinders, ashes, scraps, leaves, oil, grease, combustible substance or similar materials shall be permitted to enter any storm drain. No material, the discharge of which into natural streams, ponds, or lakes is prohibited by state or federal law or regulations, shall be discharged into any storm drain.

Sec. S5 – Enforcement

Sec. S5a Violation: Inspection and Correction Thereof

If any person shall construct, install, alter or repair any sewer or drain or connection to any public sewer or drain of The Metropolitan District in violation of the requirements of this ordinance, or, having obtained a permit as provided in this ordinance, shall construct, install, alter or repair a sewer, drain or connection thereto without having given the Engineer and his representatives adequate notice, time, opportunity and assistance, during regular working hours, to inspect such sewer, drain, connection and the work and materials used thereon, said Manager may, in his discretion, order or direct the person who constructed, installed, altered or repaired such sewer, etc., and/or the owner of any property in which such sewer, etc., may be located or which may be served thereby, or in whose interest and employ said work was done, to uncover and fully expose any or all portions of such sewer, drain or connection and afford said Engineer and his representatives adequate opportunity to examine and inspect such sewer, etc., and to secure such records thereof as may be proper. If such sewer, drain or connection and the appurtenances thereof shall be found not to be in full accord with the requirements of this ordinance and the standards established under its provisions, then said Manager may order and direct such person, owner or lessee to make such changes in or additions to or remove portions of appurtenances of such sewer, etc., as may be necessary to insure that such sewer, etc., will conform to the requirements of this ordinance and of the standards established under its provisions. All of such work shall be performed by said person, owner or lessee without delay and without expense to The Metropolitan District.

Sec. S5b Assistance and Procedure in Suspected Violations

If the Manager of the Bureau of Public Works shall have reason to believe that a sewer, drain, or any part or appurtenance thereof, which is connected to or discharges into any public sewer or drain of The Metropolitan District, has been constructed, repaired or altered or is or has been used, operated or maintained, or that substances are being or recently have been discharged through the same in violation of the requirements of this ordinance, the standards established under its provisions or action of the District Board, said Manager shall inquire into the matter.

Said Manager may require that the owner, lessee or tenant of the property where such sewer, etc., may be located or of property served by such sewer, etc., assist said Manager and his representatives in such inquiry and permit them to examine such sewer, etc., and observe the manner in which such sewer, etc., is used, operated or maintained and the wastes discharged through the same. If said Manager shall find on such inquiry that there exists good reason to believe that the requirements of this ordinance have not been or are not being complied with, he may require that the owner, lessee or tenant of said property furnish said Manager with adequate proof that said requirements are being conformed to and will continue to be complied with. If it shall appear that said requirements have not been or are not being conformed to or complied with or that good reason exists to believe that they may not thereafter be conformed to or complied with, said Manager may order and require that such owner, lessee or tenant shall immediately take such measures, provide and install such appurtenances or make such changes in such sewer, etc., or the manner of using and maintaining the same as will insure that said requirements will be conformed to or complied with thereafter. All assistance, proof, changes and new appurtenances required by this section to be furnished or provided by the owner, lessee or tenant of property in question shall be promptly furnished by such owner, lessee or tenant without expense to The Metropolitan District. (Adopted December 16, 2019) (Effective January 1, 2020)

Sec. S5c Procedure Upon Failure to Correct Violation

If any person, after proper order or direction from the Manager of the Bureau of Public Works, fails to take the remedial steps or perform the acts required by Sections S5a and S5b of this ordinance, or fails thereafter to use, operate and maintain any connection with the public sewers of the District, or appurtenance thereof, as required by this ordinance, the Bureau of Public Works, by such agents and/or facilities as it may choose, may disconnect the house connection or drain which was wrongfully connected, altered, repaired or used, or through which improper wastes were discharged into the public sewer system from the public sewer or drainage system of the District. In disconnecting such drain or house connection, the District may, if necessary, interfere with or cut off drainage from other portions of the property whereon such violation of the ordinance has occurred or of any adjacent property which is served by such house connection or drain. If the Bureau of Public Works shall have disconnected a house connection or drain from the public sewer system, as above provided, the District may collect the cost of making such disconnection from any person responsible for or willfully concerned in or who profited by such violation of the requirements of this ordinance. If the Bureau of Public Works has disconnected any property from the public sewer system, as above provided, it may thereafter refuse to permit the restoration of the former connection or of any new connection to the property concerned in the violation of

this ordinance until the claim of the District for the cost of making such disconnection shall have been paid in full plus interest and the reasonable overhead and any legal expenses incurred by the District in connection therewith.

Sec. S5d Penalty for Violation

Any person violating any provision of this ordinance may be proceeded against and fined not exceeding fifty dollars or imprisoned not more than thirty days, or both, as provided in an act amending the charter of The Metropolitan District approved July 26, 1949. Each day that any violation of this ordinance continues and each day that any person continues to discharge improper wastes or substances into any public sewer or drain shall be deemed a separate offense for the purpose of applying the above penalties.

Sec. S5e Interpretation of Requirements, etc.

The provisions of this ordinance with respect to the meaning of technical terms and phrases, the classifications of different kinds or types of sewers, the restrictions as to what wastes may be discharged into sewers, the regulations with respect to making connections to sewers and other technical matters shall be interpreted and administered by the Manager, and, acting under and for him, by the Engineer. Details as to sewer use, sewer connections, etc., not otherwise regulated or described by some provision of this ordinance shall continue as heretofore established by local custom and practice, as interpreted by the Manager or Engineer.

Sec. S5f Appeal from Interpretation

Any person who may be aggrieved by any interpretation of any provision of this ordinance made by the Manager or Engineer or by an order issued by the Manager or Engineer under authority conferred by this ordinance, or by any requirement of this ordinance, or by any classification of any sewer, drain or any waste water proposed to be discharged into any sewer or drain, made by the Manager or Engineer, may appeal from such interpretation, order, classification or requirement to the Bureau of Public Works. Any such appeal shall be in writing, addressed to the Bureau of Public Works, setting out the matter in reasonable detail and completeness. Said Bureau shall consider any such appeal made to it and, if so requested by any such person interested therein, shall afford all interested parties an opportunity to be heard by the Bureau or by a committee thereof. Thereafter, said Bureau shall take such action in the matter of the appeal as may to it appear proper, and, in its discretion, may alter the interpretation, order or requirement of the Manager or Engineer in whole or in part. Until such time as said Bureau shall have received and considered an appeal and shall have voted to change the

interpretation, order or requirement of the Manager or Engineer, such interpretation, order or requirement of the Manager or Engineer shall be observed and remain in full force and effect.

Sec. S5g Validity of Provisions

If any provision, requirement, or section of this ordinance, or any interpretation thereof by the Manager or Engineer shall be adjudged invalid or unenforceable by reason of conflict with some other provisions of law, such adjudication shall not affect the validity of any other provision hereof, but all other provisions, sections and requirements of this ordinance shall be deemed valid and effective and shall remain in full force and effect.

Appendix B

Storm System Mapping

Stormwater Ownership & Outfalls
City of Hartford

DRAFT

BLOOMFIELD

WINDSOR

WEST HARTFORD

WETHERSFIELD

SOUTH WINDSOR

EAST HARTFORD

HARTFORD

CONNECTICUT RIVER

N

G

NM

S

F

SM

P

002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024 025 026 027 028 029 030 031 032 033 034 035 036 037 038 039 040 041 042 043 043A 044 045 046 047

RG-1 RG-2 RG-3 RG-4 RG-5 RG-6

Legend

MDC STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

PRIVATE STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

STATE/ARMY CORP/OTHER STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

CITY OF HARTFORD STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

CITY OF WEST HARTFORD STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

STORM SEWERS - OWNER UNKNOWN
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

OUTFALLS
- CSO OUTFALL
- MDC STORM OUTFALL
- PRIVATE STORM OUTFALL
- CITY OF HARTFORD STORM OUTFALL
- STATE/ARMY CORP/OTHER STORM OUTFALL
- XXX NPDES DISCHARGE NUMBER
- ? RAIN GAUGE LOCATION
- MDC CSO SEWER SEPARATION PROJECTS, STORM - TBD
- DRAINAGE DISTRICT

Feet: 800 400 0 800 1,600 2,400 3,200 4,000 4,800 5,600

PREPARED BY
GIS SERVICES
THE METROPOLITAN DISTRICT
555 MAIN STREET
HARTFORD, CT 06142-0800
www.themdc.org

11-25-2019

D:\hartford\projects\stormwtr_ph2\Hartford_Stormwater_11252019.mxd

Appendix C

Field Forms, Sample Bottle Labels, and Chain of Custody Forms

City of Hartford IDDE Program - Outfall Screening & Sampling Form

Outfall ID: _____ **Inspection Date:** _____

Inspector: _____ **Last Rainfall Event:** _____

Street Name: _____ **Event Type:** ☐ Dry Weather Screening ☐ Wet Weather Sampling

Is outlet submerged?	☐ Yes	☐ No	If yes, screen/sample the first accessible upstream structure.	
Upstream Structure Type:	☐ Manhole	☐ Catch Basin	**Structure ID/Location:** _____	

Type of Outfall:	☐ Pipe	☐ Flared End	☐ Endwall	☐ Open Swale
Condition of Outfall:	☐ Good	☐ Fair	☐ Poor	☐ Crumbling
Shape of Pipe/Swale:	☐ Rounded	☐ Square	☐ Triangular	☐ Trapezoidal

Outfall Material:

- ☐ Concrete
- ☐ HDPE
- ☐ Corrugated Metal
- ☐ Clay
- ☐ PVC
- ☐ Other: _____

Pipe Measurements: (in inches)

Rounded:
- Inner Diameter: _____
- Outer Diameter: _____
- Flow Width:* _____

Rectangular:
- Pipe Width: _____
- Pipe Height: _____
- Flow Width:* _____

Swale Measurements: (in inches)

All Shapes:
- Swale Width: _____
- Swale Height: _____
- Flow Width:* _____
- Flow Height:* _____

Trapezoidal:
- Bottom Width: _____

* If flow is present

Evidence of flow: ☐ Yes ☐ No **If yes, Describe**: ☐ Heavy ☐ Moderate ☐ Trickling ☐ Damp

Visual Evidence of Illicit Discharge:

☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge:

☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Sampling Results:

Ammonia:	_____ mg/L	Surfactants:	_____ mg/L	Chlorine:	_____ mg/L
Conductivity:	_____ µs/cm	Temperature:	_____ °F	Salinity:	_____ ppt
Bacteria:*	_____ /100ml	Nitrogen:*	_____ mg/L	Phosphorus:*	_____ mg/L

*Analyzed by laboratory and not in the field.

Comments (include any required maintenance):

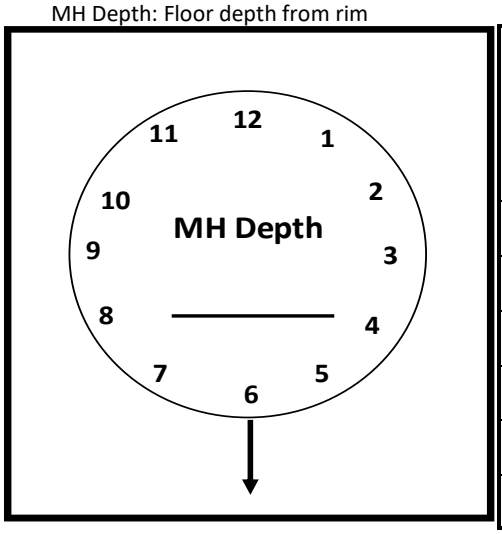
City of Hartford IDDE Program – Manhole Inspection Form

Catchment ID: _____ **Inspection Date:** _____

Manhole ID: _____ **Last Rainfall Event:** _____

Street Name: _____ **Inspector:** _____

MH Depth: Floor depth from rim



Sketch direction(s) of incoming flow

Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, CMP)	Pipe Diameter (inches)	Invert Elevation (feet)	Upgradient Structure/Source (MH, CB, Private, Unknown)	Flow (Damp, Trickle, Moderate, High)

Cover Conditions: Diameter of clear opening (inches): _____ ☐ Buried/Paved ☐ Cannot Inspect ☐ Cannot Locate

Evidence of flow: ☐ Yes ☐ No **If yes, Describe**: ☐ Heavy ☐ Moderate ☐ Trickling ☐ Damp

Visual Evidence of Illicit Discharge:
☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge:
☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Sampling Results:
Ammonia: _____ mg/L Surfactants: _____ mg/L Chlorine: _____ mg/L

Comments (include any required maintenance):

Further investigation needed? ☐ Yes ☐ No

Sample Laboratory Bottle Label

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040

DATE:	MM/DD/YY
TIME:	2:45 pm
COLLECTED BY:	ATLAS
CLIENT/SOURCE:	City of Hartford MS4 IDDE Outfall Sampling
SAMPLING SITE:	Outfall XXXX
TESTS REQUIRED:	E. coli
PRESERVATIVE:	sodium thiosulfate

Cooler: Yes [X] No [ ]
Coolant: IPK [ ] ICE [X] No [ ]

CHAIN OF CUSTODY RECORD

Temp ° C Pg 1 of 1

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Data Delivery/Contact Options:
[ ] Fax:
[ ] Phone:
[ ] Email:

Customer: Atlas Environmental
Address: 90 Starr Hill Road
Groton, CT

Project: City of Hartford
Report to: Atlas
Invoice to: Atlas
QUOTE #

Project P.O:

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature _____ Date: _____

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe **OIL**=Oil
B=Bulk **L**=Liquid

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	E. Coli	GL Amber 8 oz. w/H3PO4	Soil VOA Vials [ ] methanol [ ] H2O	GL Soil container ( ) oz	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H2SO4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H2SO4 [ ] 250ml [ ] 500ml	PL HNO3 250ml	PL NaOH 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
	Outfall ID-XXX	SW			X										1		

Relinquished by:	Accepted by:	Date:	Time:

Comments, Special Requirements or Regulations:

Turnaround:
[ ]
[ ] 2 Days*
[ ] 3 Days*
[ ] Standard
[ ] Other
* **SURCHARGE APPLIES**

RI
[ ] Direct Exposure (Residential)
[ ] GW
[ ] Other

CT
[X] RCP Cert
[ ] GW Protection
[ ] SW Protection
[ ] GA Mobility
[ ] GB Mobility
[ ]
[ ] I/C DEC
[ ] Other

MA
[ ]
[ ] GW-1
[ ] GW-2
[ ] GW-3
[ ] S-1
[ ] S-2
[ ] S-3
[ ] MWRA eSMART
[ ] Other

State where samples were collected: CT

Data Format
[ ] Excel
[X] PDF
[ ] GIS/Key
[ ] EQuIS
[ ] Other

Data Package
[ ] Tier II Checklist
[ ] Full Data Package*
[X] Phoenix Std Report
[ ] Other

* **SURCHARGE APPLIES**

Appendix D

Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures

City of Hartford
Department of Public Works
IDDE Program – Dry & Wet Weather Sampling
Standard Operating Procedures

Summary: The Department of Public Works conducts screening and sampling of outfalls and interconnections from the MS4 in dry and wet weather for evidence of illicit discharges and SSOs in accordance with the CT Department of Energy & Environmental Protection (DEEP) General Permit for the Discharge of Stormwater from Municipal Separate Storm Sewer Systems (MS4) and the City's Illicit Discharge Detection and Elimination (IDDE) Program.

Rainfall Criteria:

- Dry Weather: conduct when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period.
- Wet Weather: conduct during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall but avoiding first flush and should occur:
    - Between March and June.
    - During minimum storm event intensities that are likely to trigger sanitary sewer interconnections.

Parameters to be Analyzed:

- By a Connecticut Certified Laboratory: E. coli
- In the field: free chlorine, ammonia, surfactants, conductivity, temperature, and salinity

Prior to Sampling Event:

- Identify outfall(s) to be screened/sampled based on outfall inventory and initial catchment priority ranking. Produce mapping from GIS including aerial views to help locate outfalls in the field.
- Order sample jars from Lab for collecting E. coli (bacteria bottle with sodium thiosulfate) at: https://www.phoenixlabs.com/BottleOrders.aspx. One jar per sample is needed.
- Order Hach or alternative kits for measuring free chlorine, ammonia, and surfactants in the field. Refer to kits recommended by UCONN CLEAR MS4 located in Appendix D of the City's IDDE Plan.
- Order field meters for measuring conductivity, temperature, and salinity. Refer to meters recommended by UCONN CLEAR MS4 located in Appendix D of the City's IDDE Plan.
- Check supply of equipment listed in Table 7-1 of the City's IDDE Plan.
- Meters should be calibrated as close as possible to the sampling event to obtain the most accurate reading.
- Monitor weather for rainfall criteria listed above. Weather can be tracked using the Weather Underground website: https://www.wunderground.com/weather/us/ct/hartford/41.76,-72.68. The history section of this website gives details on the amount of precipitation.

Sampling Preparation (Day of Sampling Event):

- Conduct Safety Check:
    1. Determine if weather conditions are safe for collecting samples. Do not collect samples during lightening, hail, or other unsafe weather events.

2. If possible, collect samples in pairs. Outfalls are sometimes located in remote areas and may have treacherous conditions including steep slopes, and slippery or rocky terrain.
3. Always notify someone in the office before going into the field to collect samples (even if collecting in pairs).
4. Ensure cell phone is charged prior to going into field.

- Use field checklist in Table 7-1 of the City's IDDE Plan.

Sample Collection:

- Prior to collecting samples, label each sample jar with the unique Outfall ID # using a black Sharpie.
- Put on a pair of nitrile gloves at each outfall. Collect a sample (using dipper if necessary) from each outfall sampling point and fill bacteria containers to the top, taking care not to overfill any of the added preservative.
- Record the unique outfall ID, time of collection, and other collection data for each outfall on the City of Hartford IDDE Program Outfall Screening & Sampling Form located in Appendix C of the City's IDDE Plan.
- Using the dipper or a sample container without preservative, collect a sample from the outfall and conduct the field measurements. Follow instructions included with kit or meter. Record results on the Outfall Screening & Sampling Form for each outfall sampling point. Decontaminate dipper after sampling each outfall.
- Immediately after collection, place samples on ice in the cooler.
- Fill out Chain-of-Custody (CoC) Form. A sample CoC form is located in Appendix C of the City's IDDE Plan.
- Deliver samples to laboratory with CoC. Note: E. coli samples need to be delivered to the laboratory within six hours of collection.

Preparation - Hach kits

- Free chlorine
  - https://www.hach.com/free-chlorine-test-kit-model-cn-70f/product?id=7640219517

Preparation - test kit

- Alternative (cheaper) free chlorine: http://www.ctlscientific.com/cgi/display.cgi?item_num=91339

Preparation - Hach kits

- Ammonia
  - https://www.hach.com/nitrogen-ammonia-test-kit-model-ni-sa/product?id=7640220995&callback=qs

Preparation - Hach kits

- Surfactants/detergents
  - https://www.hach.com/detergents-test-kit-model-de-2/product?id=7640218458&callback=qs#

Preparation - meters

- Conductivity/temperature/ salinity/TDS
  - Fancy version (YSI)
    - https://www.ysi.com/pro30
  - Budget version (Amazon)

$93.50

Preparation - meters

- Turbidity
  - https://www.hach.com/2100q-portable-turbidimeter/product?id=7640450963

$1,263

Appendix E

IDDE Employee Training Record

City of Hartford DPW		SPCC/SWPPP/MS4-SWMP/IDDE Training Roster
Date:	Training Conducted By:	
Employee Name	Job Title	Employee Signature

City of Hartford DPW Fleet Division		SPCC/SWPPP/MS4-SWMP Training Roster
Date: December 19, 2019	Training Conducted By: Atlas Environmental	
Employee Name	**Job Title**	**Employee Signature**
MARK FONTAINE	SUPERINTENDENT	
Orlando Mercado	Mechanic	
JOSÉ A. DELLOYOSSE	mechanic	
STEVE ALFANO	" "	
Samuel Echevarria	Diesel Mechanic	
EDWARD J DENENCH JR	MACK	
Joel Vasquez	supply Clerk	
L. Leslie	Aut. Mech	
Daniel Diaz	Mechanic	
Darryl Lafointe	mechanic	
MICHAEL PLATANIA	MECHANIC	
DAVE MCINTYRE	MECHANIC	
Fatih UCAR	CE III	
SARA LOWENTHAL	Risk Manager	

City of Hartford DPW Facilities Division		SPCC*/SWPPP/MS4-SWMP Training Roster
Date: December 19, 2019	Training Conducted By: Atlas Environmental	
Employee Name	Job Title	Employee Signature
Adiel Rodriguez	Facilities Supervisor	
Robert K Palmer	Painter III	Robert K Palmer
Michael Batchelor	Painter II	

*Covers DPW Yard, 50 Jennings Rd. Facility, & Parker Memorial

City of Hartford DPW Highway Division		SPCC/SWPPP/MS4-SWMP Training Roster
Date: December 19, 2019	Training Conducted By: Atlas Environmental	
Employee Name	**Job Title**	**Employee Signature**
Jason Sutherland	Team Leader	
Rudy Arnelod	Motorboat III	
VIRGIL GRIFFIN	Supervisor	
Mickey Vargas	D.P.W. Street	
Antonio Ramos	DPW Streets	
MIMAGROS Rodriguez	Dpw Streets	

Appendix F

Source Isolation and Confirmation Methods:
Instructions, Manuals, and SOPs

City of Hartford IDDE Program
Dye Testing SOPs

Purpose of SOPs: Establish standard operating procedures for the use of dye testing to determine the source of illicit discharges to the Municipal Separate Storm Sewer System (MS4) as part of the City's Illicit Discharge Detection and Elimination (IDDE) Program consistent with the goals outlined in the Connecticut Department of Energy and Environmental Protection (DEEP) General Permit for the Discharge of Stormwater from Small MS4s and the City of Hartford Stormwater Management Plan.

Select Areas: Select areas for testing and produce detailed maps outlining the system's structures to determine downgradient manholes on the storm and sanitary systems and potential receiving waters.

Obtain Dye: Follow the manufacturer's recommendation on the amount of dye used. Fluorescent Yellow/Green Dye Tracer is the approved color for use in the City of Hartford. If additional dye colors are needed or proposed for use – they must be approved by the Department of Public Works, prior to use. **Absolutely no other materials or substances such as soaps may be used for testing of the sanitary or storm lines without written approval from the Department of Public Works**. Dye should be purchased prior to scheduling testing.

Schedule: Since dye testing is a visual test, project timing is significant. Dye will not be evident at night or may become diluted in areas of high flow. The optimal scheduling for dye testing is during daylight in the dry season. Dye testing should not commence during or at least 24 hours following a rain event.

Notifications: Dye testing requires public notification prior to conducting. The following notifications shall be made:

- Brief Mayor's office on dates, locations, purpose, and anticipated duration of testing prior to notifying affected residents.
- Notify the MDC, City of Hartford Fire Department, the City Emergency Communications Dispatch Center (911 Call Center) of the dates, locations, purpose, and anticipated duration of testing.
- Post public notification on the main page of the City's website.
- Schedule testing with private property owner.
- Send weekly updates to the Mayor's Office, MDC, Fire Department, and 911 Call Center.
- Notification of all parties of project completion.

