



## MEMORANDUM

DATE: July 28, 2022

TO: Robert Winn, P.E, City of Waltham

FROM: Brandon Blanchard, P.E., Pare Corporation  
Michael Moulico, Pare Corporation

CC: Timothy P. Thies, P.E., Pare Corporation

RE: **City of Waltham – IDDE Program**  
**July 2022 Program Update**  
Pare Project No.: 20104.01

This memorandum summarizes field investigations conducted as part of the City of Waltham's Illicit Discharge Detection and Elimination (IDDE) Program. The intent is to provide the City with an update on the progress of this Program for the purposes of identifying areas where additional investigation is warranted. Previously, sampling and analysis performed at outfalls throughout the City showed evidence of direct or indirect wastewater interconnections to the City's stormwater collection system. These outfalls were categorized into five groups, as follows:

- Group I – Outfalls that have exceedances of multiple parameters
- Group II – Outfalls that have high Chlorine residuals
- Group III – Outfalls that have high Phosphorus exceedances
- Group IV- Outfalls that have high Nitrogen exceedances
- Group V – Outfalls that have high E. coli exceedances

Group I outfalls were those that exceeded allowable limits of multiple parameters, suggesting they are prone to cross connection risk. Group I outfalls are OF-09, OF-145, OF-203, OF-731, and IMC-10. Similarly, Group V outfalls were those exhibiting bacterial (E. coli) concentrations higher than recommended thresholds. Group V outfalls are as follows: OF-73, OF-81, OF-111, OF-126, OF-159, OF-176, OF-528, OF-625, OF-652, OF-732, OF-735, OF-793, and OF-799. Intermunicipal Connection IMC-8 and outfall DCR 23903, managed by the Massachusetts Department of Conservation and Recreation (DCR), were also included as Group V outfalls.

For both groups, upstream flow tracing and additional sampling and analysis were proposed to help identify and isolate the source(s) of cross-connection or contamination to these outfalls. Samples were analyzed for the parameters listed in Table 1. Once further upstream sampling and analysis is done, smoke or dye testing or in some cases CCTV investigation can be used to further isolate potential point sources.

Table 1 – IDDE Sampling Program Analytes

Analyte or Parameter	Benchmark/TMDL
Ammonia	0.5 mg/L
Surfactants	0.25 mg/L
Chlorine	0.02 mg/L (detectable levels per the 2016 MS4 Permit)
Phosphorous	0.1 mg/L (not specified in Waltham IDDE Plan, so value taken from Charles River Watershed's Total Maximum Daily Load (TMDL))
Indicator Bacteria <sup>1</sup> : <i>E. coli</i> <i>Enterococcus</i>	<i>E. coli</i> : 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  <i>Enterococcus</i> : the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 33 colonies per 100 ml and no single sample taken during the bathing season shall exceed 61 colonies per 100 ml

Because the intent of the upstream flow tracing was to identify illicit discharge, dry weather sampling events were performed after no more than 0.1 inches of rainfall had occurred in the previous 72-hour period, with no significant snowmelt occurring. The 72-hour period was used to prevent stormwater runoff from entering the drainage systems and impacting sample results. It was also critical that sampling be conducted during the wet season, the most likely time for outfall discharge to occur. As such, Pare performed sampling and analysis at Group I and Group V outfalls over the course of six days, from March 30, 2022 to June 7, 2022.

## Results

The findings of Group I and Group V upstream flow tracing have been summarized and are provided as attachments to this memorandum. Figures showing structures where sampling was attempted and performed are also attached.

## Recommendations

Tasks 1 and 3 in Pare's scope of work have been completed, as described herein. The following are the upcoming tasks and recommended action items under the current IDDE Program for the City of Waltham:

- Task 2: Perform leak detection near outfalls where high residual chlorine levels were previously detected. These outfalls were identified as OF-128, OF-155, and OF-190.
- Task 4: Smoke and/or dye testing is recommended at the following locations:
  - Trapelo Road, upstream of OF-09;
  - Cherry Street, at intermunicipal connection IMC-10;
  - Winter Street, upstream of OF-81;
  - Felton Street at Mechanic Street, upstream of OF-126;
  - Immediately upstream of outfall OF-652; and
  - Longfellow Road, upstream of intermunicipal connection IMC-8.



- Task 5: One day of CCTV inspection has been budgeted. Some locations where CCTV investigation is recommended have already been identified, but a final list of locations for investigation will be determined following smoke/dye testing proposed in Task 4.

Pare will contact you to review the findings and recommendations described herein, and to coordinate the next tasks on the project. In the meantime, please contact us if you have any questions.

Attachments:

Group I Outfall Summary  
Group V Outfall Summary  
Figures

-BMB

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***Group I (Task 1) Outfalls***

***Summary of Completed Work***

## **Outfall OF-09**

<b>Background</b>	
Location	Trapelo Road
Outfall	24-inch reinforced concrete pipe
Receiving waterbody	North Cambridge Reservoir (Class A)
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• Total residual chlorine: 0.23 mg/L (exceeded benchmark value).</li> <li>• Total phosphorous: 0.147 mg/L (exceeded TMDL).</li> <li>• No other parameters exceeded TMDL or IDDE Benchmark values.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 10, 2022
Description of field work	<ul style="list-style-type: none"> <li>• Sample collected at the outfall.</li> <li>• Sample collected at upstream manholes in Trapelo Road and Mountain Road</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• Steady flow was observed on Trapelo Road between the outfall and Brennan Avenue. The drain line in Trapelo Road west of Brennan Avenue was found to be dry.</li> <li>• The manhole in Mountain Road has an 18-inch corrugated metal pipe entering from the northwest. This appears to be a cross-country drain. A trickle of flow was observed during the site visit.</li> <li>• No exceedances of TMDLs or benchmarks from this sampling round.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No exceedances of TMDLs or benchmarks from this sampling round.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• The cross-country connection to the drainage manhole on Mountain Road should be investigated further because there is no obvious source of flow entering this pipe. <b><i>Smoke testing should be considered at this location, which will be reviewed with the City.</i></b></li> <li>• Another round of dry weather upstream flow tracing and sampling is recommended as part of a future phase of the City's IDDE Program. Previous exceedances could not be replicated, and potential locations of illicit connection could not be determined.</li> </ul>	

## **Outfall OF-145**

<b>Background</b>	
Location	Farwell Street Bridge
Outfall	24-inch reinforced concrete pipe
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• E. coli: 579.43 MPN/100mL (exceeded TMDL).</li> <li>• Total phosphorous: 0.114 mg/L (exceeded TMDL).</li> <li>• No other parameters exceeded TMDL or IDDE Benchmark values.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>• Sample collected at the outfall.</li> <li>• Sample collected at 1 upstream manhole (intersection of Farwell Street and River Street).</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• Several upstream manholes along Farwell Street, between the outfall and intersection with River Street, could not be opened.</li> <li>• The manhole at the intersection of River Street was sampled, but upstream manholes on River Street to the east and west were both dry during this site visit.</li> <li>• Flow was entering in the direction of Seyton Street. An upstream manhole on Seyton Street was opened but was too deep to sample.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No exceedances at the outfall or upstream manhole at Farwell/Seyton were detected.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• Because past exceedances of E. coli and total phosphorous were not replicated in the May 2022 sampling, no suspect areas where cross-connection or point sources could be identified.</li> <li>• Another round of dry weather upstream flow tracing and sampling is recommended as part of a future phase of the City's IDDE Program. Flow tracing should be extended further upstream in future phases of this work.</li> <li>• Because there is no evidence to locate potential illicit connections, additional investigation by CCTV inspection or smoke/dye testing is not currently recommended. This recommendation should be re-evaluated based on the results of future upstream flow tracing and sampling.</li> </ul>	