Dye Test Setup: In order to make sure the test is properly conducted, the individuals checking the downstream manholes should be in place prior to the introduction of the dye. For projects primarily testing sanitary connections, a vacuum truck is not required. However, for projects primarily testing storm connections, a vacuum truck may be required to be on-site for the removal of dye colored water from the storm water drainage system (example: water resource protection district). If a vacuum truck is required, have the vacuum truck available and positioned by what is thought to be a downstream storm water manhole. If necessary, use the vacuum truck to remove any of the water and dye from the storm water system prior to it reaching a water body. Discharge the dye and water mixture to an approved sanitary sewer location.

Dye Testing Crew: The dye testing shall consist at a minimum of three (3) people: one supervisor member to administer the dye, and two checking downstream manholes (one for sanitary and one for storm). The supervisor will assist in all functions but with primary effort on data collection, logging, determination of dye testing schedule and tracking. Based on the circumstances at each location, additional people may be needed to monitor multiple locations.

Dye Testing: Drop dye in a suspected building's plumbing fixtures. Check for dye downstream of the testing location in manholes on the storm and sanitary systems to determine the sewer line connections. The time required for monitoring will vary, depending on flow in the lines that are tested. It is recommended that radios or cell phones be utilized to maintain contact during the dye test.

Identification of Illicit Discharges: Verbally notify the Department of Public Works Engineering Division within 24 hours of any confirmed illicit connection. Provide an Excel table listing the illicit discharge number, priority, manhole to manhole identification, total drainage area estimation, location, address, and description. The spreadsheet shall be provided each week and shall be cumulative with a final summary of all illicit discharges detected at the end of the project.

City of Hartford IDDE Program
Smoke Testing SOPs

Purpose of SOPs: Establish standard operating procedures for the use of smoke testing to detect illicit discharges to the Municipal Separate Storm Sewer System (MS4) as part of the City's Illicit Discharge Detection and Elimination (IDDE) Program consistent with the goals outlined in the Connecticut Department of Energy and Environmental Protection (DEEP) General Permit for the Discharge of Stormwater from Small MS4s and the City of Hartford Stormwater Management Plan.

Select Areas: Select areas for testing and produce detailed maps outlining the system's structures to determine total number of manholes and linear footage of storm mains. Determine the total number of Resident Addresses to notify for the door hanger count.

Schedule: Since smoke testing is a visual test, project timing is significant. Smoke will not be evident at night or in areas that are saturated. The optimal scheduling for smoke testing is during daylight in the dry season. Smoke testing should not commence until at least 72 hours following a rain event.

Notifications: Smoke testing requires public notification prior to conducting. The following notifications shall be made:

- Brief Mayor's office on dates, locations, purpose, and anticipated duration of testing prior to notifying affected residents.
- Notify the MDC, City of Hartford Fire Department, the City Emergency Communications Dispatch Center (911 Call Center) of the dates, locations, purpose, and anticipated duration of testing.
- Post public notification on the main page of the City's website.
- Hang door hangers at each residence 2-4 days prior to smoke testing a specific area. Door hanger design and construction must be pre-approved by the Director of Public Works.
- Provide Variable Message boards strategically placed throughout testing including major streets into the area and entrances into subdivisions.
- Send weekly updates to the Mayor's Office, MDC, Fire Department, and 911 Call Center.
- Notification of all parties of project completion.

Smoke Test Setup: Setup on every other manhole and smoke test no more than 400 ft both directions from setup (Total of 800 LF). This distance shall not be

exceeded unless written authorization and field verification is given that distances greater than a 400 ft radius are providing acceptable results.

Smoke Testing Crew: The smoke testing shall consist at a minimum of four (4) people: one member to man the machine, two (2) to walk and one supervisor. The supervisor will assist in all functions but with primary effort on data collection, logging, determination of smoke testing schedule and tracking.

Smoke Testing: Smoke will be turned on and remain on throughout the entire time of testing including the walkthrough for identification of illicit discharge and/or damaged storm drain infrastructure locations with flags as well as taking digital pictures for each flagged and numbered locations.

Identification of Illicit Discharges and/or Damaged Storm Drain Infrastructure: The walk through for locating of illicit discharges and/or damaged storm drain infrastructure will not begin until smoke is highly visible with a smoke plume emanating from the end of the setup location (maximum 400 ft radius) from the smoke testing machine. A colored locate flag should be dropped at the location of the illicit discharge and/or damaged storm drain infrastructure.

Illicit Discharge and/or Damaged Storm Drain Infrastructure Pictures: Once the area has been flagged, snap a digital picture (not less than 2 Megapixel with time and date stamp on the digital photograph) showing the smoke billowing from the location, flag, unique number, and physical features at or near the illicit discharge and/or damaged storm drain infrastructure. Pictures without smoke plume from the located illicit discharge and/or damaged storm drain infrastructure or missing visible unique number are unacceptable. Provide a self-standing sign (sandwich board) at each location with minimum 4” tall numbers physically located at each defect part of the picture. Numbering shall be consecutive, unique number per illicit discharge/damage, clearly visible in the picture and noted on the report, record drawings and summary spreadsheet.

Illicit Discharge and/or Damaged Storm Drain Infrastructure Reporting: Verbally notify the Department of Public Works Engineering Division within 24 hours of any confirmed illicit connection. The report for each illicit discharge and/or Damaged Storm Drain Infrastructure shall be a MS Word document containing the following information: name of smoke tester, date, time, address of defect, description of defect, manhole to manhole identification, digital photograph, priority rating of defect, Total Drainage Area estimation, footage smoked and map for exact location of defect. Note the map may be of an entire street with multiple defects shown. Weekly reports shall be provided in digital form. In addition, provide an

Excel table listing the defect number, priority, total drainage area estimation, location, address, and description of defect. The spreadsheet shall be provided each week with the reports and shall be cumulative with a final summary of all defects at the end of the project.

City of Hartford Department of Public Works
Street Sweeping Standard Operating Practices (SOPs)

Purpose of SOPs: Establish stormwater pollution prevention procedures for sweeping City-owned or operated streets and parking lots consistent with the following goals outlined in the Connecticut Department of Energy and Environmental Protection (DEEP) General Permit for the Discharge of Stormwater from Small Separate Storm Sewer Systems (MS4s) and the City of Hartford Stormwater Management Plan:

- Since the entire City of Hartford is located within the Urbanized Area of the MS4, all streets and parking lots shall be inspected, swept and/or cleaned (as necessary) with a minimum frequency of once per year in the spring following the cessation of winter maintenance activities.
- More frequent inspections, cleaning and/or sweeping of targeted areas determined by the City to have increased pollutant potential based on the presence of active construction activity or other potential pollutant sources.
- Identify such potential pollutant sources based upon surface inspections, catch basin cleaning or inspection results, land use, winter road deicing, impaired or TMDL waters or other relevant factors as determined by the City.
- If wet dust suppression is conducted, the use of water should be minimized such that a discharge of excess water to surface waters and/or the storm sewer system does not occur.
- For new and redeveloped municipal parking lots, evaluate options for reducing stormwater runoff to surface waters and/or the storm sewer system by installing pervious pavements and/or other measures to promote sheet flow of stormwater.
- Ensure the proper disposal of street sweepings in accordance with DEEP policies, guidance and regulations. Sweepings shall not be discharged back into the storm drain system and/or surface waters.

Street Sweeping Frequencies:

- Sweep all residential roadways twice per year, once in the spring after snow operations cease and once in the fall after the leaves have fallen.
- Sweep City-owned parking facilities once annually.
- Sweep behind City owned and operated garbage collection trucks on residential roadways, depending on availability of street sweepers.
- On a case-by-case basis, sweep streets identified by the Metropolitan District based on catch basin cleaning or inspection results.

Street Sweeping Storage and Disposal:

- When the hopper of a street sweeper is full, it is off-loaded at the City of Hartford Bulky Waste and Recycling Center (Transfer Station) located at 181 Liebert Road.
- Street sweepings are temporarily stored in a roll-off container.
- Regular pick-ups are scheduled with the waste services provider to dispose of the street sweepings as Construction and Demolition waste.

Stormwater Ownership & Outfalls
City of Hartford

DRAFT

BLOOMFIELD

WINDSOR

WEST HARTFORD

WETHERSFIELD

SOUTH WINDSOR

EAST HARTFORD

HARTFORD

RIVER

CONNECTICUT

Legend

MDC STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

PRIVATE STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

STATE/ARMY CORP/OTHER STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

CITY OF HARTFORD STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

CITY OF WEST HARTFORD STORM SEWERS
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

STORM SEWERS - OWNER UNKNOWN
- DIAM. 6" TO 21"
- DIAM. 24" AND LARGER

OUTFALLS
- CSO OUTFALL
- MDC STORM OUTFALL
- PRIVATE STORM OUTFALL
- CITY OF HARTFORD STORM OUTFALL
- STATE/ARMY CORP/OTHER STORM OUTFALL

XXX NPDES DISCHARGE NUMBER

? RAIN GAUGE LOCATION

MDC CWP SEWER SEPARATION PROJECTS, STORM - TBD

DRAINAGE DISTRICT

Feet
800 400 0 800 1,600 2,400 3,200 4,000 4,800 5,600

MDC
PREPARED BY
GIS SERVICES
THE METROPOLITAN DISTRICT
555 MAIN STREET
HARTFORD, CT 06142-0800
www.themdc.org

11-25-2019

D:\hartford\projects\stormwtr_ph2\Hartford_Stormwater_11252019.mxd

Sweeping Petroleum Contaminated Material:

- If using the street sweepers to clean up petroleum contaminated spill material (vehicle accident, spills around fuel islands or leaking hydraulic equipment, etc.), make sure that the hopper is empty of materials from regular maintenance activities.
- Empty spill clean-up material into a DOT approved drum prior to resuming regular maintenance activities. The Spill Coordinator will arrange for transportation and disposal in accordance with hazardous waste regulations.
- Spill clean-up material shall not be combined with street sweepings in roll-off at the Transfer Station.

Employee Training:

- Provide On-the-Job Training to City employees for street sweeping operations.
- Provide operational employees stormwater management training annually that includes discussion of the City's MS4 system and how to identify illicit discharges as well as a review of the DPW Yard Stormwater Pollution Prevention Plan including BMPs for material storage and handling.

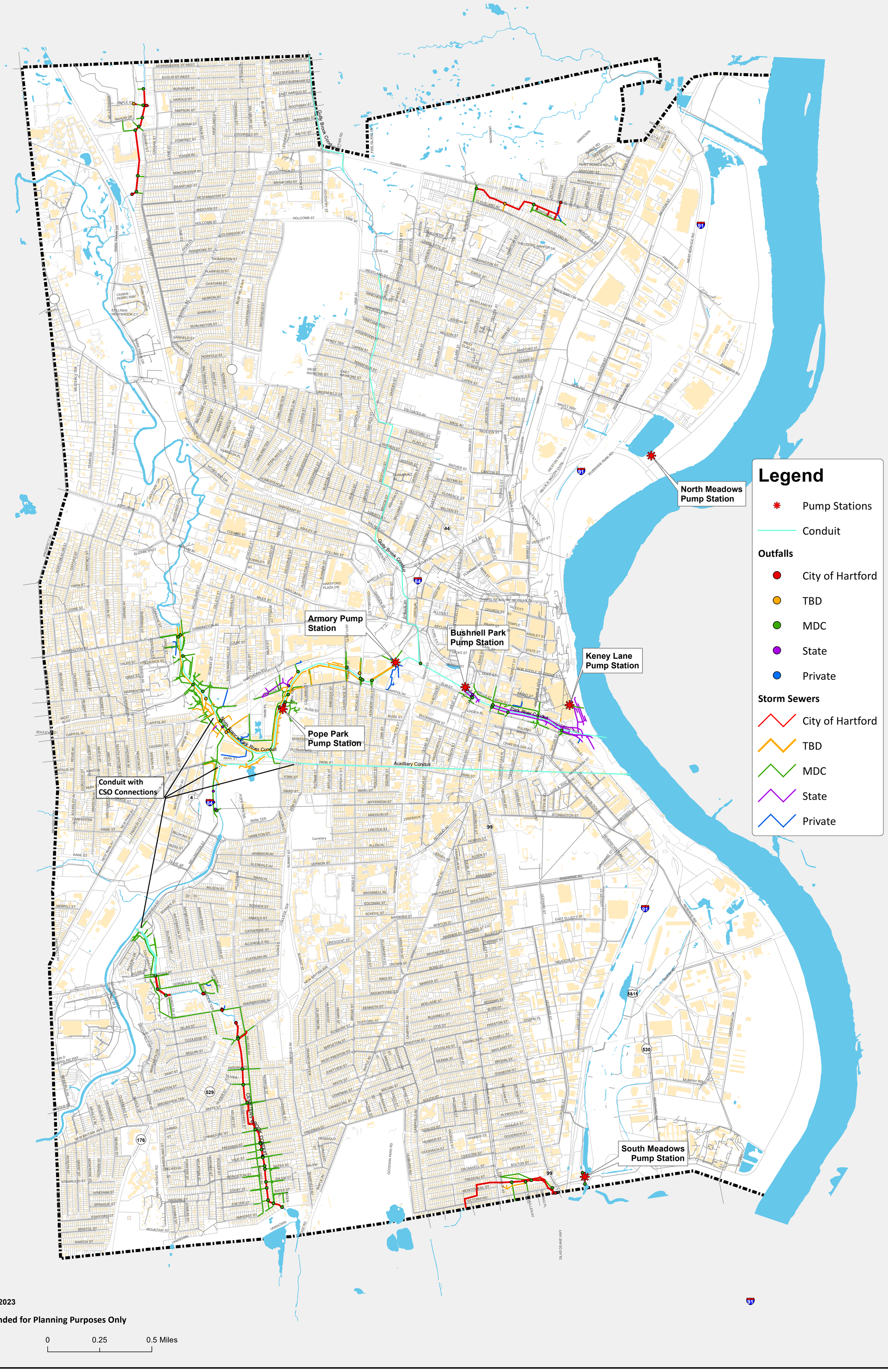
Record Keeping:

- Maintain daily sweeping log of the roads swept and the amount of street sweeping material collected.
- Document results of the sweeping program in the SWMP Annual Report including, at a minimum:
    - A summary of inspection results,
    - Curb miles swept, dates of cleaning,
    - Volume or mass of material collected, and method(s) of reuse or disposal.
    - Any runoff reduction measures implemented.