## **Outfall OF-203**

<b>Background</b>	
Location	Waltham Public Services Complex
Outfall	24-inch cast iron pipe
Receiving waterbody	Unnamed tributary to Lyman Pond
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• E. coli: 3,738 MPN/100mL (exceeded TMDL).</li> <li>• Total phosphorous: 1.23 mg/L (exceeded TMDL).</li> <li>• No other parameters exceeded TMDL or IDDE Benchmark values.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	March 30, 2022
Description of field work	<ul style="list-style-type: none"> <li>• No sample was collected at the outfall due to dry conditions.</li> <li>• A sample was collected at 1 upstream manhole.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• No flow at the outfall was observed during the site visit.</li> <li>• No flow was observed in upstream manholes.</li> <li>• Standing water was identified in 1 upstream manhole, identified as MH 203(1) for the purposes of this investigation.</li> </ul>
Results	<p>A sample was collected at 1 upstream manhole, MH 203(1).</p> <ul style="list-style-type: none"> <li>• Total phosphorous: 10.7 mg/L (exceeded TMDL).</li> <li>• Ammonia: 3 mg/L (exceeded benchmark value).</li> <li>• Surfactants: 0.78 mg/L (exceeded benchmark value).</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• No flow was observed during this site visit but standing water in a nearby upstream manhole was collected and found to have exceedances of nutrients and surfactants.</li> <li>• Operations throughout the Waltham Public Services complex likely contribute to the discharge of contaminants at the outfall (e.g., routine washing of vehicles and equipment with wash water entering onsite catch basins). Pare recommends that the City evaluate its onsite water use practices, in lieu of additional investigations, to evaluate potential sources of contaminants in stormwater runoff (as opposed to illicit connections).</li> <li>• Because there is no evidence to locate potential illicit connections (i.e., dry conditions and no evidence of recent flow), smoke/dye testing or CCTV investigation is not currently recommended.</li> </ul>	

## **Outfall OF-731**

<b>Background</b>	
Location	Reservoir Place Corporate Office Park
Outfall	18-inch reinforced concrete pipe
Receiving waterbody	Wetlands north of building (Class A waterbody)
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• Total phosphorous: 0.117 mg/L (exceeded TMDL).</li> <li>• Ammonia: 2.34 mg/L (exceeded benchmark value).</li> <li>• No other parameters exceeded TMDL or Waltham IDDE benchmark values.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 10, 2022
Description of field work	<ul style="list-style-type: none"> <li>• No samples were collected at the outfall or upstream manholes due to dry conditions.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• No flow was observed at the outfall during this site visit.</li> <li>• This outfall was partially submerged during September 2020 sampling.</li> <li>• The outfall receives stormwater runoff from a large, paved parking lot and landscape areas at the southwest corner of the building. It is possible that the past exceedance of nutrients (nitrogen and phosphorous) at this outfall result from lawn care practices.</li> <li>• Given the nature of the contributing drainage area, illicit connections seem unlikely.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No sampling was performed due to dry conditions.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• Pare recommends that the City coordinate with the property management company to evaluate their lawn care practices to potentially reduce nutrient loading at this outfall.</li> <li>• No smoke or dye testing or CCTV inspection is proposed.</li> <li>• No future upstream flow tracing to locate illicit connections is recommended, given the findings noted above.</li> </ul>	

## Intermunicipal Connection IMC-10

Background	
Location	Cherry Street (Newton, MA)
Junction Manhole	Intermunicipal connection between City of Waltham and City of Newton
September 2020 Outfall Sampling and Analysis	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• Total phosphorous: 0.186 mg/L (exceeded TMDL).</li> <li>• Surfactants: 2.1 (exceeded benchmark value).</li> <li>• No other parameters exceeded TMDL or Waltham IDDE benchmark value.</li> </ul>
Spring 2022 Upstream Flow Tracing Sampling and Analysis	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>• No samples were collected at the outfall or upstream manholes due to dry conditions.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• No flow was observed entering the junction manhole. Standing water was observed at the base of the structure, but it was not sampled.</li> <li>• The manhole immediately downstream of the junction manhole, within Newton, did not have flow or standing water.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No sampling was performed.</li> </ul>
Recommendations	
<ul style="list-style-type: none"> <li>• No smoke/dye testing or CCTV inspection is proposed at this time because no evidence of illicit connections was verified.</li> <li>• A business identified as Highlander Laundry at 71 Waltham Street in Newton is immediately adjacent to the junction manhole. <b><i>Pare recommends that smoke testing be performed at this location to determine if there is an illicit connection to the drain, given that phosphorous and surfactants were both exceedances at IMC-10. Dye testing could follow, pending the results of smoke testing.</i></b></li> <li>• Another round of upstream flow tracing and sampling and analysis should be performed in a future phase of the IDDE Program, if the results of smoke/dye testing are inconclusive.</li> </ul>	

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***Group V (Task 3) Outfalls***  
***Summary of Completed Work***



## **Outfall OF-73**

<b>Background</b>	
Location	Bacon Street
Outfall	36" reinforced concrete pipe
Receiving waterbody	Intermittent stream flowing to Beaver Brook
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 510 MPN/100mL (exceeded TMDL).</li> <li>No other parameters exceeded a TMDL or Waltham IDDE benchmark value.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>No samples were collected at the outfall or upstream manholes due to dry conditions.</li> <li>A manhole along Bacon Street, immediately upstream of the outfall, was found to be dry.</li> <li>An upstream manhole at the intersection of Bacon Street and Worcester Lane was also found to be dry.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>No flow was observed at the outfall or upstream manholes.</li> <li>The outfall was partially submerged in the September 2020 sampling. It is possible that previous sampling represents surface water conditions and not discharge from the outfall.</li> </ul>
Results	<ul style="list-style-type: none"> <li>No sampling was performed because of dry conditions.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>Smoke/dye testing or CCTV investigation is not currently recommended because potential areas of illicit connection could not be determined.</li> <li>Another round of upstream flow tracing and sampling and analysis should be performed in a future phase of the IDDE Program. However, because the outfall was partially submerged during September 2020 sampling, it is possible this sample represents surface water conditions and not discharge from the outfall. This should be monitored in future sampling events.</li> </ul>	



## **Outfall OF-81**

<b>Background</b>	
Location	Winter Street
Outfall	12" reinforced concrete pipe
Receiving waterbody	Intermittent stream flowing to Beaver Brook
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 1,000 MPN/100mL (exceeded TMDL).</li> <li>No other parameters exceeded a TMDL or Waltham IDDE benchmark value.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	March 30, 2022
Description of field work	<ul style="list-style-type: none"> <li>A sample was collected at the outfall.</li> <li>Samples were collected at several upstream manholes in Winter Street.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>Steady flow was observed at the outfall on March 30, 2022.</li> <li>The outfall was partially submerged in the September 2020 sampling. It is possible that previous sampling represents surface water conditions and not discharge from the outfall.</li> <li>A 3-inch clay line discharging to a catch basin between 55 Winter Street and 61 Winter Street was observed during the site visit. This was the only source of the flow to the catch basin, and a sample was collected at the most downstream manhole. E. coli was not detected in that sample.</li> </ul>
Results	<ul style="list-style-type: none"> <li>E. coli was not detected in any sample above laboratory detection limits.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li><i>The three-inch clay line to the catch basin between 55 Winter Street and 61 Winter Street should be investigated further, as it was observed to be flowing during our March 30, 2022 site visit. Smoke testing should be considered at this location to try to locate its origin.</i></li> <li>Another round of upstream flow tracing and sampling and analysis should be attempted in a future phase of the IDDE Program. However, because the outfall was partially submerged during September 2020 sampling it is possible this sample represents surface water conditions and not discharge from the outfall. This should be monitored in future sampling events.</li> </ul>	