City of Hartford, CT

Stormwater Management Program

City-Owned Drainage System

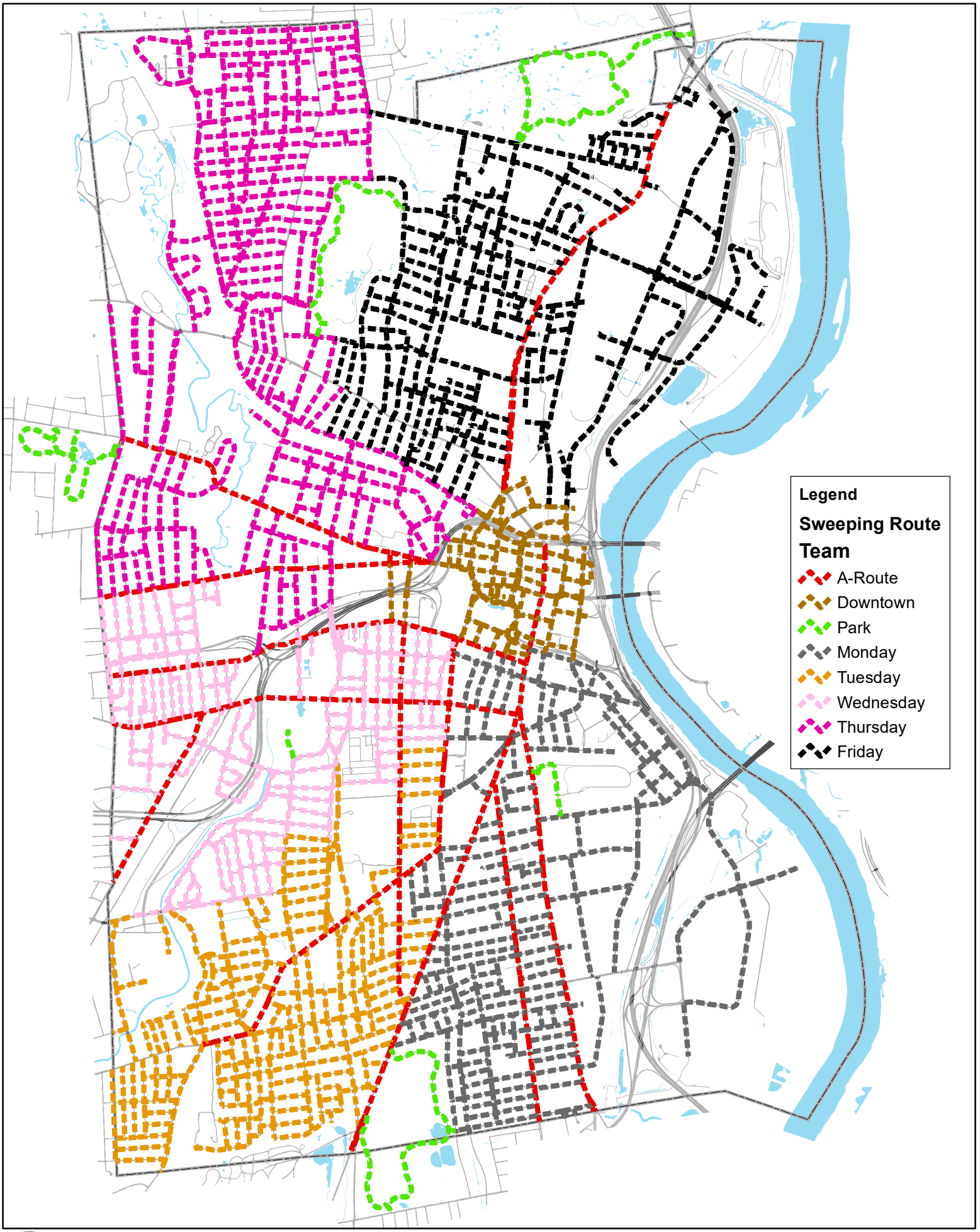


DRAFT

Issue Date: 4/19/2023

This Map is Intended for Planning Purposes Only

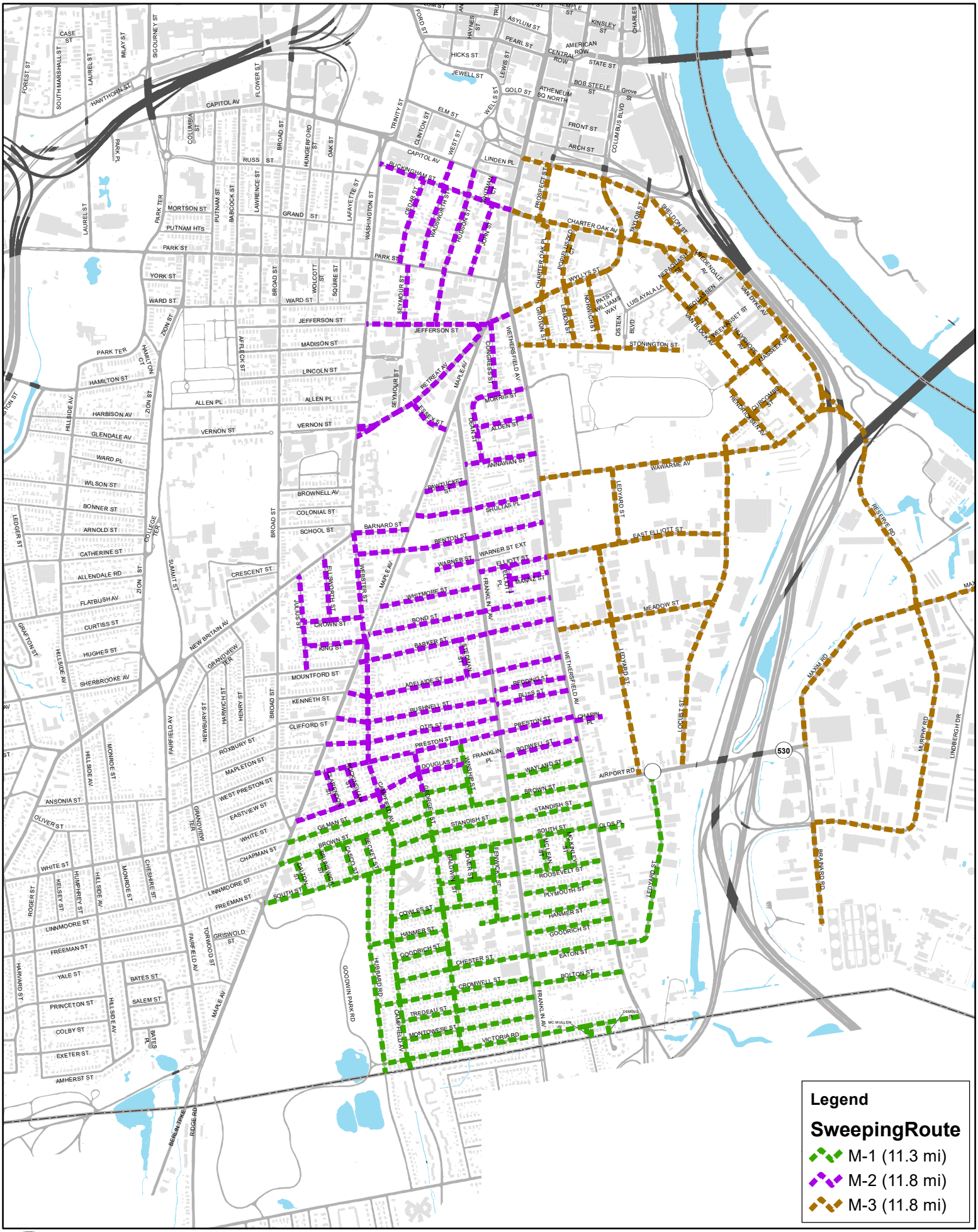
0 0.25 0.5 Miles



Sweeping Routes

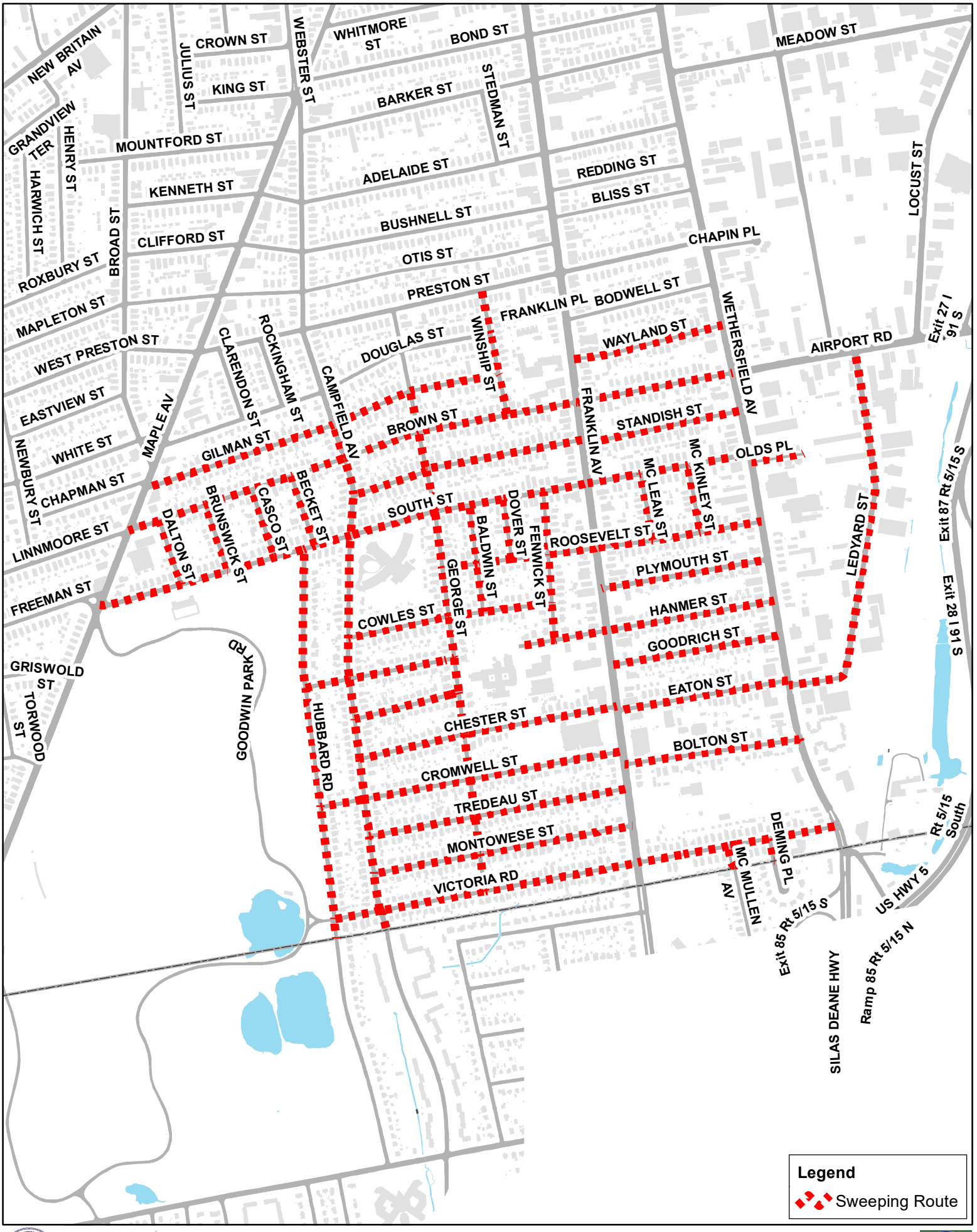
0 0.5 1 Miles

Date: 9/16/2022



Sweeping Routes - Monday

Date: 9/16/2022



Monday: District M-1

1 in = 866 feet

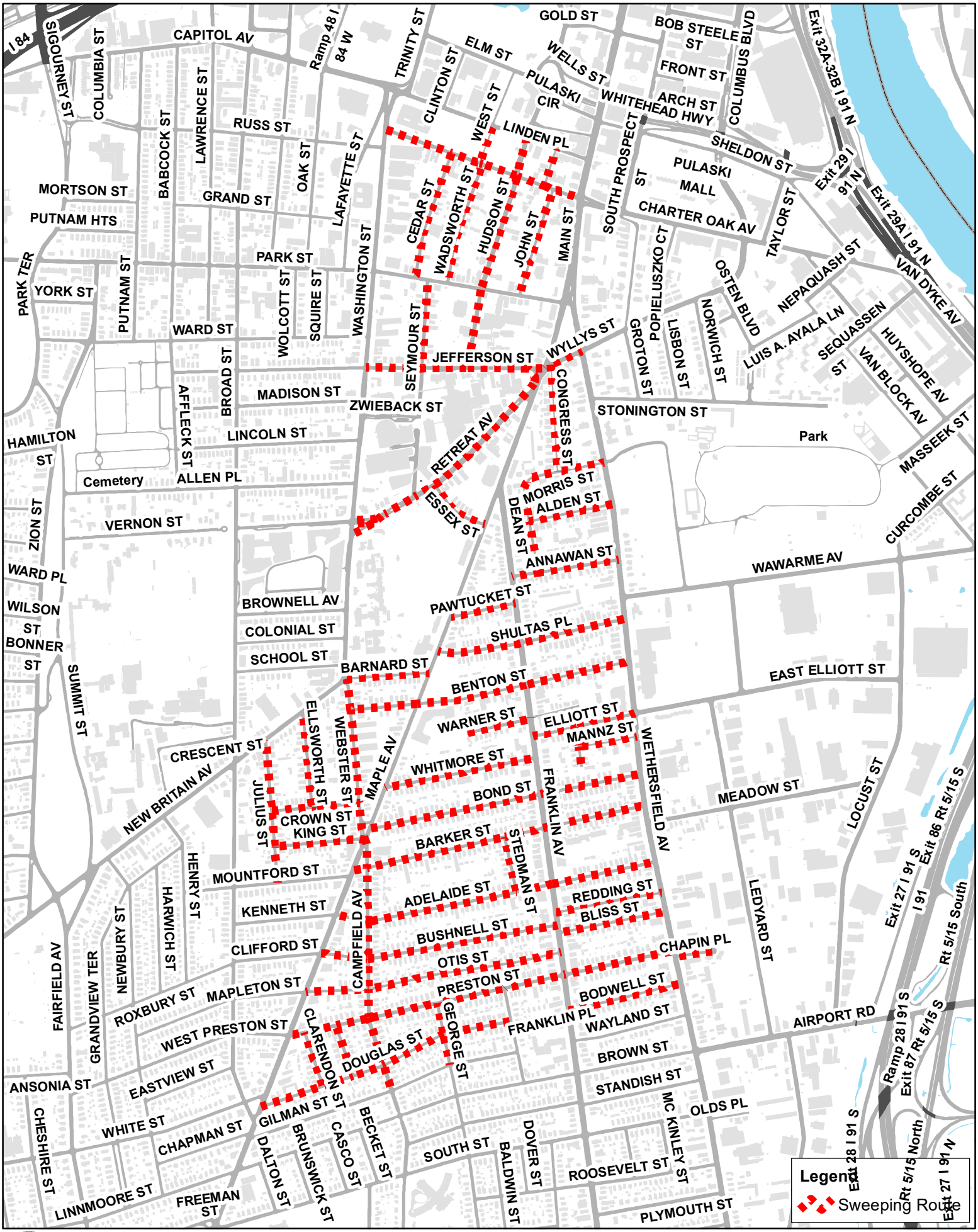
Date: 9/16/2022

District: M-1

	Street Name	Miles
1	BALDWIN ST	0.15
2	BECKET ST	0.1
3	BOLTON ST	0.24
4	BROWN ST	0.87
5	BRUNSWICK ST	0.1
6	CAMPFIELD AV	0.69
7	CASCO ST	0.1
8	CHESTER ST	0.36
9	COWLES ST	0.28
10	CROMWELL ST	0.42
11	DALTON ST	0.09
12	DOVER ST	0.08
13	EATON ST	0.24
14	FENWICK ST	0.21
15	GEORGE ST	0.7
16	GILMAN ST	0.5
17	GOODRICH ST	0.37
18	HANMER ST	0.55
19	HUBBARD RD	0.53
20	LEDYARD ST	0.52
21	MC KINLEY ST	0.09
22	MC LEAN ST	0.09
23	MC MULLEN AV	0.06
24	MONTOWESE ST	0.36

District: M-1

25	OLDS PL	0.07
26	PLYMOUTH ST	0.23
27	ROOSEVELT ST	0.45
28	SOUTH ST	0.94
29	STANDISH ST	0.54
30	TREDEAU ST	0.36
31	VICTORIA RD	0.68
32	WAYLAND ST	0.21
33	WETHERSFIELD AV	0
34	WINSHIP ST	0.18
	Total Miles:	**11.36**



Monday: District M-2

1 in = 1,143 feet

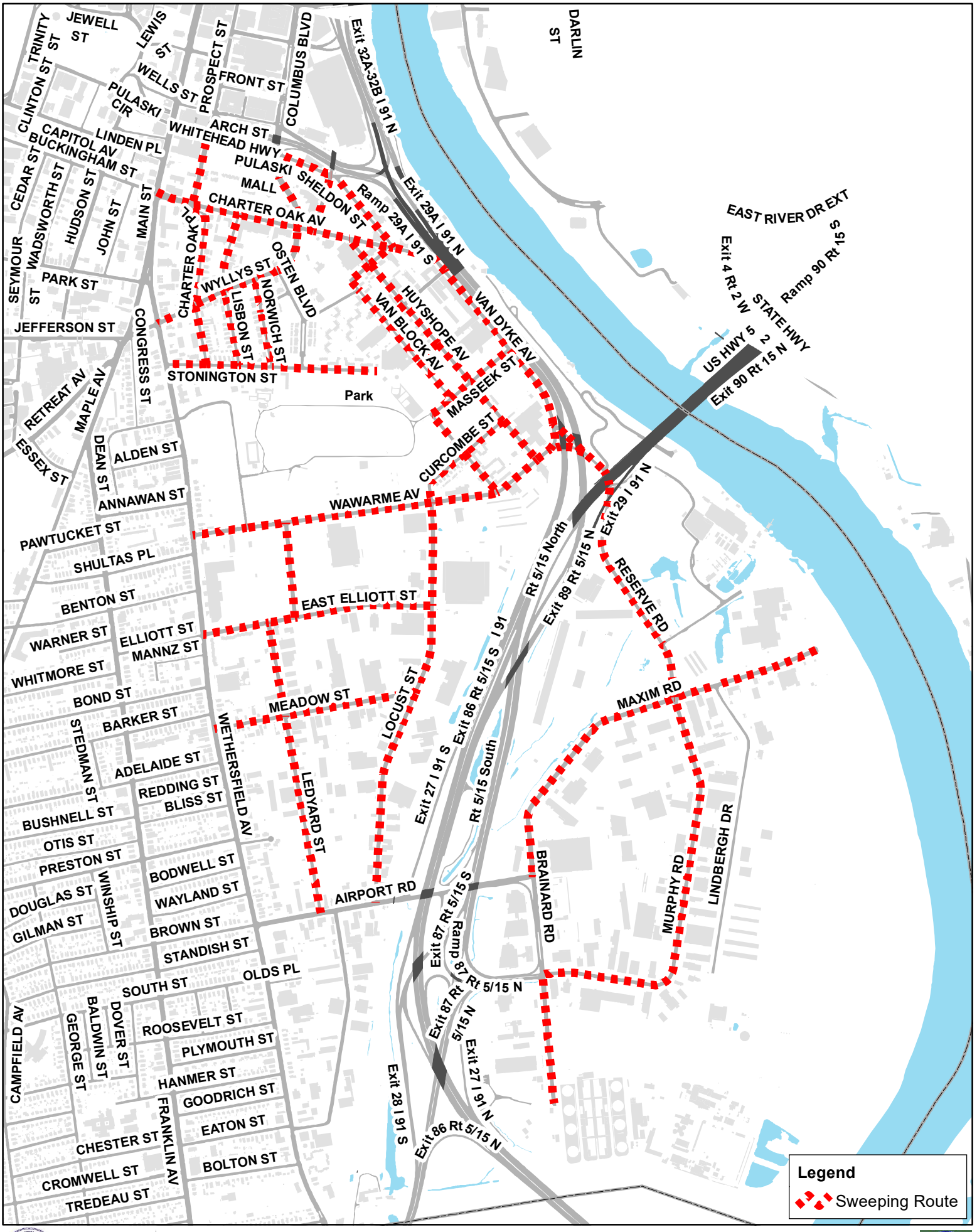
Date: 9/16/2022

District: M-2

	Street Name	Miles
1	ADELAIDE ST	0.59
2	ALDEN ST	0.15
3	ANNAWAN ST	0.2
4	BARKER ST	0.53
5	BARNARD ST	0.15
6	BENTON ST	0.51
7	BLISS ST	0.2
8	BODWELL ST	0.21
9	BOND ST	0.49
10	BUCKINGHAM ST	0.38
11	BUSHNELL ST	0.43
12	CAMPFIELD AV	0.46
13	CEDAR ST	0.23
14	CHAPIN PL	0.08
15	CLARENDON ST	0.1
16	CONGRESS ST	0.19
17	CROWN ST	0.15
18	DEAN ST	0.16
19	DOUGLAS ST	0.48
20	ELLIOTT PL	0.08
21	ELLIOTT ST	0.19
22	ELLSWORTH ST	0.17
23	ESSEX ST	0.12
24	FRANKLIN AV	0

District: M-2

25	GEORGE ST	0.12
26	HUDSON ST	0.42
27	JEFFERSON ST	0.32
28	JOHN ST	0.2
29	JULIUS ST	0.26
30	KING ST	0.16
31	MANNZ ST	0.11
32	MORRIS ST	0.15
33	OTIS ST	0.46
34	PAWTUCKET ST	0.12
35	PRESTON ST	0.71
36	REDDING ST	0.19
37	RETREAT AV	0.55
38	ROCKINGHAM ST	0.1
39	SEYMOUR ST	0.16
40	SHULTAS PL	0.34
41	STEDMAN ST	0.1
42	WADSWORTH ST	0.22
43	WARNER ST	0.12
44	WEBSTER ST	0.3
45	WEST ST	0.07
46	WHITMAN CT	0.07
47	WHITMORE ST	0.28
48	WYLLYS ST	0.07
	Total Miles:	**11.85**



Monday: District M-3

1 in = 1,326 feet

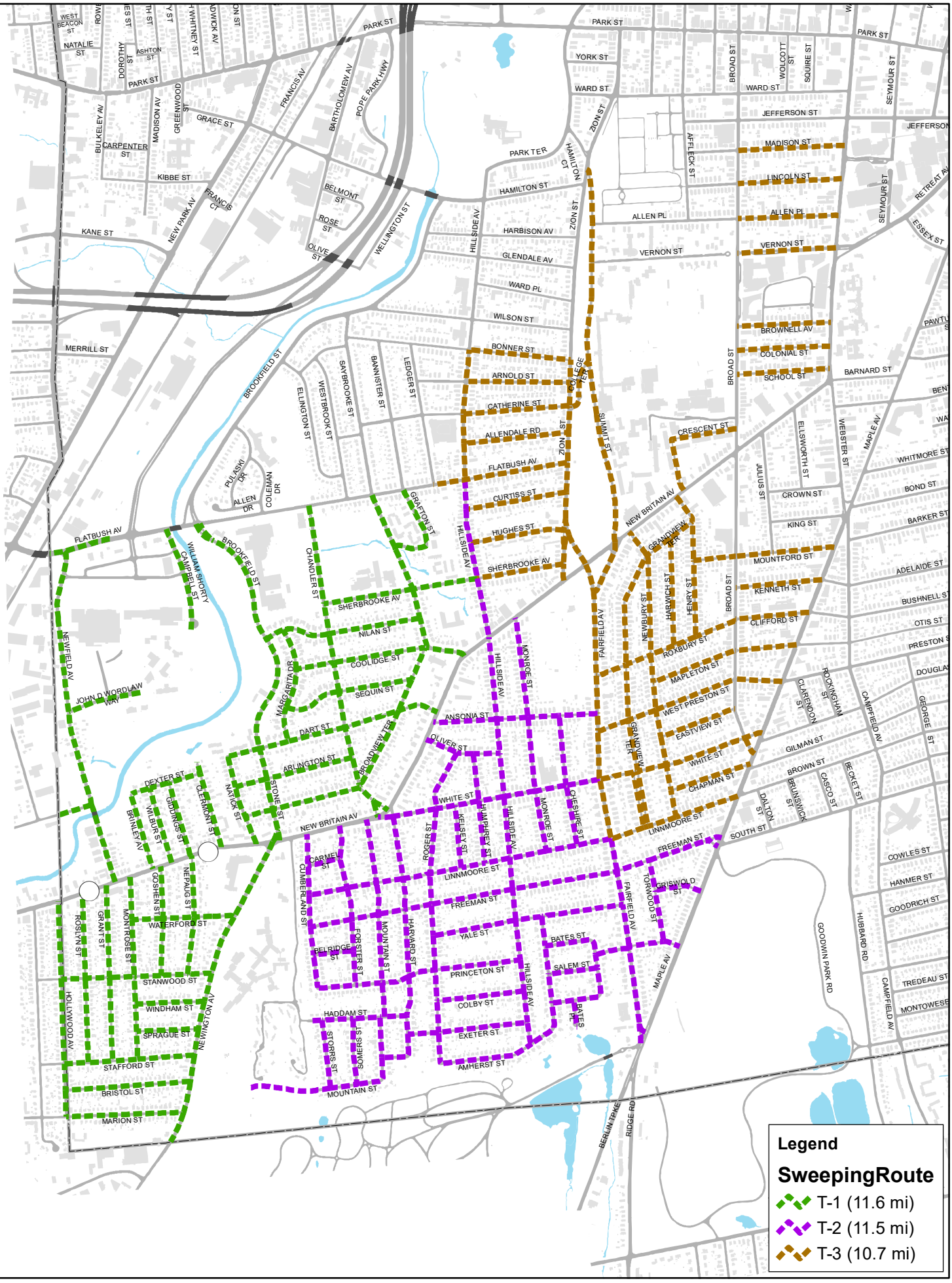
Date: 9/16/2022

District: M-3

	Street Name	Miles
1	BRAINARD RD	0.55
2	CHARTER OAK AV	0.52
3	CHARTER OAK PL	0.23
4	COLUMBUS BLVD	0.17
5	CURCOMBE ST	0.25
6	EAST ELLIOTT ST	0.49
7	GROTON ST	0.13
8	HENDRICXSEN AV	0.22
9	HUYSHOPE AV	0.62
10	LEDYARD ST	0.82
11	LISBON ST	0.16
12	LOCUST ST	0.86
13	MASSEEK ST	0.21
14	MAXIM RD	0.72
15	MEADOW ST	0.43
16	MURPHY RD	0.87
17	NEPAQUASH ST	0.1
18	NORWICH ST	0.19
19	POPIELUSZKO CT	0.16
20	PROSPECT ST	0.15
21	RESERVE RD	0.74
22	SEQUASSEN ST	0.05
23	SHELDON ST	0.55
24	STONINGTON ST	0.44

District: M-3

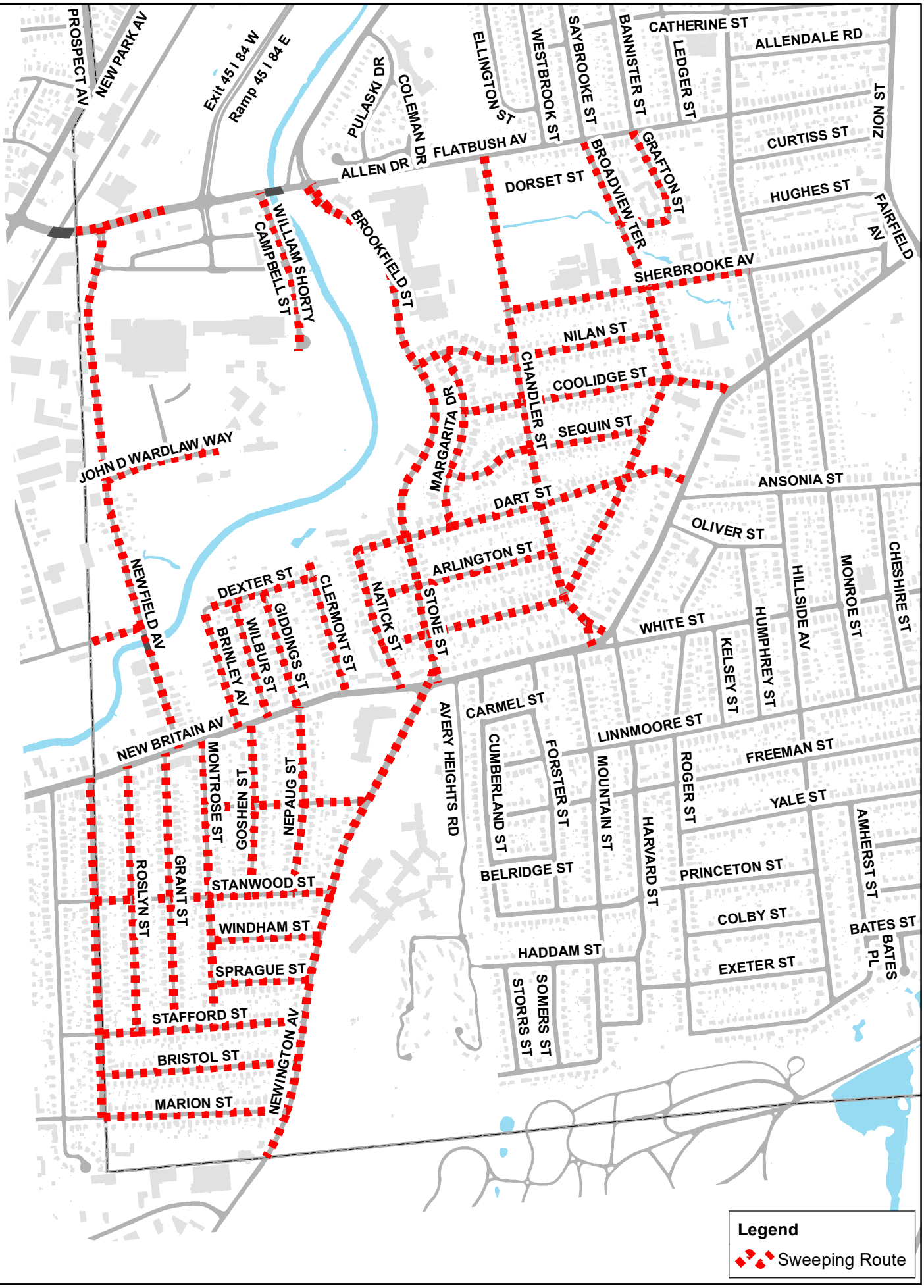
25	TAYLOR ST	0.12
26	VAN BLOCK AV	0.33
27	VAN DYKE AV	0.57
28	WAWARME AV	0.79
29	WEEHASSET ST	0.05
30	WYLLYS ST	0.39
	Total Miles:	**11.88**



Sweeping Routes - Tuesday

0 0.1 0.2 Miles

Date: 9/16/2022



Tuesday: District T-1

1 in = 899 feet

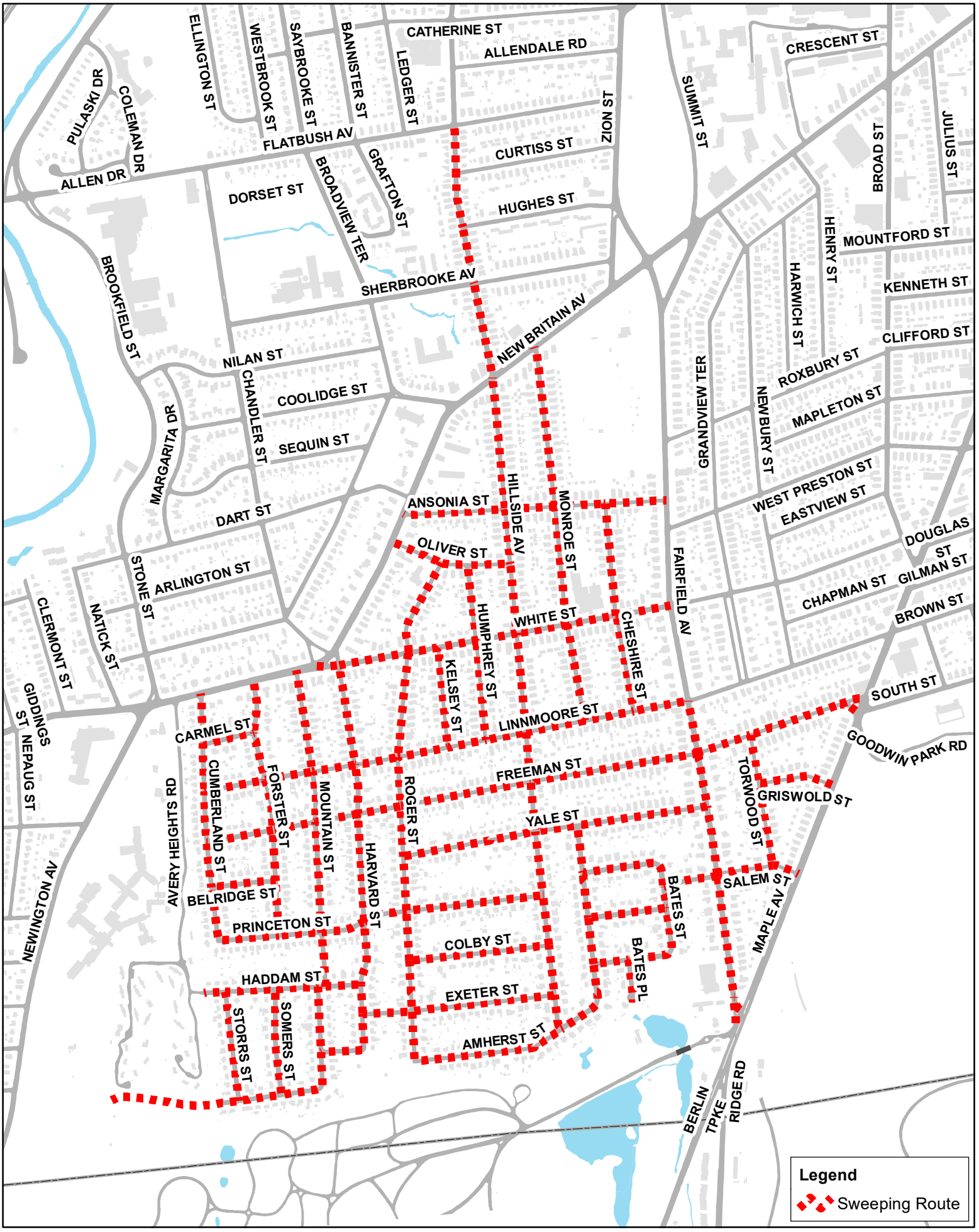
Date: 9/16/2022

District: T-1

	Street Name	Miles
1	ARLINGTON ST	0.26
2	BRINLEY AV	0.17
3	BRISTOL ST	0.27
4	BROADVIEW TER	0.91
5	BROOKFIELD ST	0.59
6	CHANDLER ST	0.73
7	CLERMONT ST	0.18
8	COOLIDGE ST	0.36
9	DART ST	0.46
10	DEXTER ST	0.22
11	FLATBUSH AV	0.13
12	GIDDINGS ST	0.16
13	GOSHEN ST	0.23
14	GRAFTON ST	0.2
15	GRANT ST	0.38
16	MARGARITA DR	0.25
17	MARION ST	0.25
18	MONTROSE ST	0.39
19	NATICK ST	0.2
20	NEPAUG ST	0.25
21	NEWFIELD AV	0.73
22	NEWINGTON AV	0.69
23	NILAN ST	0.34
24	ROSLYN ST	0.36

District: T-1

25	SEQUIN ST	0.28
26	SHERBROOKE AV	0.33
27	SPRAGUE ST	0.13
28	STAFFORD ST	0.27
29	STANWOOD ST	0.32
30	STONE ST	0.23
31	WATERFORD ST	0.23
32	WILBUR ST	0.16
33	WINDHAM ST	0.15
	Total Miles:	**10.81**



Tuesday: District T-2

1 in = 843 feet

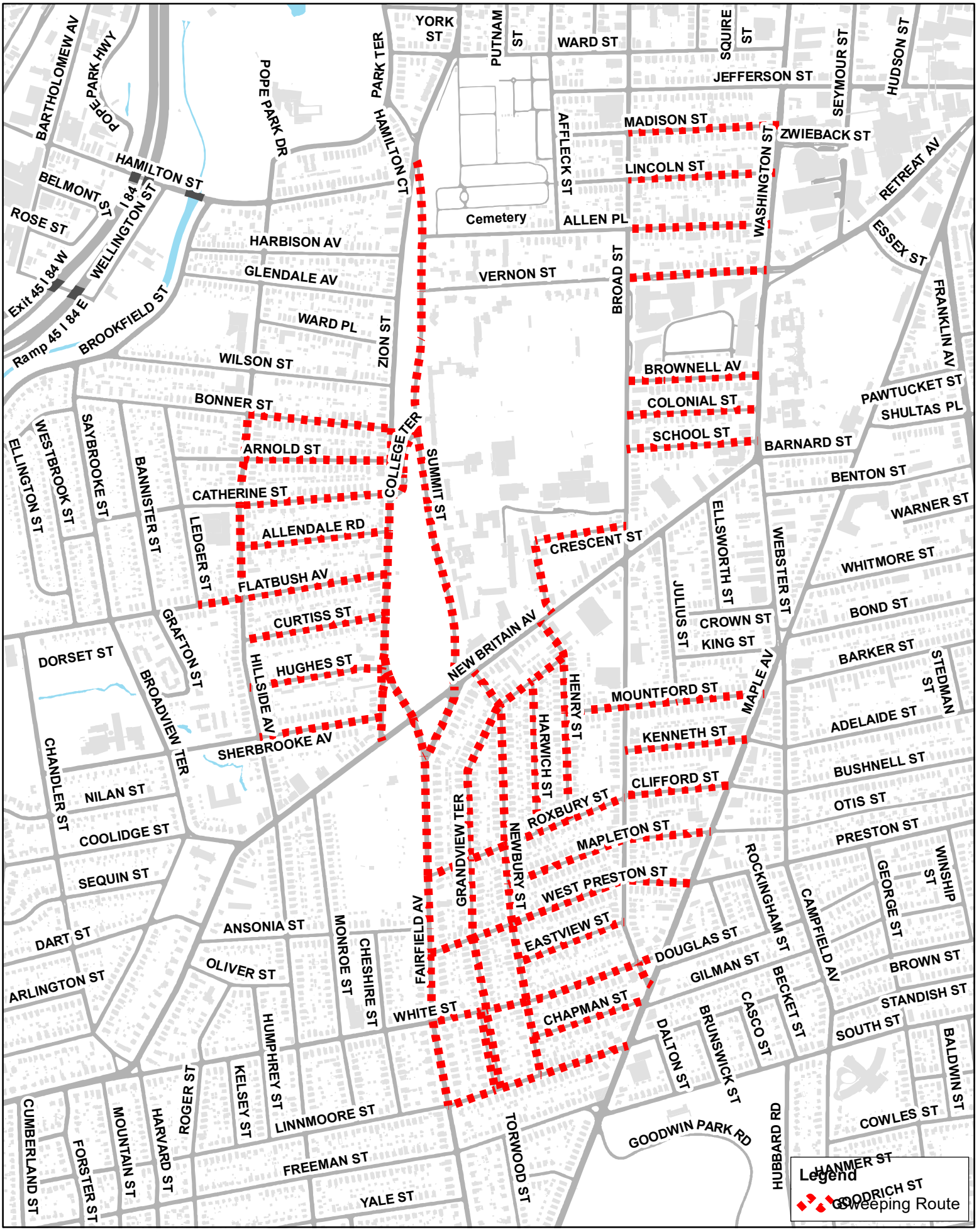
Date: 9/16/2022

District: T-2

	Street Name	Miles
1	AMHERST ST	0.49
2	ANSONIA ST	0.34
3	BATES PL	0.06
4	BATES ST	0.33
5	BELRIDGE ST	0.09
6	CARMEL ST	0.07
7	CHESHIRE ST	0.27
8	COLBY ST	0.19
9	CUMBERLAND ST	0.33
10	EXETER ST	0.26
11	FAIRFIELD AV	0.45
12	FORSTER ST	0.34
13	FREEMAN ST	0.93
14	GRISWOLD ST	0.1
15	HADDAM ST	0.22
16	HARVARD ST	0.56
17	HILLSIDE AV	1.21
18	HUMPHREY ST	0.23
19	KELSEY ST	0.13
20	LINNMOORE ST	0.65
21	MONROE ST	0.5
22	MOUNTAIN ST	0.85
23	OLIVER ST	0.17
24	PRINCETON ST	0.44

District: T-2

25	ROGER ST	0.68
26	SALEM ST	0.28
27	SOMERS ST	0.14
28	STORRS ST	0.15
29	TORWOOD ST	0.18
30	WHITE ST	0.47
31	YALE ST	0.41
	Total Miles:	**11.52**



Tuesday: District T-3

1 in = 956 feet

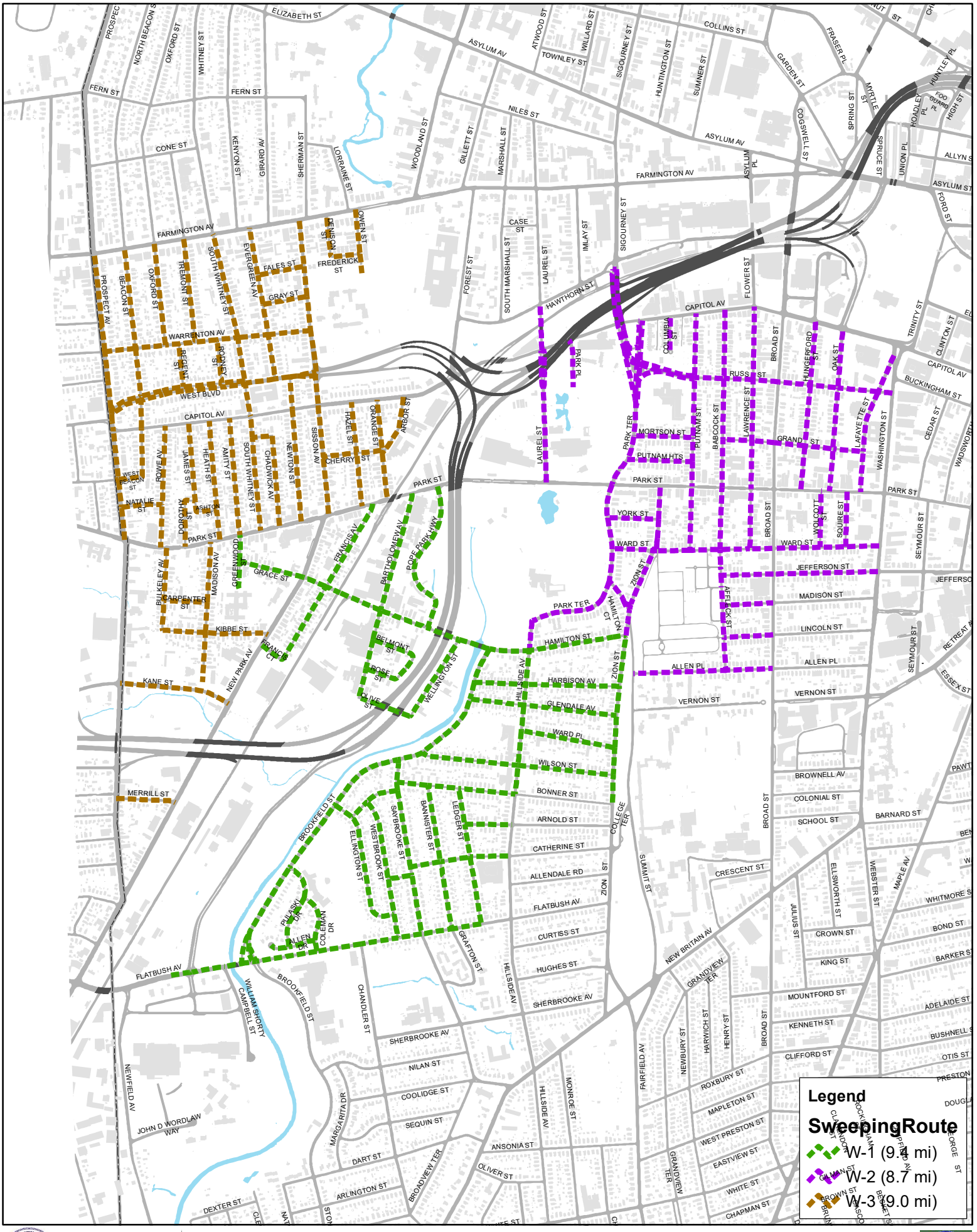
Date: 9/16/2022

District: T-3

	Street Name	Miles
1	ALLEN PL	0.21
2	ALLENDALE RD	0.22
3	ARNOLD ST	0.22
4	BONNER ST	0.22
5	BROAD ST	0.04
6	BROWNELL AV	0.2
7	CATHERINE ST	0.23
8	CHAPMAN ST	0.18
9	CLIFFORD ST	0.16
10	COLLEGE TER	0.12
11	COLONIAL ST	0.2
12	CRESCENT ST	0.25
13	CURTISS ST	0.22
14	EASTVIEW ST	0.17
15	FAIRFIELD AV	0.81
16	FLATBUSH AV	0.29
17	GRANDVIEW TER	0.83
18	HARWICH ST	0.23
19	HENRY ST	0.3
20	HILLSIDE AV	0.28
21	HUGHES ST	0.2
22	KENNETH ST	0.18
23	LINCOLN ST	0.22
24	LINNMOORE ST	0.28

District: T-3

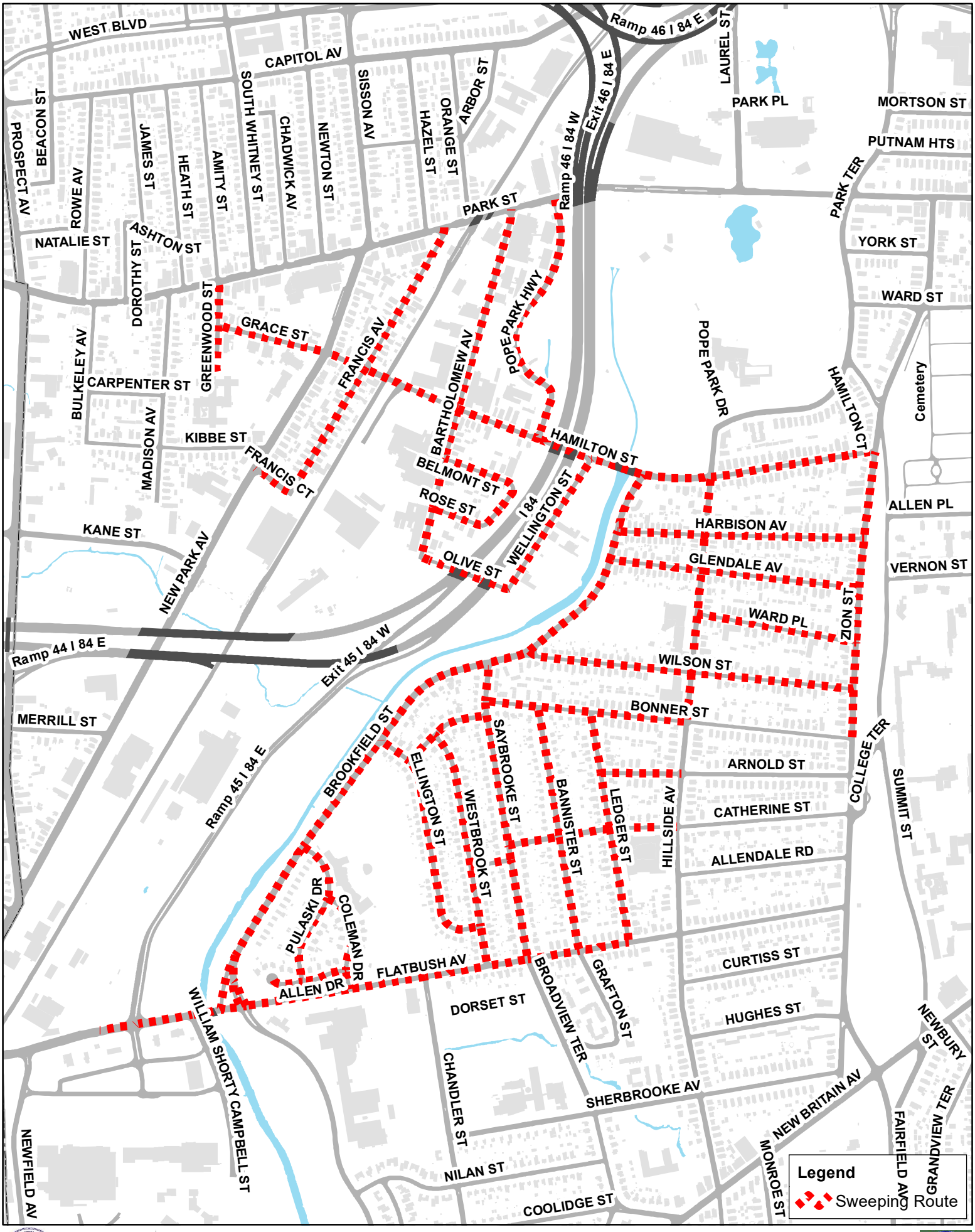
25	MADISON ST	0.23
26	MAPLETON ST	0.32
27	MOUNTFORD ST	0.3
28	NEWBURY ST	0.62
29	ROXBURY ST	0.32
30	SCHOOL ST	0.2
31	SHERBROOKE AV	0.19
32	SUMMIT ST	0.8
33	VERNON ST	0.21
34	WEST PRESTON ST	0.41
35	WHITE ST	0.36
36	ZION ST	0.5
	Total Miles:	**10.72**



Sweeping Routes - Wednesday

0 0.1 0.2 Miles

Date: 9/16/2022



Wednesday: District W-1

1 in = 826 feet

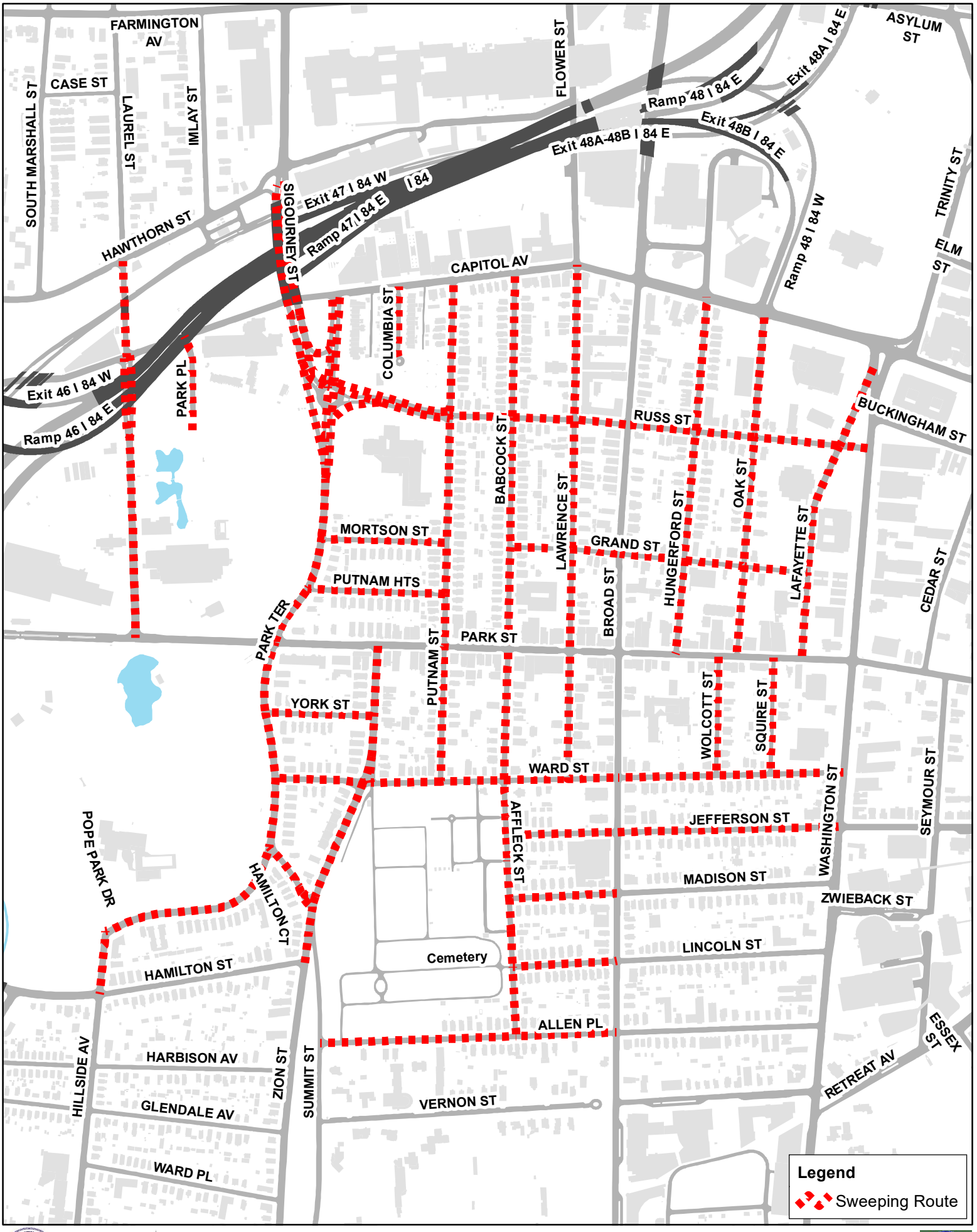
Date: 9/16/2022

District: W-1

	Street Name	Miles
1	ALLEN DR	0.1
2	ARNOLD ST	0.11
3	BANNISTER ST	0.32
4	BARTHOLOMEW AV	0.49
5	BELMONT ST	0.13
6	BONNER ST	0.38
7	BROOKFIELD ST	1.04
8	CATHERINE ST	0.28
9	COLEMAN DR	0.14
10	ELLINGTON ST	0.32
11	FLATBUSH AV	0.69
12	FRANCIS AV	0.38
13	FRANCIS CT	0.07
14	GLENDALE AV	0.33
15	GRACE ST	0.15
16	GREENWOOD ST	0.12
17	HAMILTON ST	0.74
18	HARBISON AV	0.32
19	HILLSIDE AV	0.33
20	LEDGER ST	0.3
21	OLIVE ST	0.11
22	POPE PARK HWY	0.35
23	PULASKI DR	0.2
24	ROSE ST	0.1