# Outfall OF-111

Background	
Location	Linden Street
Outfall	48" reinforced concrete pipe
Receiving waterbody	Beaver Brook
September 2020 Outfall Sampling and Analysis	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 770.1 MPN/100mL (exceeded TMDL).</li> <li>Total phosphorous: 0.174 mg/L (exceeded TMDL).</li> </ul>
Spring 2022 Upstream Flow Tracing Sampling and Analysis	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>Outfall was submerged during May 9, 2022 site visit, so no sample was collected.</li> <li>The catch basin immediately upstream of the outfall was inspected but there was no flow during this site visit, so no sample was collected.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>The outfall was partially submerged in the September 2020 sampling to the degree that sample collection was likely indicative of surface water conditions in Beaver Brook, rather than discharge from the outfall.</li> <li>Based on current GIS mapping, this outfall is connected only to a single nearby catch basin. No illicit connections were identified in this structure. Illicit connections upstream of the outfall, in general, seem unlikely.</li> </ul>
Results	<ul style="list-style-type: none"> <li>No samples were collected during the May 9, 2022 site visit.</li> </ul>
Recommendations	
<ul style="list-style-type: none"> <li>No smoke/dye testing or CCTV inspection is proposed for this location.</li> <li>The City should remove this outfall from future upstream flow tracing and sampling because there is no evidence to suggest that illicit connections are present.</li> </ul>	



## **Outfall OF-126**

<b>Background</b>	
Location	Elm Street/Felton Street
Outfall	36" brick pipe
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 920.84 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>Samples were collected at the outfall and an upstream manhole.</li> <li>Other upstream manholes in Elm Street and Carter Street were inspected but were too deep to collect samples from the surface.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>E. coli concentration at the outfall was 135.4 MPN/100mL.</li> <li>E. coli concentration at the manhole immediately upstream of the outfall was 1,413.61 MPN/100mL.</li> </ul>
Results	<ul style="list-style-type: none"> <li>E. coli exceeded the TMDL at the outfall but was lower than the E. coli concentration at the upstream manhole.</li> </ul>
Sampling date	June 7, 2022
Description of field work	<ul style="list-style-type: none"> <li>Samples were collected at the outfall and upstream manholes in Felton Street because other manholes closer to the outfall were too deep to sample based on the previous site visit performed on May 9, 2022.</li> <li>A police detail was requested but could not be filled. As such, sampling in other areas such as Moody Street north of Felton Street was not attempted.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>E. coli concentration at the outfall was 125.91 MPN/100mL.</li> <li>E. coli concentration at the manhole located at Felton Street and Mechanic Street was 1,203.33 MPN/100mL. A 3-inch cast iron pipe discharges to the drain manhole at Felton Street and Mechanic Street. It was dry during our site visit.</li> <li>E. coli concentration at the manhole located at Felton Street and Water Street was 410.58 MPN/100mL.</li> <li>A structure near the Felton Street and Water Street intersection with a manhole cover labeled "MET WW BO" was observed to have a significant number of plastic bottles in its sump. A substantial amount of infiltration was entering the structure as well. It does not appear to be connected to the City's drainage system on Felton Street, but its function or discharge location could not be verified.</li> </ul>
Results	<ul style="list-style-type: none"> <li>E. coli exceeded the TMDL at the outfall but was lower than E. coli concentrations at upstream manholes in Felton Street.</li> </ul>



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#### Recommendations

- *Smoke testing should be considered at the manhole at Felton Street and Mechanic Street to further investigate the 3-inch cast iron connection entering this structure.* However, additional illicit connections are possible because this pipe was dry and stormwater from upstream sources was found to exceed the TMDL for E. coli during both sampling events.
- The results of this sampling program suggest that E. coli is discharging to OF-126 in stormwater, at least from the area of Felton Street and further upstream. Future rounds of upstream flow tracing should extend the investigation area beyond Felton Street and potentially up Moody Street.



## **Outfall OF-159**

<b>Background</b>	
Location	Cove Street
Outfall	15" reinforced concrete pipe
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 980.39 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	April 5, 2022
Description of field work	<ul style="list-style-type: none"> <li>The outfall and a manhole immediately upstream were inspected. The outfall was submerged, and the upstream structure was dry, so no sampling was performed.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>The outfall was submerged during the site visit and it's believed to have been approximately level with the receiving water (Charles River).</li> <li>There was no flow observed at the structure immediately upstream of the outfall.</li> <li>The outfall was partially submerged in the September 2020 sampling to the degree that sample collection was likely indicative of surface water conditions in the Charles River rather than discharge from the outfall.</li> <li>Based on current GIS mapping, this outfall is connected only to catch basins in Woerd Avenue and Cove Street unless an illicit connection is present. This drainage area is made up primarily of roadways, parking areas, and a large commercial business.</li> <li>A sanitary lift station and manholes are in close proximity to the outfall and upstream drains.</li> </ul>
Results	<ul style="list-style-type: none"> <li>No samples were collected during the April 5, 2022 site visit due to dry conditions.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>No smoke/dye testing or CCTV inspection is proposed for this location at this time. The previous sampling may have detected E. coli in the surface water as opposed to discharge at the outfall.</li> </ul>	



## **Outfall OF-176**

<b>Background</b>	
Location	Pond End Road
Outfall	12" reinforced concrete pipe
Receiving waterbody	Unnamed tributary to Beaver Brook
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 7,800 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	March 30, 2022
Description of field work	<ul style="list-style-type: none"> <li>The outfall was submerged, and upstream catch basins had standing water above the invert of their outlets. No sampling was performed.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>The outfall was partially submerged during this site visit, as was the case in sampling performed in September 2020. The previous sampling was likely impacted by surface water and was not necessarily reflective of discharge at the outfall.</li> <li>Standing water was observed above the invert of the outlets from nearby catch basins. Field observations suggest that the surface water is backing up into both structures.</li> </ul>
Results	<ul style="list-style-type: none"> <li>No samples were collected during the March 30, 2022 site visit.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>GIS mapping indicates that only two nearby catch basins are connected to this outfall. If accurate, illicit connections are unlikely. No smoke/dye testing or CCTV investigation is proposed.</li> <li>Pare will make a follow-up visit during dry conditions to identify if there are any illicit connections flowing in either structure. If illicit connections are upstream of this manhole, it would most likely be at either catch basin due to their very close proximity to the outfall.</li> <li>Since past sampling was likely impacted by surface water, future sampling is not recommended unless illicit connections are found at either catch basin upon a follow-up site visit as described above.</li> </ul>	



## **Outfall OF-528**

<b>Background</b>	
Location	Parking area off Waverly Oaks Road
Outfall	12" reinforced concrete pipe
Receiving waterbody	Clematis Brook
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• E. coli: 13,390 MPN/100mL (exceeded TMDL).</li> <li>• Ammonia Nitrogen: 2.88 mg/L (exceeded benchmark value).</li> <li>• Total Phosphorous: 0.163 mg/L (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 9, 2022
Description of field work	<ul style="list-style-type: none"> <li>• The outfall was inspected as well as an upstream structure. No samples were collected due to dry conditions.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• The outfall discharges to a stormwater management area at the back of a large parking lot used by area businesses. Overflow from the stormwater management area discharges to Clematis Brook.</li> <li>• The outfall was partially submerged due to standing water in the stormwater management area during the September 2020 sampling.</li> <li>• The outfall and stormwater management area were dry during the May 9, 2022 site visit.</li> <li>• An upstream structure was inspected and found to be dry in the May 9, 2022 site visit.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No samples were collected during this site visit because of dry conditions.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• No smoke/dye testing or CCTV inspection is proposed for this location at this time. A previous sample was collected from standing water within the stormwater management area. E. coli and nutrients could be common in stormwater collecting in this area from sources other than illicit connections (e.g., the presence of wildlife in and around the brook or detention area).</li> <li>• Pare recommends that visual inspection of the stormwater management area be performed periodically during times of dry weather to document conditions, given that standing water was present during a period of dry weather in September 2020 yet not observed in early May 2022.</li> </ul>	





## **Outfall OF-625**

<b>Background</b>	
Location	Cooper Street
Outfall	20" vitrified clay pipe
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 1,203.33 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 2, 2022
Description of field work	<ul style="list-style-type: none"> <li>Samples were collected at the outfall and at 3 upstream structures.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>A steady stream of flow was observed at the outfall. A sample was collected, and E. coli was reported to be 1,299.65 MPN/100mL.</li> <li>Three upstream structures were sampled with E. coli ranging from 2,250 MPN/100mL to 7,757 MPN/100mL.</li> <li>The E. coli concentration detected in each sample exceeds the TMDL for the Charles River.</li> <li>The most upstream manhole that was inspected was at the intersection of Cooper Street and Pine Street. Flow in Pine Street was observed from the east, but there was no flow in Pine Street from the west.</li> <li>Structures further upstream to the east in Pine Street could not be accessed on May 2 without a police detail. Pare made a follow-up visit on June 7. Police detail was requested for this day but was not filled. No additional sampling was performed.</li> </ul>
Results	<ul style="list-style-type: none"> <li>Exceedances of E. coli were reported at the outfall and at upstream structures, but the results did not identify suspected locations of illicit connections.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>A future phase of the IDDE Program should conduct an expanded upstream flow tracing and sampling program. Upstream flow tracing and sampling should be extended easterly along Pine Street. The structures previously inspected and sampled should again be sampled as part of this future work, for comparison.</li> <li>The stretch of sewer in Cooper Street, between the outfall and Pine Street, may be considered for CCTV inspection given the variability in E. coli concentrations detected from the May 2 sampling event. This will be determined when the complete scope of CCTV investigation is finalized following the smoke/dye testing program.</li> </ul>	



## **Outfall OF-652**

<b>Background</b>	
Location	Mt. Feake Cemetery
Outfall	24" reinforced concrete pipe
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 8,206 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	April 5, 2022
Description of field work	<ul style="list-style-type: none"> <li>The outfall was inspected and partially submerged. An upstream structure was inspected and found to be dry. As a result, no samples were collected.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>The outfall was partially submerged during the April 5, 2022 site visit, as was the case in September 2020.</li> </ul>
Results	<ul style="list-style-type: none"> <li>No samples were collected at the outfall or upstream structures during this site visit.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>Because the outfall has routinely been submerged, sample results from September 2020 may represent surface water conditions and not discharge from the outfall.</li> <li><i>Given that there is a sanitary sewer line that runs close to this outfall, Pare recommends that dye testing be performed at this location. This would be the most likely source of E. coli discharge to the river from this outfall. Should no cross-connection be identified, this outfall should be removed from future sampling because there are no other likely locations for cross-connection.</i></li> </ul>	



## **Outfalls OF-732/OF-735**

<b>Background</b>	
Location	Reservoir Place Corporate Office Park
Outfall	12" reinforced concrete pipe
Receiving waterbody	Unnamed tributary to North Cambridge Reservoir (Class A waterbody)
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>• E. coli (OF-732): 726.99 mg/L (exceeded TMDL).</li> <li>• E. coli (OF-735): 980.39 mg/L (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 10, 2022
Description of field work	<ul style="list-style-type: none"> <li>• No samples were collected at the outfall or upstream structures due to dry conditions.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>• No flow was observed at these outfalls during this site visit.</li> <li>• These outfalls were partially submerged during September 2020 sampling.</li> <li>• Given the nature of the contributing drainage area to OF-732, an illicit connection seems unlikely.</li> <li>• A structure upstream of OF-735 has a pipe entering it from the direction of the building, which could be investigated further.</li> </ul>
Results	<ul style="list-style-type: none"> <li>• No sampling was performed due to dry conditions.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>• It is likely that past exceedances of E. coli at these two outfalls were due to submerged surface water. However, the structure upstream of OF-735 shows evidence of a pipe entering it in the direction of the nearby building. <b><i>Pare recommends that the City investigate this location to identify if this represents a cross-connection to the storm drain on the exterior of the building.</i></b></li> <li>• No future upstream flow tracing to locate illicit connections is recommended, given the findings noted above and the nature of the drainage areas to these outfalls.</li> </ul>	



## **Outfalls OF-793/OF-799**

<b>Background</b>	
Location	Newton Street
Outfall	Concrete Box Culverts
Receiving waterbody	Charles River
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli (OF-793): 387.32 mg/L (exceeded TMDL).</li> <li>E. coli (OF-735): 260.25 mg/L (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 10, 2022
Description of field work	<ul style="list-style-type: none"> <li>Samples were collected at both outfalls.</li> <li>Samples were collected at 3 upstream manholes.</li> </ul>
Findings	<p>E. coli was found to exceed the TMDL at both outfalls, as follows:</p> <ul style="list-style-type: none"> <li>E. coli (OF-793): 1,203.333 mg/L (exceeded TMDL).</li> <li>E. coli (OF-799): 648.82 mg/L (exceeded TMDL).</li> </ul>
Results	<ul style="list-style-type: none"> <li>E. coli was found to exceed the TMDL at both outfalls. However, samples collected at 3 upstream manholes did not exceed the TMDL for E. coli.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>Sampling performed on May 10, 2022, replicated high concentrations of E. coli at each outfall, but samples collected immediately upstream did not identify potential locations of illicit connection.</li> <li>These outfalls represent the discharge point of a significant reach of the buried stream (i.e., box culverts) as well as the open stream further to the north, which receives stormwater flow from the relatively large Beaver Brook watershed. Several other upstream outfalls discharge to this stream which flows to outfalls OF-793 and OF-799. Exceedances reported at these outfalls may be impacted by stormwater from upstream outfalls.</li> <li>Samples collected at and in the vicinity of outfalls OF-793 and OF-799 did not establish that suspected illicit connections are localized to these outfalls. As such, additional sampling upstream of these outfalls to locate illicit connections is not recommended.</li> </ul>	



## **Intermunicipal Connection IMC-8**

<b>Background</b>	
Location	Whitman Road
Outfall	24" reinforced concrete pipe
Receiving waterbody	Unnamed stream leading to the Town of Watertown collection system
<b>September 2020 Outfall Sampling and Analysis</b>	
Sampling date	September 2020
Results	<ul style="list-style-type: none"> <li>E. coli: 1,986.29 MPN/100mL (exceeded TMDL).</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	April 5, 2022
Description of field work	<ul style="list-style-type: none"> <li>Flow was observed at the intermunicipal connection and in the upstream drain line in Whitman Road.</li> <li>Samples were collected at several upstream structures.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>E. coli varied considerably in upstream samples, from not detected above laboratory detection limits to 1,986.29 MPN/100mL. Locations of suspected illicit connections could not be isolated based on these sample results.</li> </ul>
Sampling date	<ul style="list-style-type: none"> <li>June 7, 2022</li> </ul>
Description of field work	<ul style="list-style-type: none"> <li>Flow was observed at the intermunicipal connection and in the upstream drain line in Whitman Road.</li> <li>Samples were collected at several upstream structures, including locations further upstream from locations sampled during the April 5, 2022 site visit.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>E. coli ranged from 1,119.87 MPN/100mL to 4,711 MPN/100mL in 3 samples collected in Whitman Road.</li> <li>E. coli was not detected in a sample collected at the upstream structure at the bend in Longfellow Road, to the east of Whitman Road.</li> <li>There was no flow in Longfellow Road to the west of Whitman Road.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li><i>Smoke testing is recommended in the stretch of the drain in Longfellow Road, east of Whitman Road.</i></li> <li><i>If smoke testing in this area is inconclusive, Pare recommends that the drain in Whitman Road be further investigated by CCTV.</i> Inspection of drainage and sanitary manholes in Whitman Road suggests that overflows from the sewer to the underlying drainage may have historically been present. It is possible that the sewer in this street is not completely separated, given the E. coli concentrations observed. Cross-connections may be present which would likely best be determined by CCTV investigation.</li> </ul>	