District: W-1

25	SAYBROOKE ST	0.39
26	WARD PL	0.21
27	WELLINGTON ST	0.2
28	WESTBROOK ST	0.31
29	WILSON ST	0.42
30	ZION ST	0.36
	Total Miles:	**9.39**



Wednesday: District W-2

1 in = 663 feet

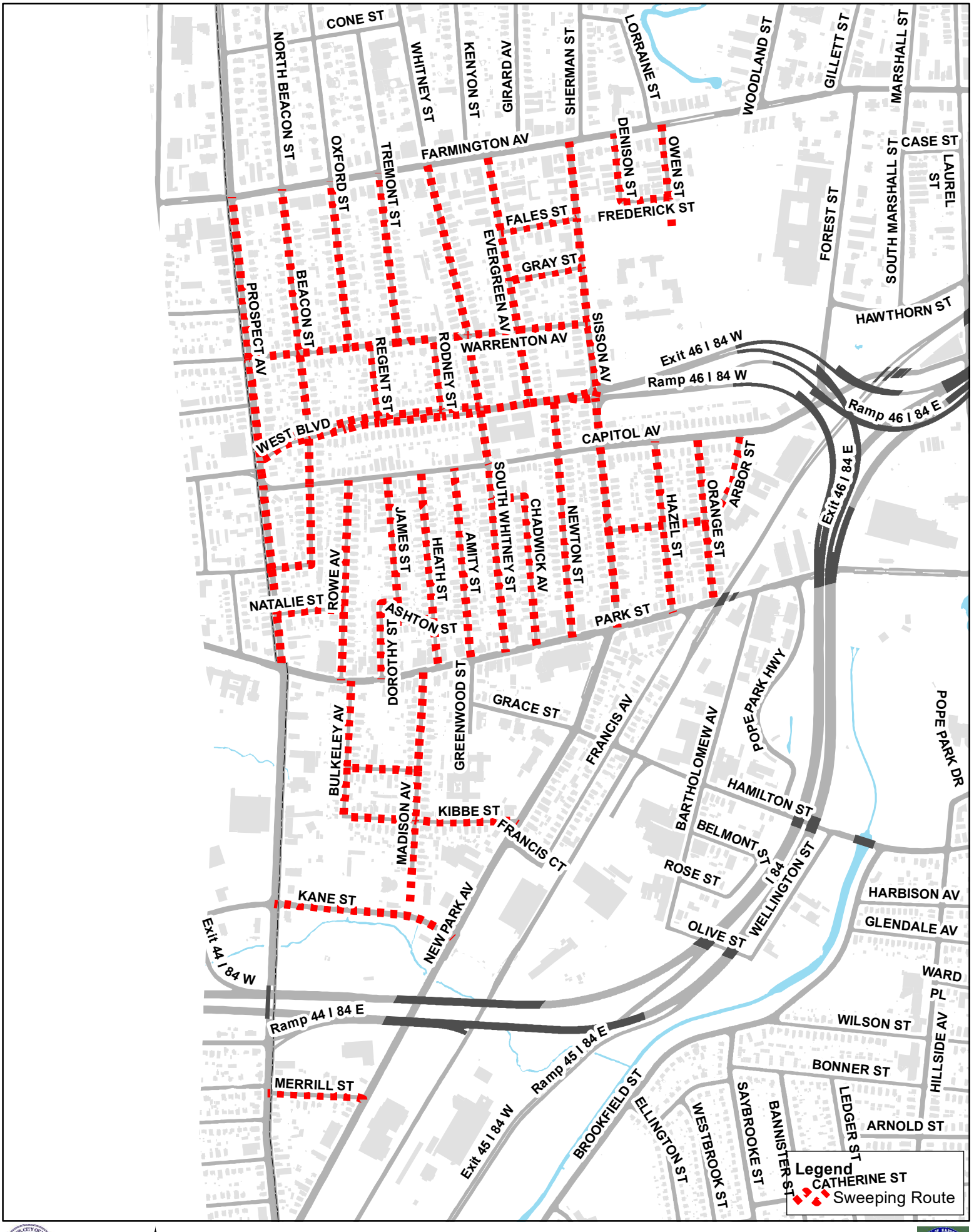
Date: 9/16/2022

District: W-2

	Street Name	Miles
1	AFFLECK ST	0.41
2	ALLEN PL	0.3
3	BABCOCK ST	0.39
4	COLUMBIA ST	0.07
5	GRAND ST	0.31
6	HAWTHORN ST	0.01
7	HILLSIDE AV	0.07
8	HUNGERFORD ST	0.37
9	JEFFERSON ST	0.35
10	LAFAYETTE ST	0.32
11	LAUREL ST	0.48
12	LAWRENCE ST	0.53
13	LINCOLN ST	0.11
14	MADISON ST	0.11
15	MORTSON ST	0.13
16	OAK ST	0.36
17	PARK PL	0.11
18	PARK TER	0.99
19	PUTNAM HTS	0.14
20	PUTNAM ST	0.51
21	RUSS ST	0.74
22	SIGOURNEY ST	0.6
23	SQUIRE ST	0.12
24	SUMMIT ST	0.1

District: W-2

25	WARD ST	0.6
26	WOLCOTT ST	0.12
27	YORK ST	0.11
28	ZION ST	0.37
	Total Miles:	**8.83**



Wednesday: District W-3

1 in = 852 feet

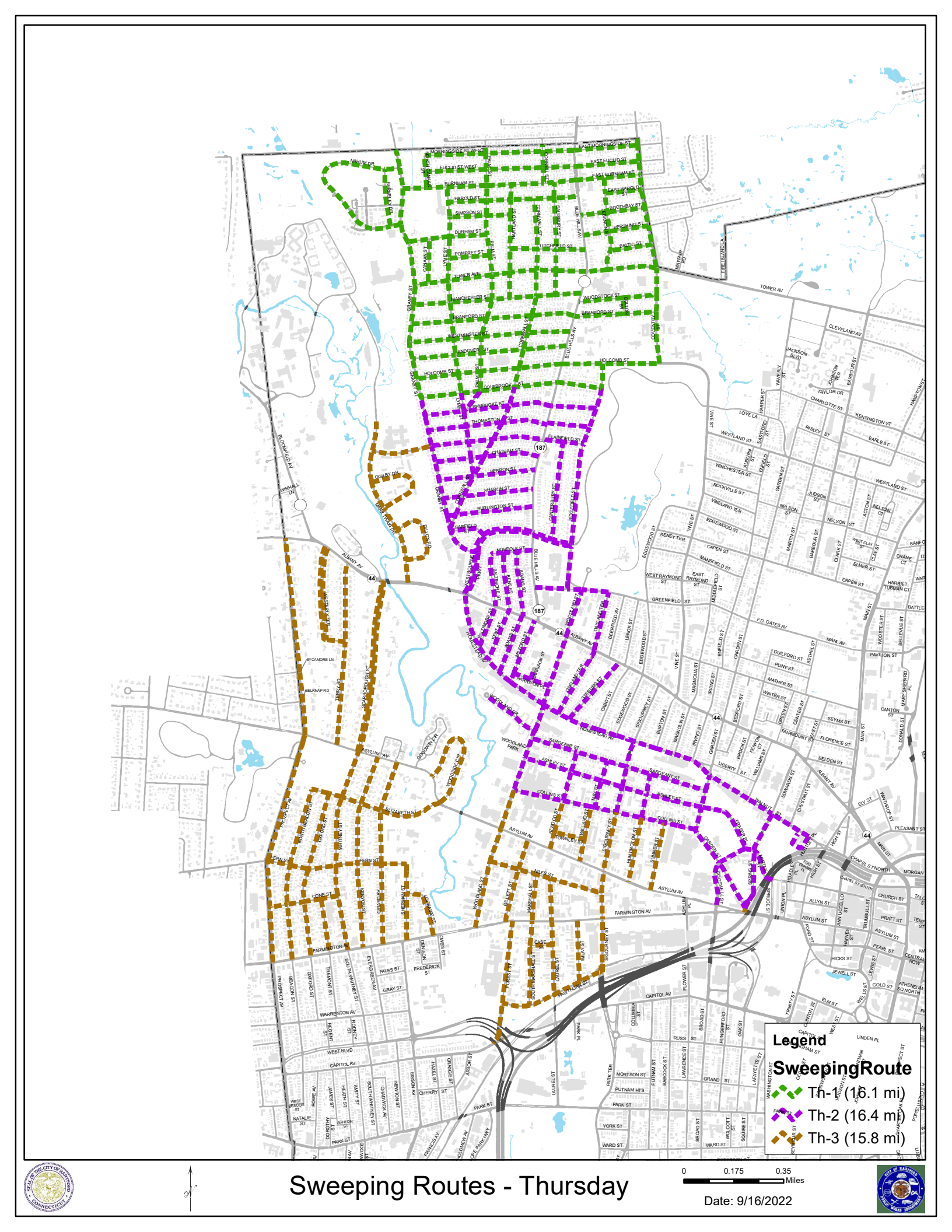
Date: 9/16/2022

District: W-3

	Street Name	Miles
1	AMITY ST	0.26
2	ARBOR ST	0.13
3	ASHTON ST	0.07
4	BEACON ST	0.56
5	BULKELEY AV	0.19
6	CARPENTER ST	0.1
7	CHADWICK AV	0.24
8	CHERRY ST	0.13
9	DENISON ST	0.09
10	DOROTHY ST	0.12
11	EVERGREEN AV	0.35
12	FALES ST	0.1
13	FREDERICK ST	0.06
14	GRAY ST	0.1
15	HAZEL ST	0.23
16	HEATH ST	0.27
17	JAMES ST	0.17
18	KANE ST	0.25
19	KIBBE ST	0.23
20	MADISON AV	0.31
21	MERRILL ST	0.13
22	NATALIE ST	0.09
23	NEWTON ST	0.32
24	ORANGE ST	0.22

District: W-3

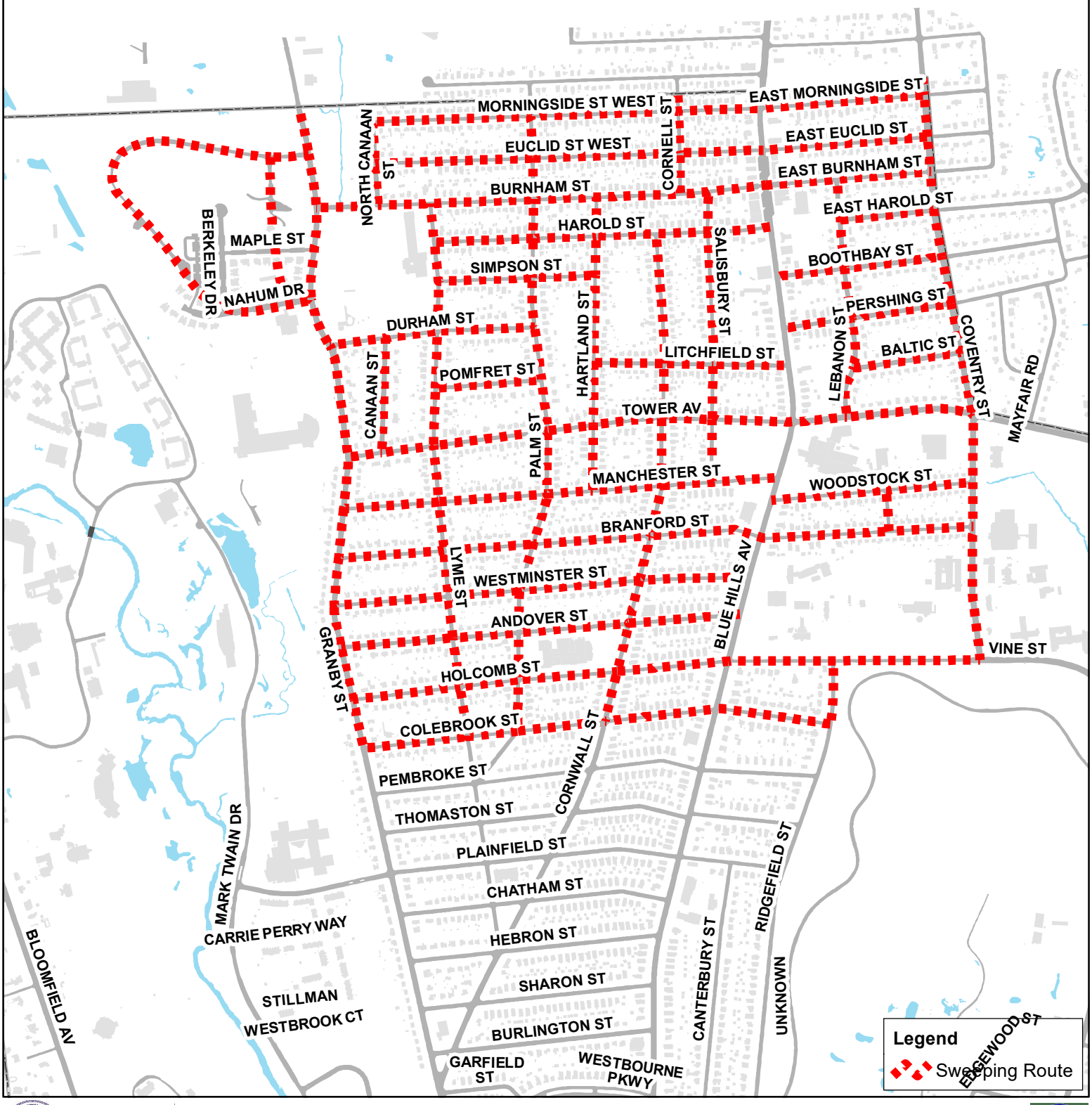
25	OWEN ST	0.04
26	OXFORD ST	0.23
27	PROSPECT AV	0.61
28	REGENT ST	0.1
29	RODNEY ST	0.1
30	ROWE AV	0.26
31	SISSON AV	0.66
32	SOUTH WHITNEY ST	0.68
33	TREMONT ST	0.23
34	WARRENTON AV	0.48
35	WEST BLVD	0.81
	Total Miles:	**8.92**



Sweeping Routes - Thursday

0 0.175 0.35 Miles

Date: 9/16/2022



Thursday: District Th-1

1 in = 965 feet

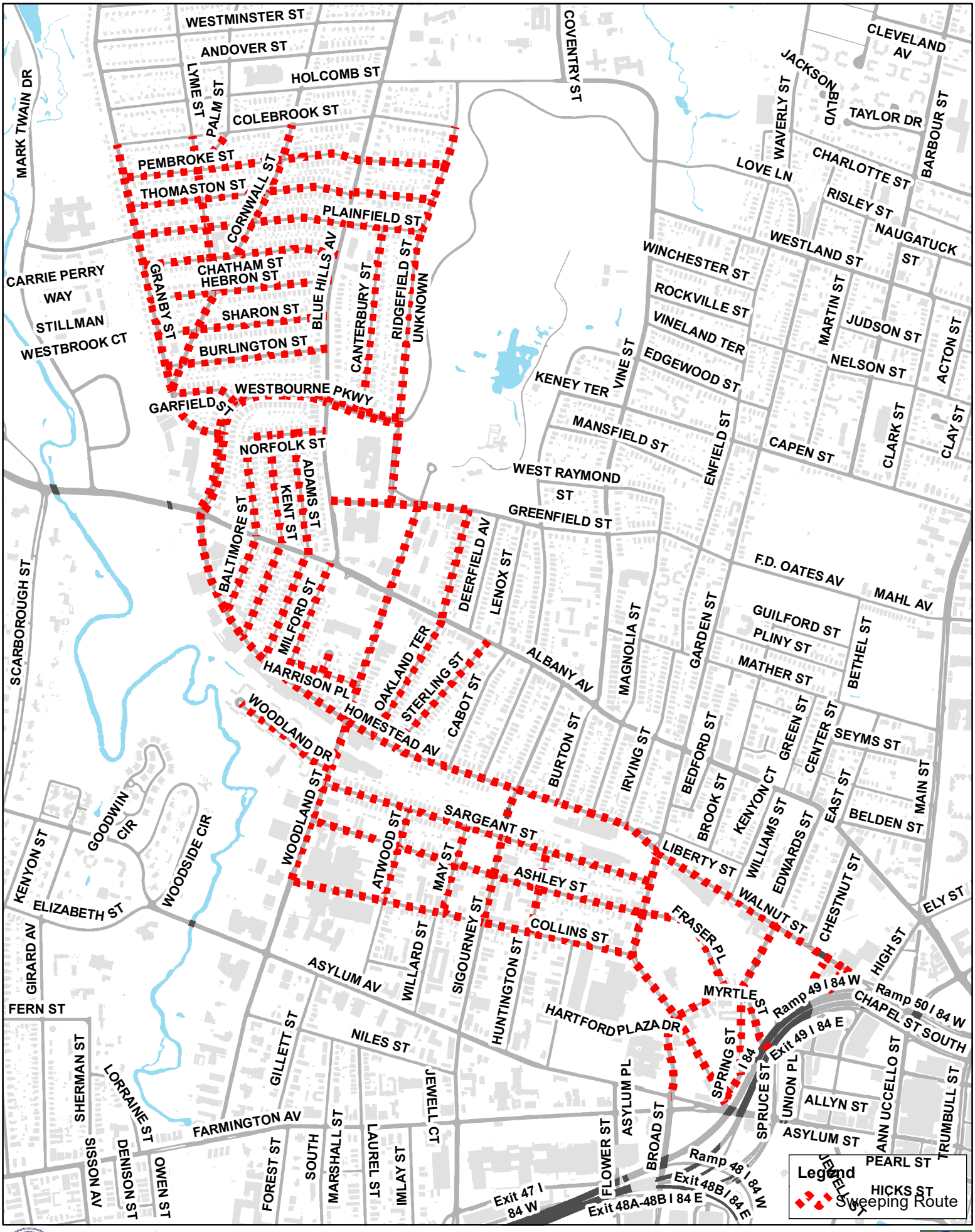
Date: 9/16/2022

District: Th-1

	Street Name	Miles
1	ANDOVER ST	0.54
2	BALTIC ST	0.15
3	BERKELEY DR	0.2
4	BOOTHBAY ST	0.22
5	BRANFORD ST	0.85
6	BURNHAM ST	0.6
7	CANAAN ST	0.16
8	COLEBROOK ST	0.64
9	COLTON ST	0.06
10	CORNELL ST	0.14
11	CORNWALL ST	0.67
12	COVENTRY ST	0.78
13	DURHAM ST	0.28
14	EAST BURNHAM ST	0.23
15	EAST EUCLID ST	0.22
16	EAST HAROLD ST	0.13
17	EAST MORNINGSIDE ST	0.22
18	EUCLID ST WEST	0.52
19	GRANBY ST	0.89
20	HAROLD ST	0.46
21	HARTLAND ST	0.39
22	HOLCOMB ST	0.85
23	LEBANON ST	0.33
24	LITCHFIELD ST	0.27

District: Th-1

25	LYME ST	0.74
26	MANCHESTER ST	0.59
27	MORNINGSIDE ST WEST	0.52
28	NAHUM DR	0.65
29	NORTH CANAAN ST	0.12
30	PALM ST	0.87
31	PERSHING ST	0.23
32	POMFRET ST	0.14
33	RIDGEFIELD ST	0.09
34	SALISBURY ST	0.39
35	SIMPSON ST	0.22
36	TOWER AV	0.85
37	WESTMINSTER ST	0.57
38	WOODSTOCK ST	0.28
	Total Miles:	**16.06**



Thursday: District Th-2

1 in = 1,188 feet

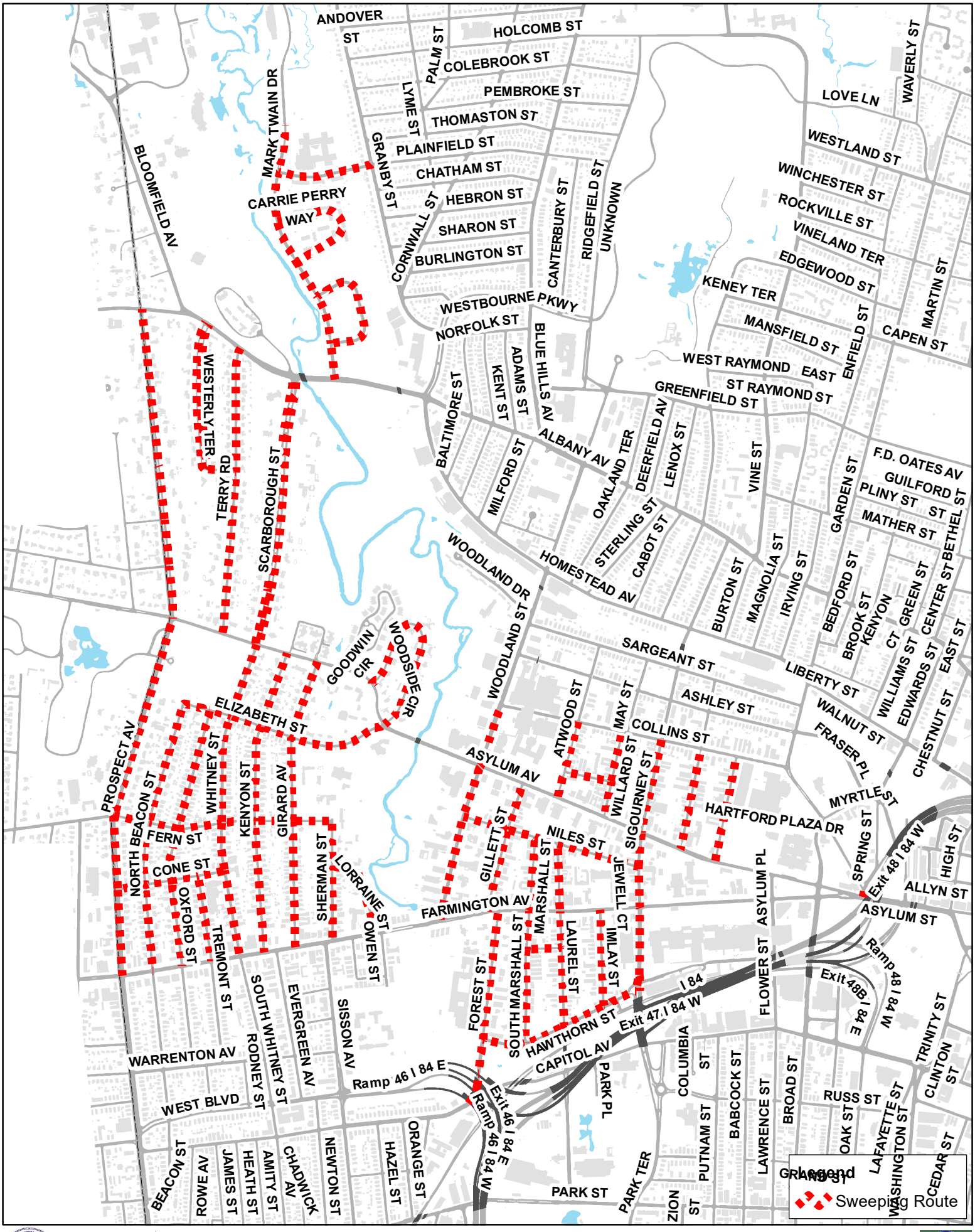
Date: 9/16/2022

District: Th-2

	Street Name	Miles
1	ADAMS ST	0.44
2	ASHLEY ST	0.64
3	ATWOOD ST	0.18
4	BALTIMORE ST	0.33
5	BURLINGTON ST	0.3
6	CANTERBURY ST	0.34
7	CHATHAM ST	0.37
8	COGSWELL ST	0.15
9	COLLINS ST	0.65
10	CORNWALL ST	0.55
11	EDWARDS ST	0.14
12	FRASER PL	0.23
13	GARDEN ST	0.52
14	GARFIELD ST	0.12
15	GRANBY ST	0.61
16	GREENFIELD ST	0.25
17	HARRISON PL	0.13
18	HARRISON ST	0.04
19	HEBRON ST	0.34
20	HOADLEY PL	0.05
21	HOMESTEAD AV	1.14
22	HUNTINGTON ST	0.15
23	HUNTLEY PL	0.07
24	KENT ST	0.4