## **DCR 23903**

<b>Background</b>	
Location	Waverly Oaks Road
Outfall	36" reinforced concrete pipe
Receiving waterbody	<p>Runyan Brook to Beaver Brook</p> <ul style="list-style-type: none"> <li>DCR Structure ID 23903 was identified by the Massachusetts Department of Conservation and Recreation (Mass DCR) as a location where E. coli concentrations have previously been high. It is located in the Beaver Brook Reservation, which is managed by Mass DCR. DCR 23903 discharges to Runyan Brook, which flows southeasterly and into Beaver Brook.</li> </ul>
<b>Spring 2022 Upstream Flow Tracing Sampling and Analysis</b>	
Sampling date	May 2, 2022
Description of field work	<ul style="list-style-type: none"> <li>Flow was observed at the outfall.</li> <li>Samples were collected at several upstream structures.</li> </ul>
Findings	<ul style="list-style-type: none"> <li>Flow was observed in the drain line along Waverly Oaks Road, from the south, which discharges to the outfall.</li> <li>A 20-inch cross-country drain across Waverly Oaks Road to the west was dry during this site visit.</li> <li>Flow at the manhole immediately upstream of the outfall was higher than anticipated based on the inspection of other manholes further upstream of this location. There may be an unmapped connection to this manhole that would need to be investigated further.</li> </ul>
Results	<ul style="list-style-type: none"> <li>E. coli was detected at 27,551 MPN/100mL at the structure immediately upstream of the outfall.</li> <li>Three other upstream structures were sampled, with E. coli concentrations ranging from 5.21 MPN/100mL to 307.59 MPN/100mL.</li> </ul>
<b>Recommendations</b>	
<ul style="list-style-type: none"> <li>The manhole immediately upstream of the outfall appears to carry flow from Waverly Oaks Road to the northwest as well as a second connection from the southwest. There may also be an unmapped connection given that the flow increases at this location despite low-flow conditions at other upstream manholes. <b><i>CCTV inspection should be performed at this location to verify all connections to the manhole. Accessibility of CCTV equipment to this manhole needs to be confirmed.</i></b></li> </ul>	



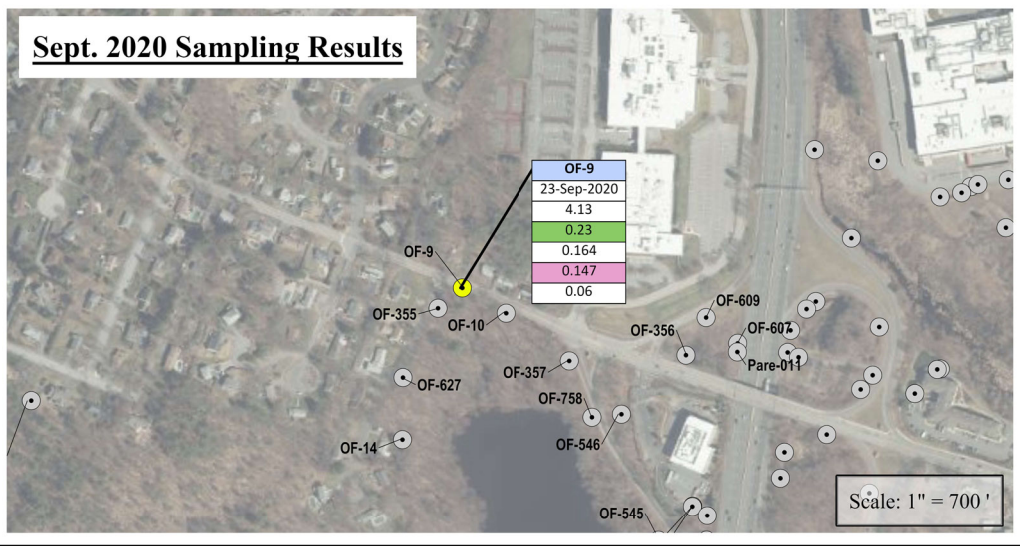
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## *Figures*





Sept. 2020 Sampling Results



Legend

- Sewer Infrastructure**

  - Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
  - Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter
- Miscellaneous Piping**

  - Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type
- Stormwater Infrastructure**

  - Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts
- Field Verified**

  - Field Verified Drain Line (approx)
  - Field Verified Manhole (approx)
  - Drain Manholes
  - Stormwater Catch Basins
  - Drywell
  - Leaching Chambers or Pits
  - Oil/Water Separator
  - Treatment
  - Water Quality Indicator
  - Outlet Control Structure
  - Cleanouts
  - Detention Basins
- Hydrologic Features**

  - Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	OF-9
	Sample Date	23-Sep-2020
E. coli (col/100ml)		4.13
Tot. Res. Chlorine (mg/l)		0.23
Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

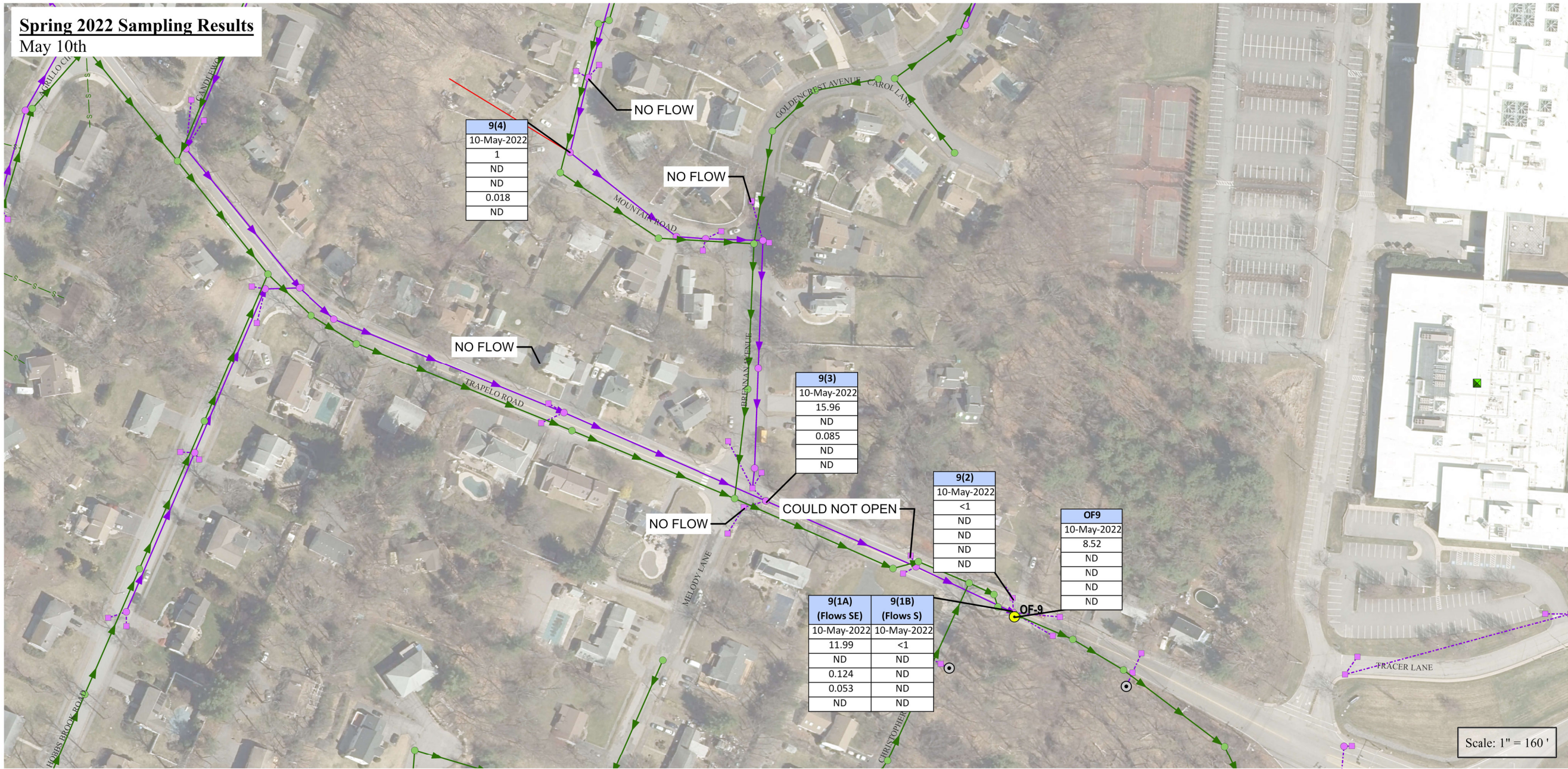
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 10th



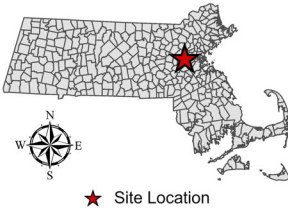
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 9



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

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WALTHAM, MA 02451

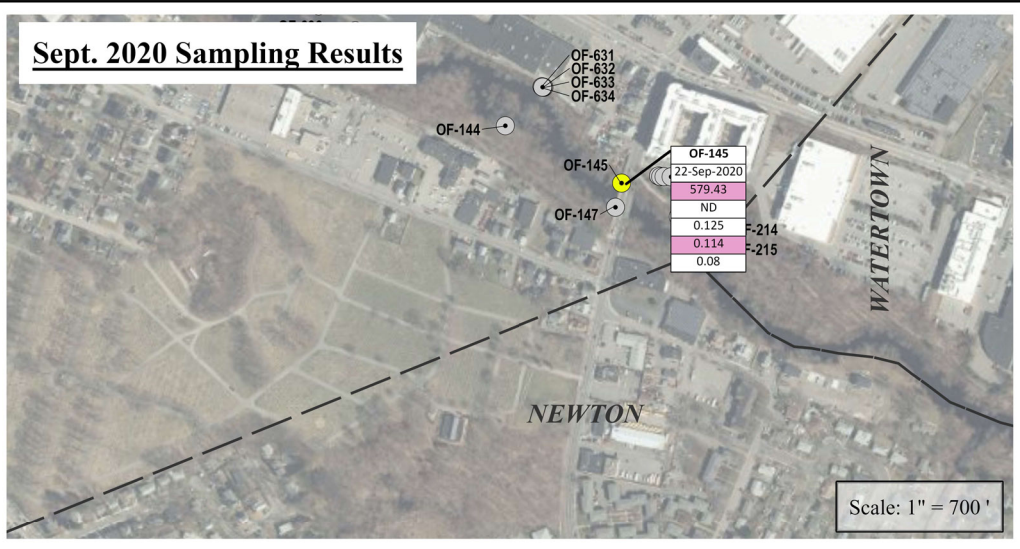


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
- Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
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  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
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- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
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  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	OF-9
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E. coli (col/100ml)		4.13
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Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

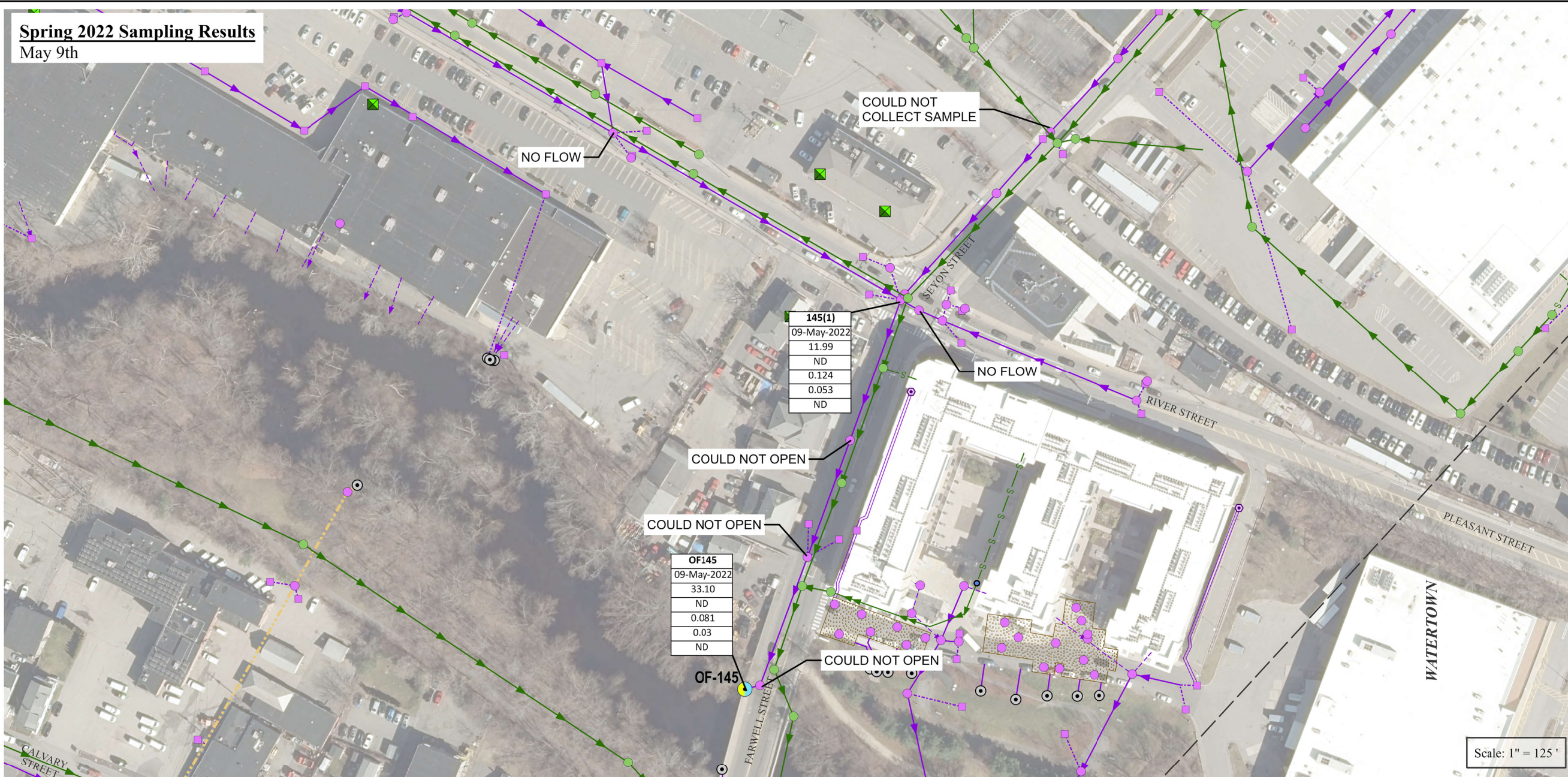
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 9th



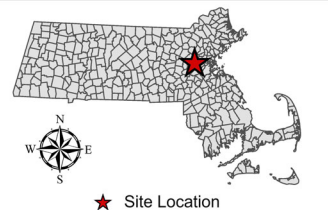
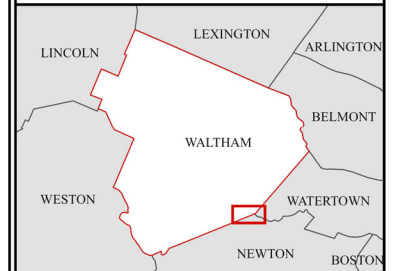
**PARE CORPORATION**  
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 145