District: Th-2

25	LYME ST	0.28
26	MAY ST	0.17
27	MILFORD ST	0.23
28	MYRTLE ST	0.27
29	NORFOLK ST	0.15
30	OAKLAND TER	0.47
31	PALM ST	0.09
32	PEMBROKE ST	0.61
33	PLAINFIELD ST	0.54
34	RIDGEFIELD ST	0.7
35	SARGEANT ST	0.63
36	SHARON ST	0.32
37	SIGOURNEY ST	0.25
38	SPRING ST	0.24
39	STERLING ST	0.26
40	THOMASTON ST	0.57
41	WALNUT ST	0.42
42	WALNUT ST	0.04
43	WESTBOURNE PKWY	1.07
44	WOODLAND DR	0.21
45	WOODLAND ST	0.74
	Total Miles:	**16.4**



Thursday: District Th-3

1 in = 1,419 feet

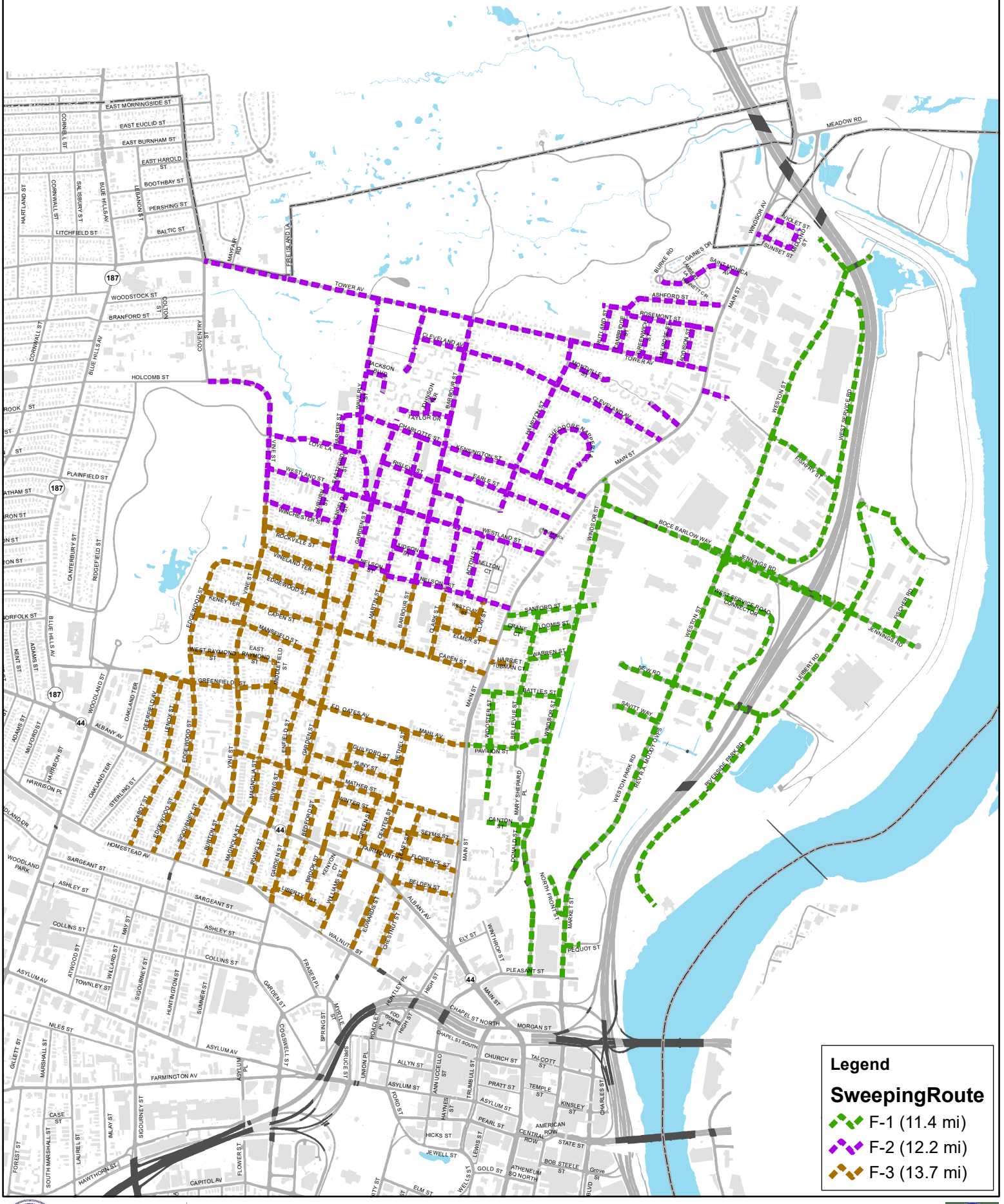
Date: 9/16/2022

District: Th-3

	Street Name	Miles
1	ATWOOD ST	0.18
2	CASE ST	0.08
3	CONE ST	0.24
4	DILLON RD	0.28
5	ELIZABETH ST	0.47
6	FERN ST	0.41
7	FOREST ST	0.47
8	GARDEN ST	0.01
9	GILLETT ST	0.3
10	GIRARD AV	0.65
11	HAWTHORN ST	0.37
12	HUNTINGTON ST	0.23
13	IMLAY ST	0.21
14	KENYON ST	0.67
15	LAUREL ST	0.41
16	LORRAINE ST	0.2
17	MARK TWAIN DR	0.6
18	MARSHALL ST	0.16
19	NILES ST	0.4
20	NORTH BEACON ST	0.61
21	OGILBY DR	0.3
22	OXFORD ST	0.58
23	PLAINFIELD ST	0.21
24	PROSPECT AV	1.5

District: Th-3

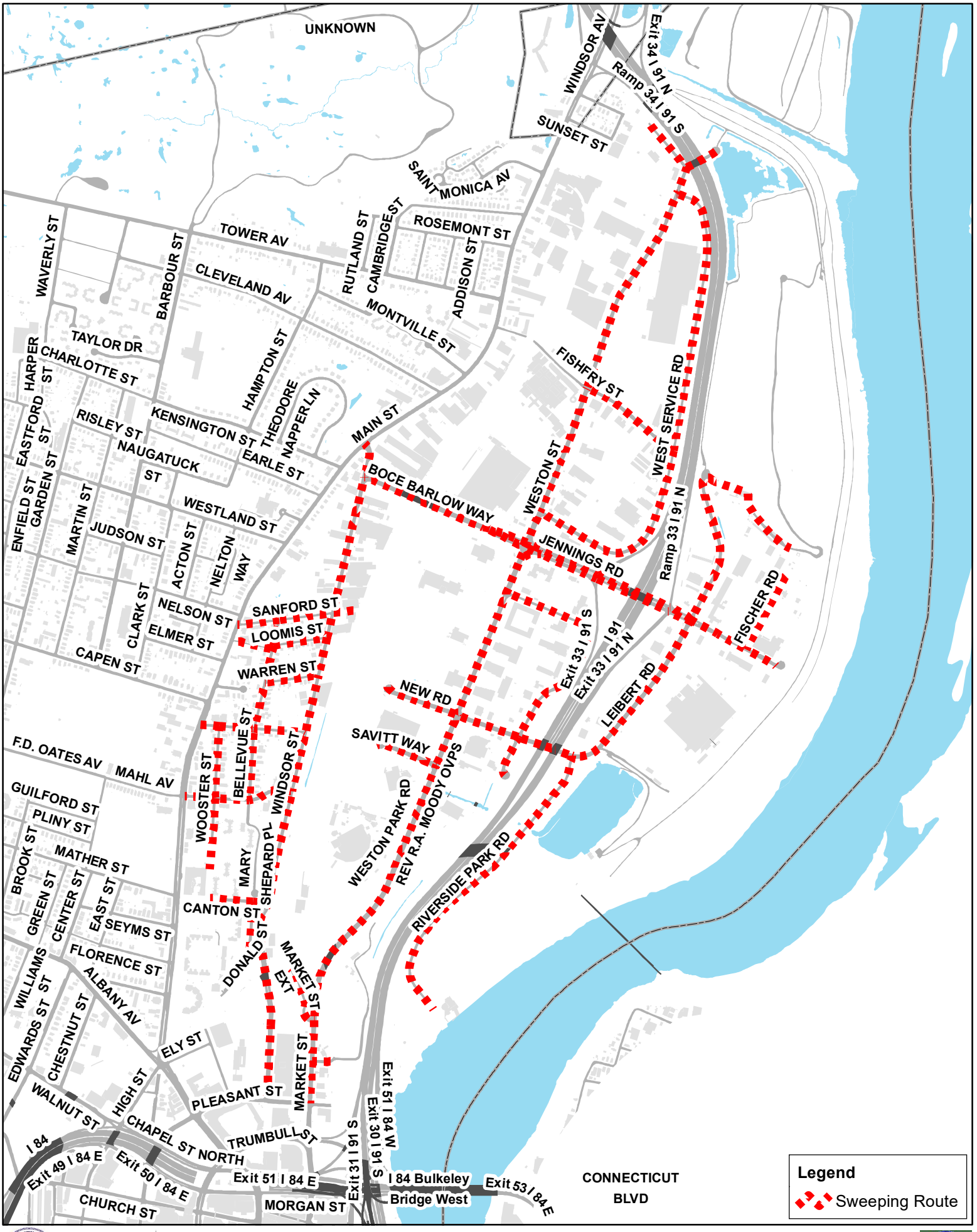
25	SCARBOROUGH ST	1.22
26	SHERMAN ST	0.37
27	SIGOURNEY ST	0.6
28	SOUTH MARSHALL ST	0.3
29	SUMNER ST	0.24
30	TERRY RD	0.64
31	TOWNLEY ST	0.11
32	TREMONT ST	0.19
33	WESTERLY TER	0.73
34	WHITNEY ST	0.71
35	WILLARD ST	0.19
36	WOODLAND ST	0.5
37	WOODSIDE CIR	0.43
	Total Miles:	**15.77**



Sweeping Routes - Friday

0 0.15 0.3 Miles

Date: 9/16/2022



Friday: District F-1

1 in = 1,329 feet

Date: 9/16/2022

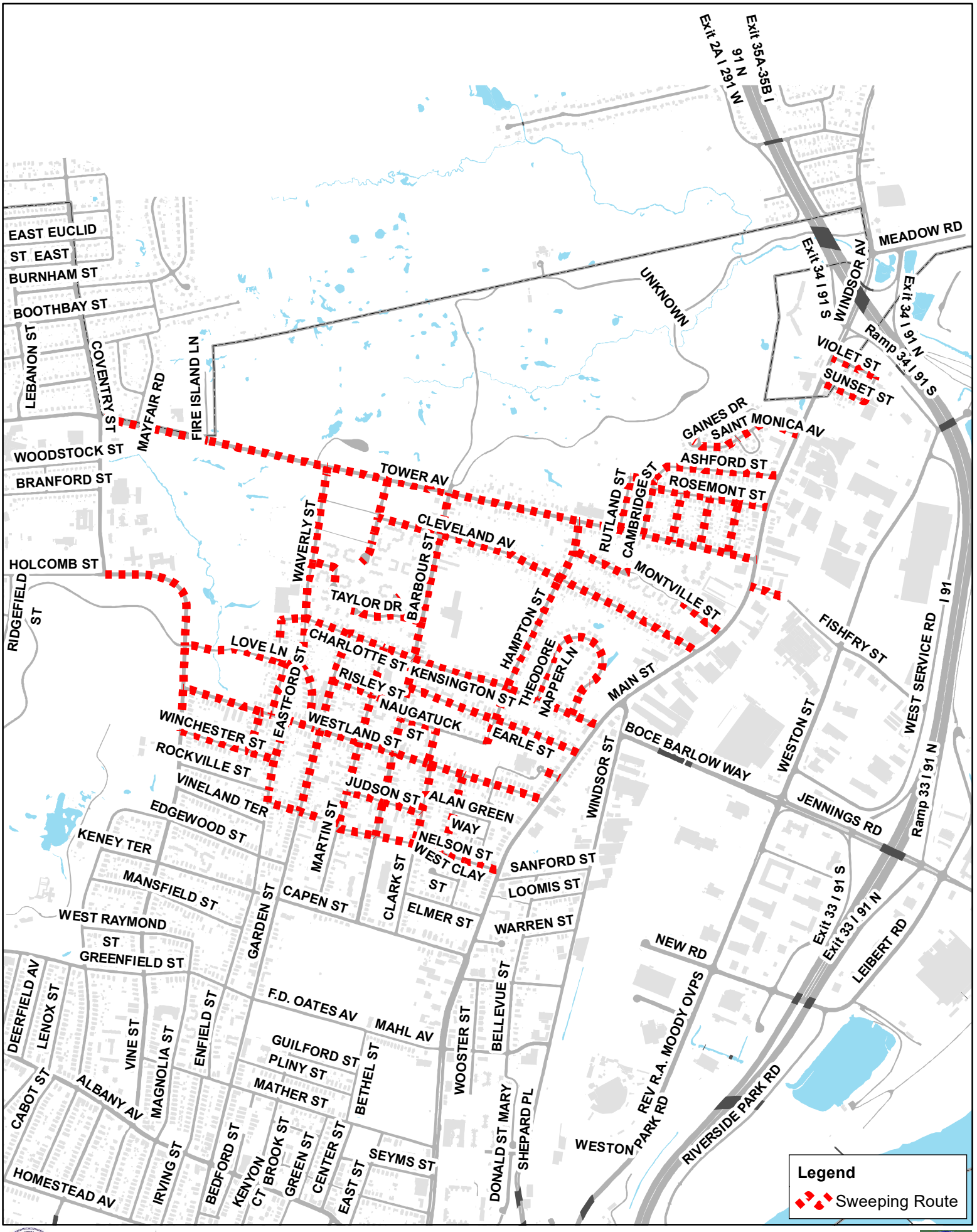
District: F-1

	Street Name	Miles
1	BATTLES ST	0.22
2	BELLEVUE ST	0.38
3	BOCE BARLOW WAY	0.47
4	CANTON ST	0.12
5	CRANE CT	0.09
6	DONALD ST	0.13
7	DUMP RD	0.22
8	FISCHER RD	0.18
9	FISHFRY ST	0.22
10	JENNINGS RD	0.96
11	LEIBERT RD	0.73
12	LOOMIS ST	0.11
13	MARKET ST	0.18
14	MARKET ST EXT	0.13
15	NEW RD	0.16
16	PAVILION ST	0.22
17	PEQUOT ST	0.14
18	REV R.A. MOODY OVPS	0.71
19	RIVERSIDE PARK RD	0.67
20	SANFORD ST	0.25
21	SAVITT WAY	0.13
22	WARREN ST	0.11
23	WEST SERVICE RD	1.52
24	WESTON ST	1.64

District: F-1

25	WINDSOR ST	1.4
26	WOOSTER ST	0.3

Total Miles: 11.39



Friday: District F-2

1 in = 1,348 feet

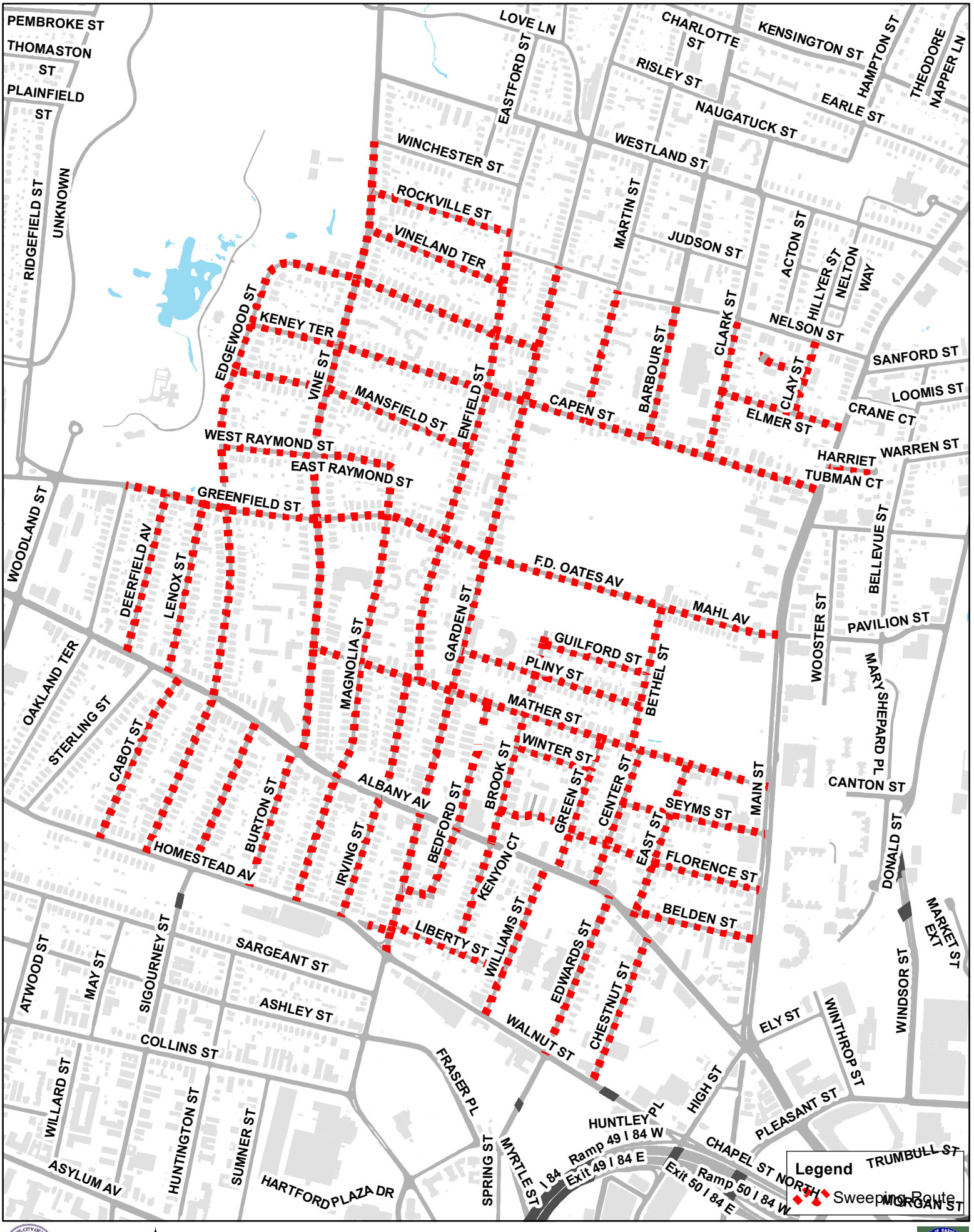
Date: 9/16/2022

District: F-2

	Street Name	Miles
1	ACTON ST	0.18
2	ADDISON ST	0.11
3	ASHFORD ST	0.22
4	AUBURN ST	0.09
5	BARBOUR ST	0.74
6	CAMBRIDGE ST	0.18
7	CHARLOTTE ST	0.3
8	CLARK ST	0.17
9	CLEVELAND AV	0.74
10	EARLE ST	0.39
11	EASTFORD ST	0.11
12	ENFIELD ST	0.18
13	FISHFRY ST	0.07
14	GARDEN ST	0.61
15	GREENWICH ST	0.1
16	HAMPTON ST	0.52
17	HARPER ST	0.09
18	JACKSON BLVD	0.1
19	JOHNSON TER	0.05
20	JUDSON ST	0.17
21	KENSINGTON ST	0.42
22	LOVE LA	0.4
23	MARTIN ST	0.38
24	MELROSE ST	0.11

District: F-2

25	MIDLAND ST	0.06
26	MONTVILLE ST	0.24
27	NAUGATUCK EAST	0.04
28	NAUGATUCK ST	0.15
29	NELSON ST	0.51
30	RISLEY ST	0.16
31	ROSEMONT ST	0.31
32	RUTLAND ST	0.11
33	SAINT MONICA AV	0.19
34	SUNSET ST	0.1
35	TAYLOR DR	0.15
36	THEODORE NAPPER LA	0.39
37	TOWER AV	1.41
38	VINE ST	0.47
39	VIOLET ST	0.1
40	WAVERLY ST	0.43
41	WESTLAND ST	0.8
42	WINCHESTER ST	0.21
	Total Miles:	**12.26**



Friday: District F-3

1 in = 866 feet

Date: 9/16/2022

District: F-3

	Street Name	Miles
1	BARBOUR ST	0.19
2	BEDFORD ST	0.29
3	BELDEN ST	0.17
4	BETHEL ST	0.2
5	BROOK ST	0.47
6	BURTON ST	0.2
7	CABOT ST	0.24
8	CAPEN ST	0.68
9	CENTER ST	0.2
10	CHESTNUT ST	0.21
11	CLARK ST	0.19
12	CLAY ST	0.11
13	DEERFIELD AV	0.22
14	EAST RAYMOND ST	0.11
15	EAST ST	0.22
16	EDGEWOOD ST	1.22
17	EDWARDS ST	0.23
18	ELMER ST	0.17
19	ENFIELD ST	0.6
20	F.D. OATES AV	0.25
21	FAIRMOUNT ST	0.22
22	FLORENCE ST	0.15
23	GARDEN ST	0.98
24	GREEN ST	0.19

District: F-3

25	GREENFIELD ST	0.51
26	GUILFORD ST	0.15
27	HARRIET TUBMAN CT	0.06
28	HOMESTEAD AV EXT	0.03
29	IRVING ST	0.34
30	KENEY TER	0.12
31	LENOX ST	0.24
32	LIBERTY ST	0.16
33	MAGNOLIA ST	0.54
34	MAHL AV	0.16
35	MANSFIELD ST	0.34
36	MARTIN ST	0.19
37	MATHER ST	0.65
38	MIDDLEFIELD ST	0.07
39	PLINY ST	0.26
40	ROCKVILLE ST	0.2
41	SEYMS ST	0.2
42	SIGOURNEY ST	0.22
43	VINE ST	0.85
44	VINELAND TER	0.2
45	WEST CLAY ST	0.07
46	WEST RAYMOND ST	0.13
47	WILLIAMS ST	0.23
48	WINTER ST	0.11
	Total Miles:	**13.74**

6.14 Stormwater & Low Impact Development

6.14.1 INTENT

A. Stormwater Management. Stormwater management on developed sites is necessary to maintain public health and safety and improve water quality for the people of the city and its natural systems.

B. Maintenance & Restoration of Natural Systems. Streams, drainage systems, and floodplains are essential for the maintenance of the health and general welfare of the people of the city. Accordingly, these regulations shall require the maintenance, where feasible, of the natural environment of city streams and drainage systems by the control of pollutants from storm runoff from entering the systems and through reduction of flow quantities resulting from redevelopment and new development and, where feasible, restoration of the floodplain to its natural functional purpose.

6.14.2 REGULATIONS

A. Basic Requirements. In no case shall a zoning permit, including a zoning permit for a parking lot, allow the following:

(1) Direct channeling of untreated surface water runoff into adjacent ground and surface waters.

(2) Peak runoff discharge rates from 2, 10, 25, and 100-year storms to exceed the corresponding pre-development peak discharge rates.

(3) Disturbance of pre-development natural hydrologic conditions other than in a minimal way, unless absolutely necessary or unless pre-development conditions are restored post-development.

B. Stormwater System Requirements. In no case shall a zoning permit, including a zoning permit for a parking lot, be issued for a stormwater system that does not meet the requirements of this section.

(1) Stormwater systems shall be designed in accordance with the latest version of the Connecticut Department of Transportation's Drainage Manual and the latest version of the Connecticut Stormwater Quality Manual.

(2) Wherever feasible, an applicant must incorporate into a planned stormwater system those stormwater management strategies identified in the Low-Impact Development Appendix of the latest Connecticut Stormwater Quality Manual. Acceptable design solutions include minimization of impervious surfaces, minimization of curbing and collection, bio-retention areas and basins, green roofs, infiltration planters, trenches and strips, permeable surfaces, rain barrels, rain gardens, and bioswales.

(3) Wherever feasible, natural landscape solutions such as minimization of impervious surfaces, undisturbed buffers, landscape depressions, and grass or vegetative filter strips are used instead of structural solutions such as detention ponds.

(4) If a stormwater system component outlets to a drainage system which is under the control of the Metropolitan District Commission (MDC), the system shall be designed in accordance with MDC standards and obtain relevant approvals.

C. Stormwater Management Plan.

(1) **Requirement.** A stormwater management plan shall be required to be submitted and implemented at any property for which a zoning permit is sought, which is not exempted pursuant to subsection (4) of this section.

(2) **Evaluation Criteria.** The decision-making body shall review stormwater management plans for compliance with the following criteria and shall reject plans that fail to meet the following criteria:

(a) Basic and stormwater system requirements of 6.14.2.A. and 6.14.2.B.

(b) 90 percent of the average annual storm events shall be captured (including release to any off-site land, waterway, or facility in accordance with this section) and treated on site, subject to 6.14.2.C.(3). Volumes shall be calculated pursuant to the Water Quality Volume equation found in section 7.4.1 of the latest Connecticut Stormwater Quality Manual.

(c) Pollutants shall be controlled at their source to the maximum extent feasible in order to contain and minimize contamination. Methods include but are not limited to sweeping of streets and parking lots, especially in the early spring, the use of oil traps and sediment basins prior to infiltration, the use of pervious surfaces, and the encouragement of sheet flow to filter strips.

(d) Stormwater management systems shall be designed and maintained to manage site runoff in order to eliminate surface and groundwater pollution, prevent flooding and,

where required, control peak discharges and provide pollution treatment.

(e) Treatment systems shall trap floating material, oil and litter through devices such as oil and grit separators or trash hoods.

(f) On-site storage of stormwater shall be employed to the maximum extent feasible. On-site storage methods include but are not limited to landscaped depressions, grass swales, infiltration trenches, and retention or detention basins.

(g) Stormwater treatment systems shall be employed where necessary to ensure that the average annual loadings of total suspended solids following the completion of the proposed activity at the site are no greater than such loadings prior to the proposed activity. Alternatively, stormwater treatment systems shall remove 80% of total suspended solids from the site on an average annual basis.

(3) If for whatever reason the requirement in 6.14.2.C.(2)(b) cannot be achieved, then alternative compliance may be achieved through either of the following means:

(a) Implementation of off-site practices or infrastructure that will divert from any public stormwater drainage system an amount of stormwater equivalent to the amount of stormwater that is required to be diverted pursuant to 6.14.2.C.(2)(b) but cannot prudently or feasibly be managed on site; or

(b) Payment into the city green infrastructure fund of $3 per gallon at the peak time, or for a lot in the federally-designated North Hartford Promise Zone $1.50 per gallon at the peak time, for each gallon that cannot be managed on the lot for which the zoning permit is sought and is not being managed by off-site improvements.

(4) **Exemptions.** The following activities are exempt from compliance with 6.14.2.C.:

(a) Routine maintenance performed to maintain the original line and grade, or hydraulic capacity, including the paving of an existing road with a compacted or impervious surface and reestablishment of existing associated shoulders;

(b) Freestanding One-, 2-, and 3-Unit Dwellings not part of a larger subdivision or common plan of development or sale, including additions or modifications thereof;

(c) Land disturbing activities that disturb less than 2,500 square feet of land area, except for land disturbing activities that are part of a larger common plan of development or sale that is 2,500 square feet or greater of disturbance;

(d) Land-disturbing activities conducted in response to a public emergency where the related work requires immediate authorization to avoid imminent endangerment to human health or the environment;

(e) Activities that relate to reclaiming or clearing of land for primarily agricultural or open space purposes;

(f) Existing cemeteries and principal Open Space uses identified in 3.3.3.

D. Encroachment on Existing Natural Systems. Any encroachment upon, or filling or destruction of streams, drainage systems, or floodplains, unless approved by the city, is a violation of these regulations.

E. Maintenance. Approved stormwater and low-impact development infrastructure shall be maintained for the duration of the use with which the approval was associated, to the standard of performance represented in the application or otherwise accepted as standard practice. Failure to maintain such infrastructure without just cause (which may be determined in the sole discretion of the zoning enforcement officer) is a violation of these zoning regulations.

6.16 Soil & Excavation

6.16.1 INTENT & APPLICABILITY

A. Intent. To minimize land form change that occurs as a result of development, to sustain aesthetic, recreational and fish and wildlife habitat and values, to maintain the capability of soil to support vegetation, to reduce sediment entering water bodies and sewers, and to conserve and protect the water, land, air, and other environmental resources of the city.

6.16.2 EXCAVATION

A. Removal of soil, sand or other material. The use of land for the removal of topsoil, sand, gravel or other material from the land is permitted in any district, solely under a temporary certificate from the city engineer, and on condition that such removal of soil will not be below the normal building grade as established from the nearest existing or proposed street, when such building grade has been established and approved by the city engineer. A temporary certificate may be issued in appropriate cases upon filing of an application accompanied by a suitable agreement or bond that such removal will not cause stagnant water to collect, or leave the surface of the land at the expiration of such permit in an unstable condition or unfit for the growing of turf or for other land uses permitted in the district in which such removal occurs. This regulation shall not prohibit the normal removal of soil for the construction of an approved building or structure when such plans have been approved by the director of the division of licenses and inspections and a building permit has been issued and shall not prohibit the installation of a stormwater management system.

B. Excavations or Holes. The construction, maintenance or existence within the city of any unprotected, unbarricaded, open or dangerous excavations, holes, pits or wells, or of any excavations, holes or pits which constitute or are reasonably likely to constitute a danger or menace to the public health, safety or welfare are hereby prohibited. However, this section shall not prevent any excavation under a permit issued under these regulations or the state building code, where such excavations are properly protected and warning signs posted in such manner as may be approved by the director of the division of licenses and inspections.

C. Permitted Earthen Materials Fill. The filling of soil, sand, gravel, or other earthen material is permitted in any district, provided that:

(1) Such use or activity is in compliance with all applicable environmental laws and regulations, and

(2) The surface of such material is graded within a reasonable time in a manner preventing the collection of stagnant water, and leaving the ground surface in a condition suitable for the growing of turf or for other land uses permitted in a district; and

(3) In a residential district, on an area of up to 10,000 square feet a volume of no more than one cubic yard of material per 100 square feet of lot shall be allowed; and

(4) In a non-residential district, on an area of up to 10,000 square feet a volume of no more than 5 cubic yards of material per 100 square feet of lot shall be allowed; and

(5) Regrading an area of 10,000 square feet or more shall be permitted only after review and approval of a soil erosion and sediment control plan per 6.16.

6.16.3 SOIL EROSION & SEDIMENT CONTROL REQUIREMENTS

A. Applicability. The regulations of this section apply to activities that:

(1) Require the disturbance of ground, including the destruction or removal of ground cover leaving the land subject to accelerated erosion during or after construction, in a cumulative amount (including temporary disturbances and phased projects) greater than 10,000 square feet;

(2) Results in the regrading of more than 30 percent of the total lot area by more than 2 feet;

(3) Are located on slopes of greater than 15 percent; and

(4) Otherwise requires an inland wetlands permit.

B. Requirements

(1) No activity to which this section applies may commence, without the submission of a soil erosion and sediment control plan, a statement from the city engineer or qualified consulting party that such plan is satisfactory, and review and approval by the decision-making body.

(2) The plan must follow the guidelines and planning processes as outlined in the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, as amended or superseded from time to time.

(3) A soil erosion and sediment control plan must include:

(a) A clear delineation of specific measures that minimize or eliminate soil erosion and sedimentation resulting from the activity;

(b) A narrative describing the project, the schedule of major activities on the land, sequence of construction, the application of conservation practices, design criteria, construction details, the maintenance and monitoring program for any erosion and sediment control facilities that are installed, and the names and contact information for key personnel, including personnel responsible during and after work hours, in case of emergency;

(c) Documentation of all supporting calculations, soil testing, and borings as appropriate to support the plan; and

(d) A map or maps that show topography, cleared and graded areas, proposed area alterations, and the location of and detailed information concerning erosion and sediment measures and facilities.

(4) The soil erosion and sediment control plan must be prepared by a licensed professional engineer, or a landscape architect, with experience in erosion and sedimentation control and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, as amended or superseded from time to time.

(5) The soil erosion and sediment control plan must be written to maintain all control measures and facilities to ensure ongoing compliance with any approved plan.

C. Review Process. A complete soil erosion and sediment control plan will be reviewed by the applicable decision-making body as part of the applicable type of review, or pursuant to a stand-alone site plan review.

D. Conditions of Approval

(1) The decision-making body and the city engineer may approve, approve with conditions, or reject a soil erosion and sediment control plan.

(2) The decision-making body may impose conditions of approval in accordance with 1.3.1.F. and other provisions of these regulations, including 1.3.1.I.

(3) The applicant may be required to certify that he or she has public insurance against liability which might result from the proposed operation or use covering any and all damages which might occur within one year of completion of such operations.

(4) The decision-making body may require the applicant to submit monitoring and inspection reports during any phase of the activity.

(5) No permit issued pursuant to this section may expire more than one year after its commencement date.

(6) The city may periodically review and inspect sediment and erosion control measures required by any approved soil erosion and sediment control plan.

E. Exempted Activities

(1) In addition to activities not meeting the threshold criteria of 6.16.3.A., the following activities are exempt from the provisions of this section:

(a) The construction of a detached single-unit dwelling, which is not part of a Campus Overlay or other larger development.

(b) Community gardens or urban farms, per 3.3.3.

(2) Notwithstanding the foregoing, projects that do not require a soil erosion and sediment control plan must still conduct soil and erosion control methods consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, as amended or superseded from time to time.

1.3 Procedures

1.3.1 COMMON APPLICATION PROCEDURES

A. Applicability. The common procedural provisions of this section apply to all of the procedures in this chapter unless otherwise expressly stated.

B. Application Procedures

(1) **Applicability.** This section 1.3.1.B. shall apply to applications for special permits, site plan reviews, zoning permits, and variances.

(2) **Authority to File.** Applications must be filed with the zoning administrator by the owner of the subject property. Applications may also be filed by the property owner's authorized agent.

(3) **Pre-Application Meetings**

(a) **Purpose.** Pre-application meetings provide an early opportunity for staff and applicants to discuss the procedures, standards and regulations required for development approval under these zoning regulations

(b) **Requirement.** Applicants are required to schedule pre-application meetings with staff regarding applications for the following types of projects: Multi-Unit Residential, Hotel/ Apartment Hotel, Civic and Institutional Use, Intensive Park Use, River Use, Beer/ Wine/Liquor Sales, Convenience Store, Drinking Place, Entertainment Assembly, Vehicle Fueling and Limited Service, Vehicle Service/Car Wash, Office Use involving new construction of more than 5,000 square feet, Adult Use, Infrastructure Use, Industrial Use, new construction in the DT districts, and any other project the zoning administrator determines is a major development project. Pre-application meetings are encouraged in all cases. An applicant's failure to schedule and attend a pre-application meeting (or meetings, if more than one meeting is required by the zoning administrator) shall render the application incomplete.

(4) **Application Submittal Requirements.** Applicants must submit 3 edge-bound paper copies of all plans and paperwork, folded 8.5 inches by 11 inches or smaller if fewer than 12 sheets, or rolled if 12 sheets or more, and collated into 3 separate packets. Applications must also be saved and properly installed on a USB flash drive, labeled with the property address and the date of hearing. Applications must include materials and information to assist the staff and the decision-making bodies in their consideration of the application, with specific application requirements further outlined in 1.3.2 through 1.3.8.

(5) **Completeness of an Application**

(a) An application will be considered complete and ready for processing only if it is submitted in the required number and form, includes all required information, does not contain significant inaccuracies or omissions, does not contain multiple minor inaccuracies or omissions, and is accompanied by the required fee amount.

(b) If an application is determined to be incomplete, the zoning administrator may provide notice to the applicant along with an explanation of key deficiencies in the application. Notice of an incomplete application may be provided by personal service, electronic mail, or first-class mail. Failure to provide such a notice shall not be construed as a finding that any submittal is complete, given the plain and clear language of these regulations regarding applicable requirements.

(c) No further processing of an incomplete application will occur. The application will only be returned to the processing cycle if and when all deficiencies are corrected and the application requirements are fully met, whether or not each and every such requirement was expressly included in the list of deficiencies given to the applicant by staff pursuant to 1.3.1.B.(5)(b). If an application is not complete within 60 days of the initial submission of the application to staff, the application will be deemed to have been withdrawn. No decision-making body has the authority to review an incomplete application.

(d) Only upon the completion of an application in accordance with this section shall any legal period within which an application may be "deemed approved" commence. An incomplete application shall not suffice to establish the applicable effective date of these regulations, and shall not forestall the enactment or imposition of any regulations made effective prior to the date that a complete application is submitted.

(e) Prior to the consideration of any application for any permit or approval by the decision-making body, an applicant may amend an application without prejudice.

(6) **Separate Applications.** A separate application must be filed for each project, for each permit sought, for each lot.

(7) **Rejection of an Application Prior to Full Review.** An application may be rejected prior to a full review if the decision-making body does not have legal authority to approve the application or if the application is not completed within 60 days of the application's initial submission to staff.

C. Application Processing Cycles. The zoning administrator, after consulting with review and decision-making bodies, is authorized to promulgate reasonable cycles and timelines for processing applications, including deadlines for receipt of complete applications.

D. Notices

(1) **Newspaper Notice.** For public hearings and for other instances in which this chapter requires that newspaper notice be provided, the notice must be published in a newspaper of general circulation within the city. Notice of the hearing shall be published at least twice, at intervals of not less than 2 days, the first not more than 15 days or less than 10 days and the last not less than 2 days before the date set for the hearing.

(2) **Posted Notice.** For public hearings and for other instances in which this chapter requires that posted notice be provided, the applicant must post notice for at least 7 consecutive days before the public hearing. Such notice shall consist of at least one official public hearing notice sign in a conspicuous place visible from each public street abutting the subject project. The city is authorized to collect a deposit to ensure the return of official public hearing notice signs. Before any required public hearing, the applicant must file a certificate of posting or equivalent which affirms that notice signs have been posted in accordance with the provisions of these zoning regulations.

(3) **Mailed Notice.** For public hearings and for other instances in which this chapter requires that mailed notice be provided:

(a) Notices must be sent by United States Postal Service, postmarked at least 10 days before the scheduled public hearing. State law may require that such notice be sent by certified mail, return receipt requested.

(b) Addresses must be based on the best obtainable property ownership information. When required notices have been properly addressed and deposited in the U.S. mail, alleged failure of a party to receive the mailed notice does not constitute grounds to invalidate any action taken.

(c) Before a public hearing, the applicant or other party expressly assigned responsibility for delivery of mailed notice must file a certificate of mailing or equivalent affirming that notice has been provided in accordance with the provisions of these zoning regulations.

(4) **Content of Notice.** All required notices must:

(a) Indicate the date, time and place of the public hearing that is the subject of the notice;

(b) Describe any property involved in a specific, property-owner-initiated application by map, street address, or legal description;

(c) Describe the action sought in the application or proposal;

(d) Identify who will conduct the hearing; and

(e) Indicate where additional information on the matter can be obtained.

(5) **Meeting Agendas and Materials**

(a) The agenda for any meeting of the commission must be released at least 24 hours before the meeting at which listed matters are to be considered, unless a longer time period is required by law. A copy of any application which will be the subject of a public hearing and related documents must be filed in the office of the city clerk and made available for public inspection at least 24 hours prior to the hearing, unless a longer time period is required by law.

(b) The agenda for any meeting of the zoning board of appeals must be released at least 10 days before the meeting at which listed matters are to be considered. A copy of any application which will be the subject of a public hearing and related documents must be filed in the office of the city clerk and made available for public inspection at least 10 days prior to the hearing.

(6) **Notice to Adjoining Municipalities**

(a) The commission must provide mailed notice, certified mail, return receipt requested, to the clerk of any adjoining municipality of the pendency of any application concerning any project on any site that meets one or more of the following criteria, within 7 days of receipt of an application:

(i) Any portion of the property affected by a decision of the commission is within 500 feet of the boundary of the adjoining municipality;

(ii) A significant portion of the traffic to the completed project on the site will use streets within the adjoining municipality to enter or exit the site;

(iii) A significant portion of the sewer or water drainage from the project on the site will flow through and significantly impact the drainage or sewerage system within the adjoining municipality; or

(iv) Stormwater runoff from the improved site will impact streets or other municipal or private property within the adjoining municipality.

(b) Such adjoining municipality may, through a representative, appear and be heard at any hearing on any such application.

(7) **Notice to the Capitol Region Council of Governments.** For proposed zoning amendments that affect the use of a zone any portion of which is within 500 feet of the boundary of another municipality, the Capitol Region Council of Governments and the other municipality shall be notified by certified mail, return receipt requested, or electronic mail 30 days before the public hearing to be held in relation thereon. If any report from such council is not submitted at or before the hearing, it shall be presumed that such council does not disapprove of the proposal. The report of such council is purely advisory. Regional notice by certificate or electronic mail shall be provided in accordance with general statutes section 8.3b.

(8) **Constructive Notice**

(a) Minor defects in required notices will not be deemed to impair the notice or invalidate proceedings pursuant to the notice. Minor defects in notice are limited to errors in a legal description or typographical or grammatical errors that do not impede communication of the notice to affected parties. If questions arise at the hearing regarding the adequacy of notice, the hearing body must make a formal finding about whether there was substantial compliance with the notice requirements of these zoning regulations.

(b) When the records of the city document the publication, mailing, and posting of notices as required by this chapter, required notice of the public hearing will be presumed to have been given.

E. Public Hearings

(1) **Prior to Public Hearing.** The public shall be allowed to inspect relevant public hearing materials in accordance with 1.3.1.D.(5).

(2) **At the Public Hearing**

(a) Any person or persons may appear and be heard and may be represented by agent or by attorney.

(b) Interested persons may submit information and comments, verbally or in writing.

(c) The hearing body is authorized to establish reasonable rules and regulations governing the conduct of hearings and the presentation of information and comments.

(3) **Continuance of a Public Hearing**

(a) Once commenced, a public hearing may be continued by the hearing body.

(b) No re-notification is required if the continuance is set for a specified date and time, and that date and time is announced at the time of the continuance.

(c) If a public hearing is continued or postponed for an indefinite period of time from the date of the originally scheduled public hearing, new public hearing notice must be given before the rescheduled public hearing.

(d) If the applicant requests and is granted a continuance or postponement requiring renotification, the applicant must pay any costs of re-notification.

(4) **Timing of Hearings and Decisions**

(a) For all petitions, applications, requests, or appeals requiring a hearing, such hearing must commence within 65 days after receipt

of such petition, application, request, or appeal, and shall be completed within 35 days after such hearing commences.

(b) All decisions on such matters shall be rendered not later than 65 days after completion of such hearing, unless a shorter period of time is required by state law.

(c) The petitioner or applicant may consent to one or more extensions of any period specified in this subsection, provided the total extension of all such periods shall not be for longer than 65 days, or may withdraw such petition, application, request or appeal.

F. Decision-Making

(1) **Action.** Review and decision-making bodies may take any action that is consistent with:

(a) These zoning regulations;

(b) Any rules or bylaws which apply to the review or decision-making body; and

(c) The notice that was given.

(2) **Reasons.** The decision-making body must state in the record the reasons for its action.

(3) **Burden of Proof or Persuasion.** In all cases, the burden is on the applicant to show that an application or proposal complies with all applicable review or approval criteria.

(4) **Continuance or Deferral.** Decision-making bodies are authorized to continue a public hearing or defer action in order to receive additional information or further deliberate.

(5) **Time Limit.** Unless otherwise expressly stated, if a review or decision-making body does not render a decision or take action within any time period required under these zoning regulations, and the applicant has not agreed to an extension of that time limit, the application is deemed denied.

(6) **Conditions of Approval.**

(a) Review bodies are authorized to recommend conditions and decision-making bodies are authorized to approve the subject application with conditions.

(b) Any conditions recommended or approved must relate to a situation likely to be created or aggravated by the proposed use or development and must be roughly proportional to the impacts of the use or development.

(c) The decision-making body may restrict hours of operation, including but not limited to hours of operation of Drinking Places and Smoking Places.

(d) To ensure the orderly development of land or to increase conformity with these regulations, decision-making bodies may require the merger of lots owned in common (or to be developed in common) prior to or as a condition of approval. In such a circumstance, front line lot coverage requirements shall not apply to any existing building but would apply to a new building, new addition, or building reconstruction or replacement.

G. Post-Approval Matters

(1) Applicants who have received a permit or other approval for a project requiring a pre-application meeting pursuant to 1.3.1.B.(3) must, before commencing any substantial work on the site, meet with the director of the division of licenses and inspections to establish construction and inspection schedules. For the purposes of the preceding sentence, the determination of what constitutes "substantial work" shall be made by the director of the division of licenses and inspections.