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

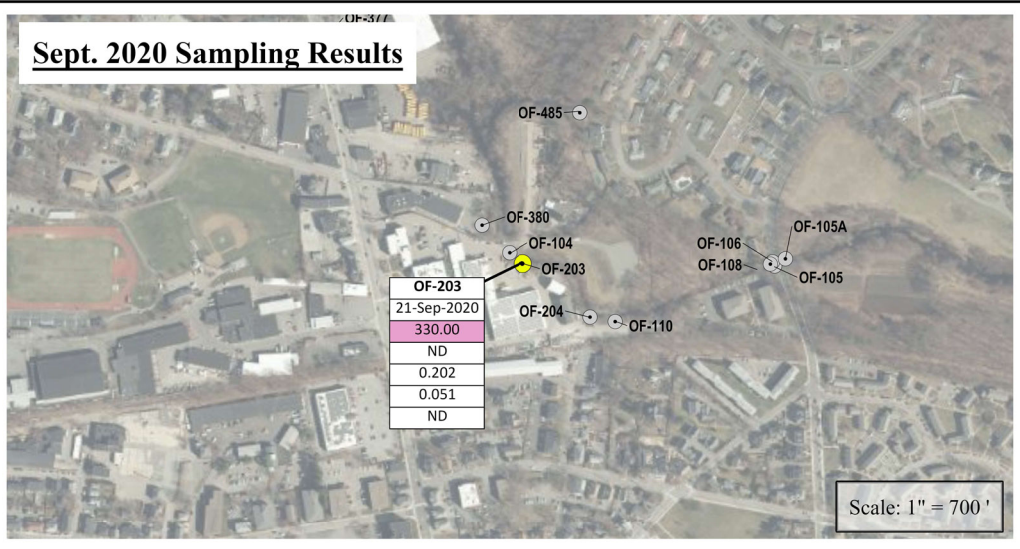


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DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
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- Miscellaneous Piping**
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- Hydrologic Features**
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  - Intermittent Stream
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  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

Analytical Key:

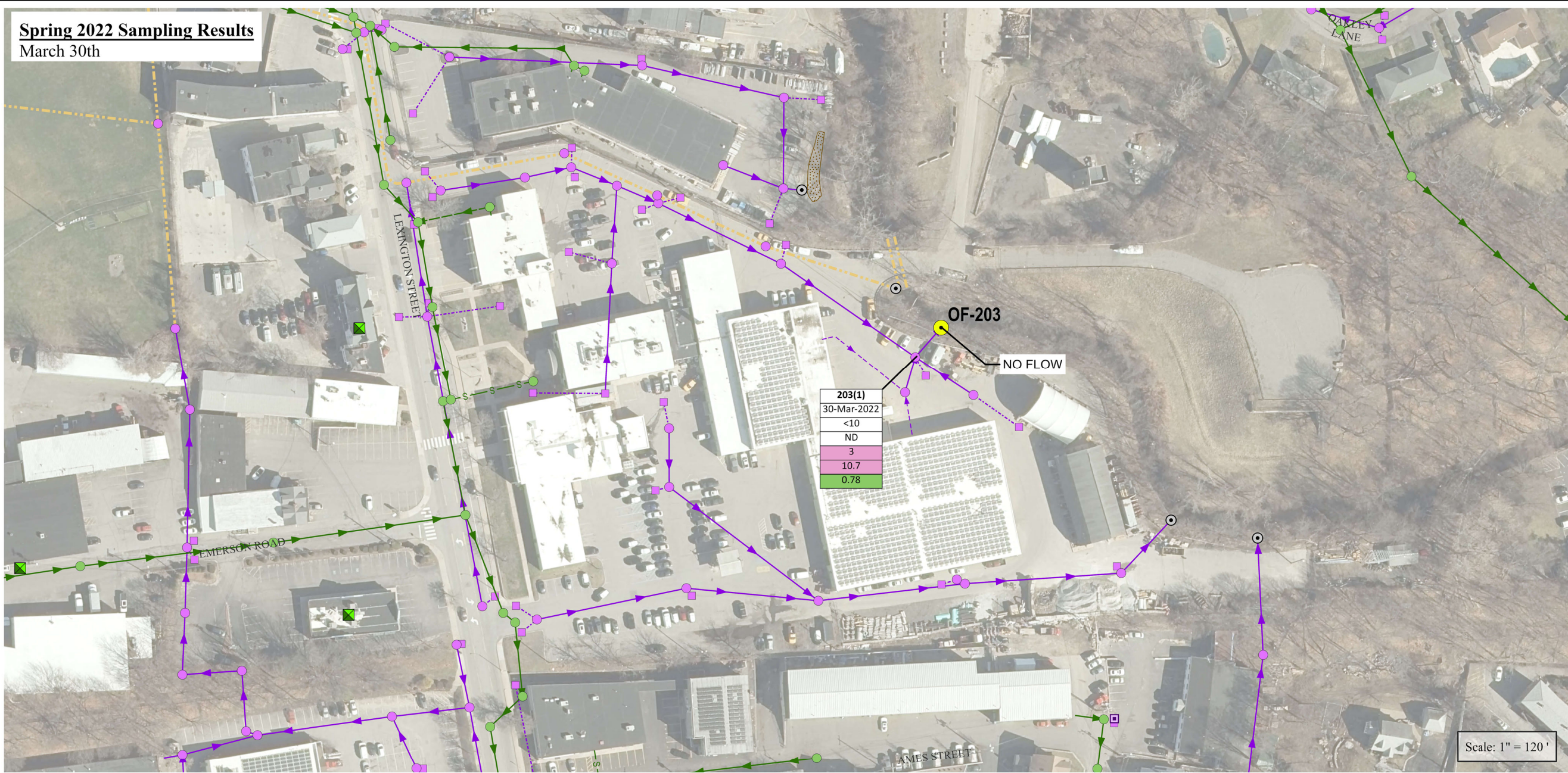
Analytical Method	Outfall ID	OF-9
E. coli (col/100ml)	23-Sep-2020	4.13
Tot. Res. Chlorine (mg/l)		0.23
Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results  
March 30th



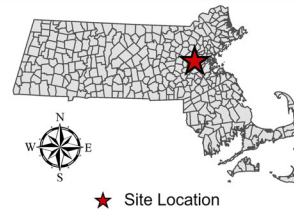
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 203