(2) **Amendments to Approved Permits and other Development Approvals.** After approval has been granted, all amendments or changes to an issued permit or other approval under these regulations must be processed and considered as a new application and the issuance of an additional zoning permit. However, the zoning administrator is authorized to approve minor changes in the placement and size of improvements and the type of exterior materials for an approved project if:

(a) The changes are required because of conditions that were unknown at the time the approval was issued and have only a de minimis impact;

(b) The zoning administrator determines that the changes satisfy and are consistent with the intent of these regulations and the findings made by the decision-making body in connection with the approval and have only a de minimis impact; and

(c) The changes involve, as applicable: a change in placement of a building or structure which is less than 2 feet away from the

approved placement, the use of materials or components accounting for no more than 2.5 percent of the facade, a modification in landscaping that produces no additional negative environmental effects, or the use of a replacement material whose performance and appearance is substantially similar to an approved material.

(3) **Lapse of Approval.**

(a) All work in connection with any permit or approval issued pursuant to these regulations must be completed within 3 years from the date of the original permit or approval, provided that work made in connection with a site plan approval must be completed within 5 years from the date of the original approval, except that projects involving 400 or more dwelling units and commercial, industrial, or retail projects greater than 400,000 square feet may be completed within up to 10 years from the date of the approval.

(b) Failure to complete all work within the applicable period shall result in automatic lapse and expiration of the permit or approval, except that with good cause shown, the commission may grant one or more extensions of the time to complete all or part of the work in connection with the site plan provided the total extension or extensions shall not exceed 10 years from the date such permit or approval has been issued.

(c) "Work" for purposes of this subsection means all physical improvements required by the permit or approval.

(d) Notice regarding certificates and approvals which have expired and on which no action has been taken may be sent to the applicant within 15 days of the date on which the period for approval has lapsed.

(4) **Transferability.** The status of permits and approvals is not affected by mere changes of tenancy (of the same use), ownership, or management.

(5) Appeals of any decision by a decision-making body pursuant to these regulations may be pursued in accordance with state statute. Appeals of administrative decisions may be filed in accordance with 1.3.8.

H. Fees and Charges

(1) The commission is authorized to establish a fee schedule for all applications for approvals and permits being sought from the commission, the zoning board of appeals, the inland wetlands commission, and the historic preservation and properties commissions, or for any administrative review required. The fee schedule may also include any matter deemed necessary in order for the planning division or any review or decision-making body to carry out its responsibilities under these zoning regulations.

(2) Among other things, the fee schedule may include applicable charges for zoning permits, special permits, zoning map amendments, zoning text amendments, zoning board of appeals applications (including variances), zoning board of appeals applications following notices of violation, certificates of zoning compliance, site plan reviews (both residential and commercial), subdivision applications, mapping, liquor permits, wetland permits (with and without public hearings), historic properties reviews and certificates of appropriateness, fence permits, public notice costs, security deposits for posted notice signs, and late penalties.

(3) The fee schedule and any amendment to the fee schedule must be adopted by the council before becoming effective.

(4) A copy of the fee schedule must be available for public inspection in the office of the commission and the division of licenses and inspections.

(5) Applicable fees must be paid in advance to the commission by all parties other than a department of the city or the commission, in which case no fee is required.

(6) Fees due to the city forester for permits to alter, damage, remove, or perform other covered activities to covered trees shall be administered in accordance with the city tree ordinance separately from the zoning fees. Such fees may appear on the commission fee schedule as a courtesy to applicants.

I. Bonds

(1) The decision-making body is expressly authorized to require applicants for zoning permits, site plan permits, and special permits to post a bond with the decision-making body in a form and on such terms as are acceptable to the corporation counsel, and in such amount as the decision-

making body deems necessary to ensure the faithful performance and completion of the work in accordance with the provisions of the approved permit.

(2) If the applicant fails to comply with any requirements of a permit, the decision-making body may declare the permit to be null and void, declare the project to be in default and call the bond.

(3) The decision-making body may take whatever steps are needed to bring the site into compliance with the permit, and may pay for such work from the bond proceeds.

(4) The bond will be released by the decision-making body upon certification by the applicant's architect or engineer, through submission of accurate, detailed "as-built" plans, that all work is in accordance with the approved permit.

(5) Notwithstanding any other provision of this paragraph, the bond terms may provide for partial, proportionate release of the bond as work is completed.

(6) Release of such bonds shall follow procedures set forth in state statutes.

J. Third Party Assistance

(1) The decision-making body may call upon any city department or third party consultant for assistance in the performance of its duties. It is the duty of such department to render such assistance, as may be reasonably required.

(2) Applicants shall be required to pay the city in advance for projected or proposed third party consultant expenses associated with review of their applications, prior to any approval being effective.

Looney, Michael

From: kristin atlas-environmental.com
Sent: Tuesday, April 25, 2023 8:50 AM
To: Casparino, Nicholas
Subject: FW: Inter-jurisdictional agreements

From: DOT.MS4 <DOT.MS4@ct.gov>
Sent: Wednesday, October 27, 2021 9:05 AM
To: kristin atlas-environmental.com <kristin@atlas-environmental.com>
Cc: DOT.MS4 <DOT.MS4@ct.gov>
Subject: RE: Inter-jurisdictional agreements

Hi Kristin,

This has not been a priority for the Department since both the Municipalities and the Department have the same permit requirements. We currently have no plans to develop MOU's with the 120+ MS4 municipalities State wide. We have been sharing any of our IDDE results in excess of permit triggers with municipalities in an effort to coordinate identification and elimination of sources.

Thanks
Dan

Daniel Imig, P.E.
Environmental Compliance / MS4 Program
Connecticut Department of Transportation
P: 860-594-3455
Teleworking – email is best

From: kristin atlas-environmental.com <kristin@atlas-environmental.com>
Sent: Tuesday, October 26, 2021 2:10 PM
To: DOT.MS4 <DOT.MS4@ct.gov>
Subject: Inter-jurisdictional agreements

Hi,

How does DOT handle the inter-jurisdictional agreements to control the contribution of pollutants between DOT's MS4 and MS4s owned and operated by municipalities under Section 4(A)(f) for the DOT Stormwater Management Plan? I am working with a few MS4s that have the same requirement for a Memorandum Of Understanding.

Regards, Kristin

Kristin Doundoulakis
Atlas Environmental
90 Starr Hill Road
Groton, Connecticut, 06340
Kristin@Atlas-Environmental.com
Office 860-405-1463
Fax 860-405-8309
Cell 860-514-2338

6.4 Tree Quantity, Types, & Spacing

6.4.1 REQUIRED QUANTITY OF LOT TREES

Sufficient trees shall be retained or planted on a lot so that the square footage of vegetative canopy of such trees, when mature, creates a significant canopy over the city as a whole.

A. **Quantity of Trees by Canopy Coverage.** The percentage of canopy coverage required for each zoning district is listed in Figure 6.4-A Quantity of Trees Required, provided that more specific regulations for particular uses, such as buffers required in 6.8 Frontage Buffer, 6.9 Side & Rear Buffer, and 6.10 Interior Parking Lot Landscape, shall apply in addition to, and may be used to satisfy, the applicable requirements in Figure 6.4-A Quantity of Trees Required. Where a solar parking lot canopy is constructed in accordance with 4.20.6.C., the quantity of trees required by these regulations may be adjusted by the zoning administrator or the commission, as applicable, guided by the intent statements in 6.1.1, 6.4.1.E., and other provisions of these regulations.

B. **Measurement.** The total canopy coverage for a lot is the sum of the canopy, at maturity, of the individual trees located on the lot. Refer to Figure 6.4-B Typical Canopy Size by Tree Size for Measuring.

   (1) Street trees located in the public right-of-way directly adjacent to the property line of the lot may be counted toward the canopy coverage for the lot.

   (2) For developments that encompass more than one lot, the required quantity shall be calculated for the total canopy for the total area of all of the lots.

   (3) For developments that span multiple blocks, the required quantity shall be calculated separately for each contiguous area of the development within a block.

C. **Credit for Existing Trees.** Additional credit for canopy coverage may be granted for retaining healthy trees of appropriate species and location, subject to the approval of the city forester, as shown in Figure 6.4-C Existing Tree Canopy Credits.

D. **Alternative Compliance.** Where existing conditions or other provisions of this section make it impracticable to meet the canopy coverage requirement on or adjacent to the site, the applicant shall plant sufficient trees to make up the shortfall with the location to be determined by the city forester. Impracticability may be proven by an applicant's submission of a daylighting study that shows insufficient sunlight to support trees or shrubs on the parcel.

E. **Negative Impacts.** No new tree shall have a significant negative impact on any adjacent or nearby property owner. A property owner may not plant any tree which, when fully grown, will shade a solar collector existing at the time of the planting of the tree.

6.4.2 TREE TYPES

The types of trees permitted to be planted and their classification are listed in Figure 6.4-D Permitted Tree Types. Deviations or modifications to this list may be approved by the city forester from time to time. Planted trees shall be a combination of permitted species, where possible.

6.4.3 TREE SPACING

Trees shall be planted no closer than 25, 15, and 5 feet apart for large, medium, and small trees, respectively, and as close to these intervals as practically possible to achieve continuous canopy coverage.

6.10 Interior Parking Lot Landscape

Parking lot interior is defined as the area dedicated to parking on a given parcel as measured from edge of pavement to edge of pavement.

6.10.1 INTENT & APPLICABILITY

A. Intent. To provide shade, minimize paving & associated stormwater runoff, & improve the aesthetic look of parking lots.

B. General Applicability. All off-street surface parking lots in all districts with more than one double-loaded aisle. For clarity, this section applies to parking lots with a double-loaded aisle plus a single-loaded aisle, as well as parking lots with a double-loaded aisle plus one travel lane additional to the travel lane used for parking.

C. Other Internal Parking Lot Areas. Canopy coverage shall be provided in accordance with Figure 6.4-A Quantity of Trees Required, provided, however, that canopy coverage of 10 percent is required for any internal parking lot area.

D. Existing Vegetation. Existing vegetation may be credited toward these requirements in accordance with Figure 6.4-C Existing Tree Canopy Credits.

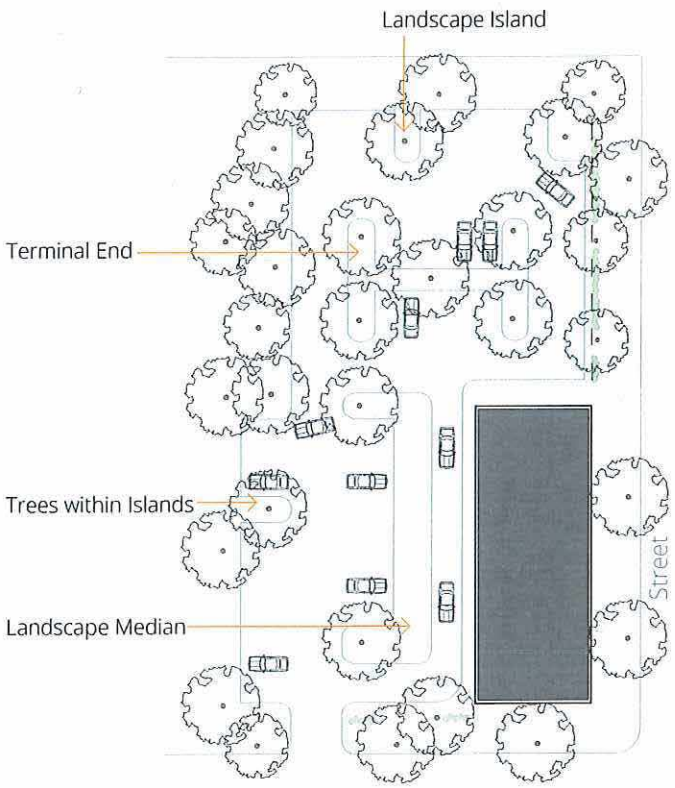


Figure 6.10-A Interior Parking Lot Landscaping.

6.10.2 INTERIOR PARKING LOT LANDSCAPE REQUIREMENTS

A. Landscape Island Requirements

Required Island Locations	1. At terminal ends of freestanding rows or bays of parking. Freestanding rows or bays of parking are those not abutting the parking lot perimeter or building face, and may have a single or double row of parking. 2. Where there is a row of parking greater than 8 spaces in length, either (a) after every 8th parking space; (b) after every 16th parking space, and applicant pays $7,500 into the city complete streets account per island otherwise required by (a) and $1,000 into the city tree account for every tree otherwise required by (a); or (c) after every 24th parking space and applicant pays $15,000 into the city complete streets account per island otherwise required by (a) and $2,000 into the city tree account for every tree otherwise required by (a).
Minimum Width	5'; islands less than 15' must utilize structural soil under any paved surface within a tree's critical root zone; Islands under 9' must install an aeration system and utilize permeable pavement
Slotted Curbs	Slotted curbs are encouraged on parking lot islands to allow stormwater runoff into islands where appropriate, and proper island design to infiltrate runoff
Required Trees Within Islands	Minimum of 1 medium or large shade tree per island

B. Landscape Median Requirements

Required Median Location	Required in each free-standing bay of parking along the length of the bay
Slotted Curbs	Slotted curbs are encouraged on parking lot islands to allow stormwater runoff into medians where appropriate, and proper island design to infiltrate runoff
Minimum Width	5'; medians less than 15' must utilize structural soil under any paved surface within a tree's critical root zone. Medians under 9' must install an aeration system and utilize permeable pavement

C. Tree Requirements

Tree Requirements per Parking Space	Each parking space must be located within 50' of a tree planted within parking lot interior
	Minimum of 1 shade tree must be planted within parking lot interior or within 4' of parking lot's edge for every 5 parking spaces
	Where a property owner has chosen options (b) or (c) in number 2. of the "Required Island Locations" line in 6.10.2.A., these requirements shall be reduced proportionally by the number of trees that would have otherwise been required by their choosing option (a) in that section.
	Trees within any required buffer area may not be utilized to meet these requirements

changing facilities results in a fractional number, any result of 0.5 or more shall be rounded up to the next consecutive whole number. Any fractional result of less than 0.5 may be rounded down to the previous consecutive whole number.

(3) **Multiple Uses on a Lot.** When there are multiple uses on a lot, required spaces or shower and changing facilities shall be calculated as an amount equal to the total requirements for all uses on the lot, unless the uses qualify for shared, cooperative, or other credits to reduce parking. (Refer to 7.2.3 Multiple Use Reduction.)

7.2.3 MULTIPLE USE REDUCTION

Before imposing any vehicular parking requirements through the special permit process, the commission must consider evidence presented regarding: the possibility of multiple use reductions as shown in Figure 7.2-C Parking Time Periods per Use; the provision of bicycle parking; the proximity to transit stations or bus stops; the provision of on-site or nearby car share services; and transportation management plans promoting carpools, vanpools, subsidized transit passes, walking, biking, or regional ride sharing.

7.3 Parking Design Standards

7.3.1 OFF-STREET PARKING LOTS

The design or redesign of all off-street parking facilities shall be subject to the site plan approval procedure.

A. Automobile Parking Space Dimensions. The appropriate dimensions for parking spaces are outlined in Figure 7.3-A Parking Space Dimensions.

(1) The width of a parking space shall be measured from the center of a stripe.

(2) Each space shall have a vertical clearance of at least 7 feet.

B. Wheel Stops. Install wheel stops or bumper guards when parking is adjacent to a pedestrian pathway to limit vehicle overhang that reduces the sidewalk width. Such stops or guards shall be properly anchored or secured.

C. Location of Parking. Refer to 4.0 Building Types and for information on the location of on-site parking facilities and 7.2.1.C.(4) for location of off-site parking facilities.

D. Access. All off-street parking and loading facilities shall open directly onto an aisle, alley, or driveway designed to provide safe access to such facilities. Exceptions include:

(1) **Tandem Parking.** No more than 2 spaces may be included in a tandem parking spot, and the rear space must meet the access requirement.

(2) **Parking Lifts.** The lift exit shall meet the access requirement.

E. Slopes. All parking and driveway or sidewalk access shall meet the requirements of the Connecticut Accessibility Code.

F. Landscape Screening and Buffer Zones. All parking areas shall meet the requirements of 6.0 Sitework & Landscape.

G. Landscape Areas. Areas not used specifically for sidewalks, parking spaces, driving aisles, loading, or refuse shall be built and maintained as a raised landscaped area and shall not be paved.

H. Pavement Construction. All parking and driveways shall be constructed using asphalt, concrete, pavers, or other semi-pervious surfaces approved by the zoning administrator. One of the following shall be met:

(1) Paving materials with a solar reflectance index (SRI) of at least 29.

(2) Pervious pavement material, such as permeable asphalt, permeable concrete, or permeable pavers.

(3) Recycled content of 15 percent or more.

I. **Sidewalk Crossings.** Sidewalk pavement elevation, width, design, scoring, and material shall extend continuously over any driveway pavement with the intent of prioritizing the sidewalk path over the driveway and distinguishing the sidewalk path from the driveway.

J. **Illumination.** All off-street parking lots or parking structures and their related pedestrian areas and pathways shall provide a level of illumination at any point in the parking lot or parking structure not less than one foot-candle measured at the pavement. All lighting shall be shielded or otherwise optically controlled to provide glare-less illumination and limit trespass on adjacent properties.

(1) **Inter-Lot Drives.** In all districts except NX and N, when 2 or more parking lots are located adjacently in the rear and each lot contains the same building type, the parking lots shall be connected with a drive perpendicularly crossing the minimum setback.

7.3.2 PEDESTRIAN ACCESS

All parking lots with 2 or more double-loaded aisles shall provide internal pedestrian pathway(s) within the parking area and outside of the parking drive aisle. Refer to Figure 7.3-B Parking Lot Pedestrian Walkway.

A. **Dimension.** The pathway shall be a minimum of 6 feet in width.

B. **Quantity.** One pathway is required for every 2 double-loaded aisles.

C. **Location.** The pathway shall be centrally located within the parking area to serve a maximum number of parking stalls.

(1) Pathways shall provide direct connections to the principal structure(s) entrances from the spaces furthest from the entrance.

(2) At least one pathway shall provide a direct connection between adjacent street rights-of-way and/or trails and the principal structure's entrance.

D. **Pathway Delineation.** Pedestrian pathways should be clearly marked with striping or through the use of alternative materials, such as pavers.

7.3.3 BICYCLE PARKING DESIGN

Bicycle parking (refer to Figure 7.2-B Bicycle Parking for quantity required) shall be designed and located as follows.

A. **Dimensions.**

(1) An aisle a minimum of 5 feet wide shall be provided adjacent to any bicycle parking facilities to allow for maneuvering.

(2) Racks shall be installed a minimum of 2 feet from any wall or other obstruction, except for wall-mounted bicycle racks, which may be mounted directly on a wall.

B. **Location.** Bicycle parking may be located within 50 feet of the entrance of the use on the same lot as the use served by such parking.

(1) Short-term bicycle parking may be indoors or outdoors. Long-term bicycle spaces must be located in a limited-access enclosure protecting bicycles from precipitation and theft, such as: enclosed indoor bicycle rooms, bicycle sheds, bicycle lockers, and weather-protected bicycle parking spaces that are monitored by an attendant or security system, such as bike boxes.

(2) Spaces located within individual dwelling units may not be counted toward bicycle parking requirements.

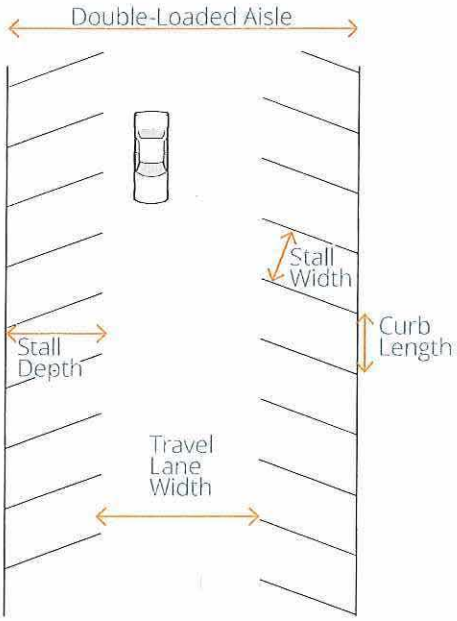
(3) Bicycle parking facilities shall be separated from vehicular parking areas to protect parked bicycles from damage. The separation may be accomplished through grade separation, distance or physical barrier, such as curbs, wheel stops, poles or other similar features.

C. **Racks and Structures.** Racks and structures shall be provided for each unprotected parking space, and shall be designed to accommodate both chain and U-shaped locking devices supporting the bicycle frame at 2 points. Racks may be floor-mounted or wall-mounted, and they must be securely affixed or bolted to the floor or wall.

D. **Surface.** The parking surface shall be designed and maintained to be mud and dust free. The use of rock or gravel areas for bicycle parking is permitted provided that edging materials, so that the bicycle parking area is clearly demarcated and the rock material is contained.

E. **Signage.** If required bicycle parking for public use is not visible from the street, signs must be posted indicating their location.

F. Maintenance and Lighting. Areas used for required bicycle parking must be well-lit with acceptable drainage to be reasonably free of mud and standing water. Accessory off-street parking for bicycles shall include provision for secure storage of bicycles. Such facilities shall provide lockable enclosed lockers or racks or equivalent structures in or upon which a bicycle may be locked by the user.



MINIMUM PARKING SPACE DIMENSIONS[1]

Angle	Curb Length	Stall Width	Stall Depth	Travel Lane Width	
				One-Way	Two-Way
0 degrees	18 feet	8 feet	18 feet	12 feet	24 feet
45 degrees	12 feet	8.5 feet	17 feet	12 feet	24 feet
60 degrees	10 feet	8.5 feet	18 feet	18 feet	24 feet
90 degrees	8.5 feet	8.5 feet	18 feet[2]	24 feet	24 feet

[1] Maximum dimensions shall not exceed 10 percent of the minimum dimensions.
[2] Stall depth may be reduced 2' when stall directly abuts an interior parking lot median that includes an additional area beyond the minimum width, permitting the overhang of the adjacent parked vehicle's front bumper.

Figure 7.3-A Parking Space Dimensions.

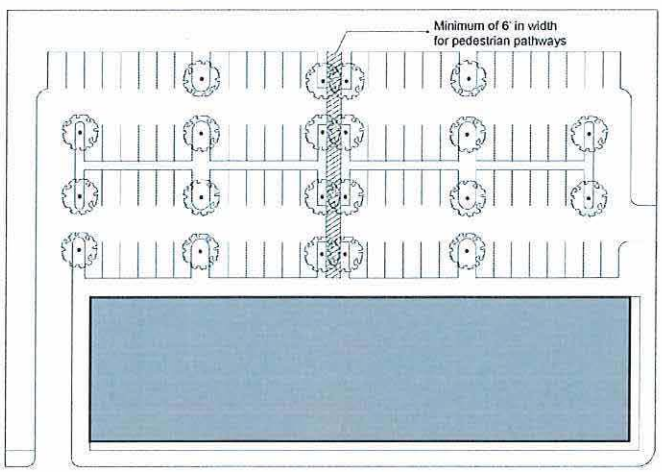


Figure 7.3-B Parking Lot Pedestrian Walkway