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

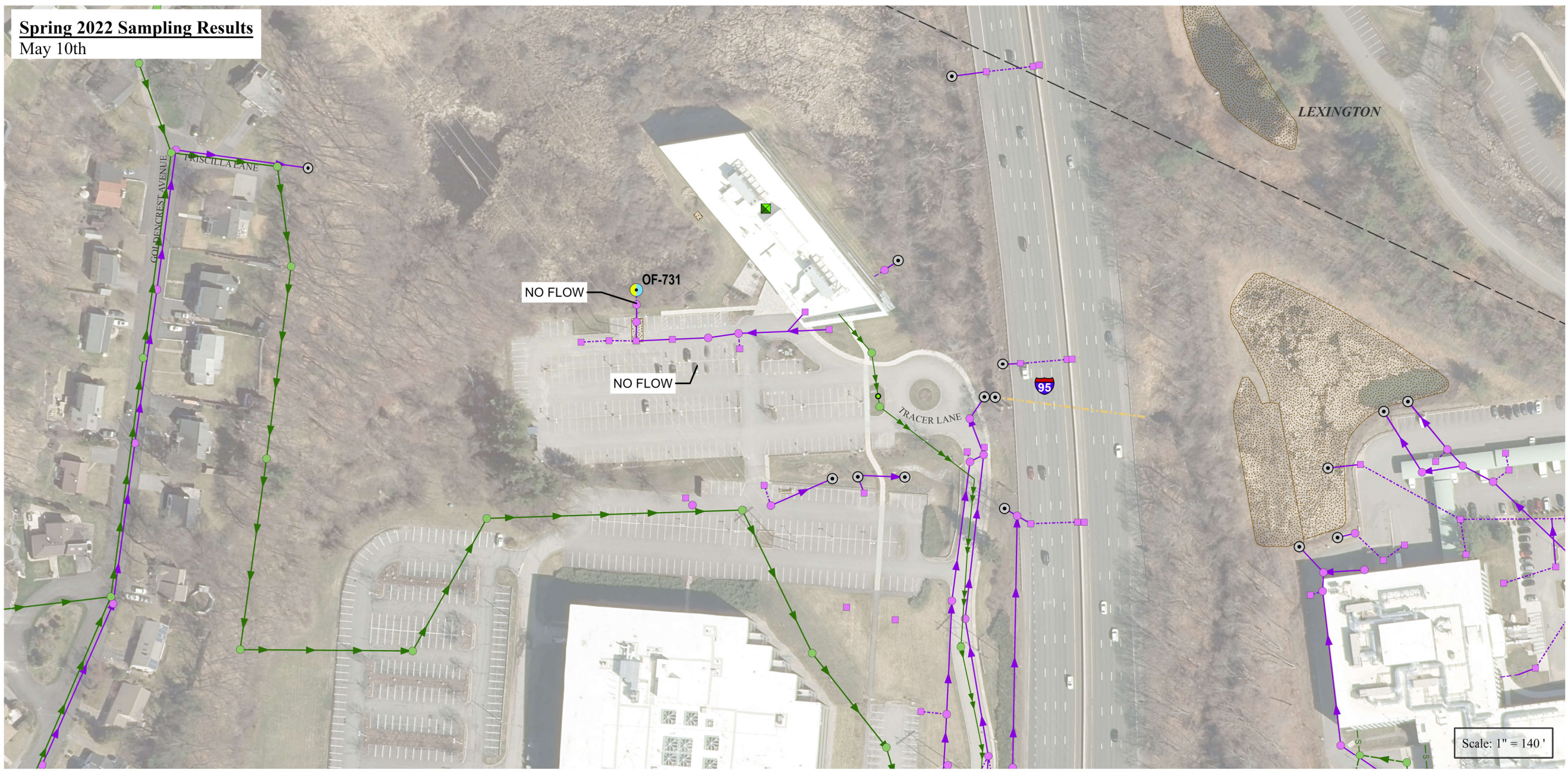
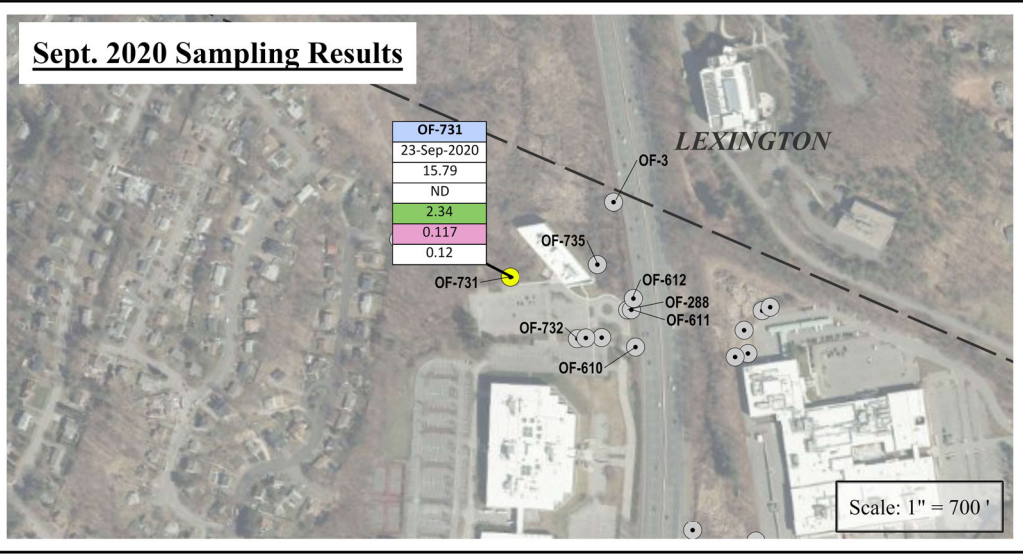
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DATE: 07/26/2022  
SCALE: AS NOTED





**Legend**

**Sewer Infrastructure**

- Task 1 Outfalls
- Task 3 Outfalls
- Remaining Outfalls
- Force Main
- Gravity Main
- Service Main
- Other
- Sewer Manholes
- Net Junctions
- Cleanouts
- Grease Trap
- Meter

**Miscellaneous Piping**

- Bypass
- Conduit
- Equalizer
- Header
- Storage
- Stub
- Treated Water Discharge
- Unknown Pipe Type

**Stormwater Infrastructure**

- Catch Basin Lateral
- Force Main
- Foundation/Perimeter Drains
- Gravity Drain
- Perforated Drain
- Roof Drain
- Trench Drain
- Underdrain
- Swales
- Culverts

**Field Verified Drain Line (approx)**

- Field Verified Manhole (approx)
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- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

**Hydrologic Features**

- Perennial Stream
- Intermittent Stream
- Manmade Shoreline
- Ditch/Canal
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- Dam
- Channel in Water
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Salt Wetland
- Submerged Wetland
- Cranberry Bog
- Tidal Flat
- Inundated Area

**Analytical Key:**

Analytical Method	Outfall ID	Sample Date	OF-9
E. coli (col/100ml)		23-Sep-2020	4.13
Tot. Res. Chlorine (mg/l)			0.23
Nitrogen Ammonia (mg/l)			0.164
Total Phosphorus (mg/l)			0.147
MBAS (mg/l)			0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

**PARE CORPORATION**  
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

**OUTFALL 731**

2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

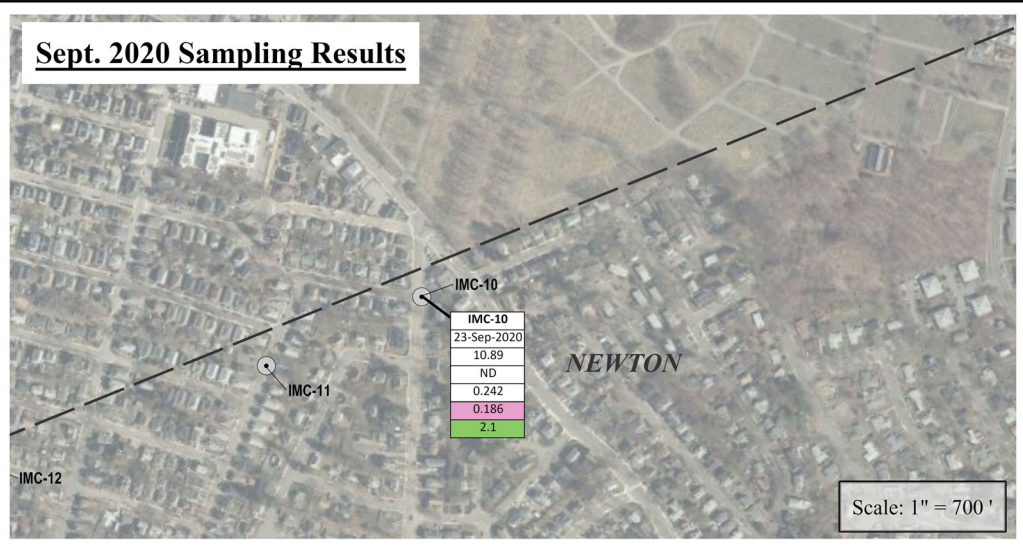
Site Location

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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
- Task 3 Outfalls
- Remaining Outfalls
- Sewer Infrastructure
  - Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping
  - Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure
  - Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
- Drywell
- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features
  - Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	OF-9
	Sample Date	23-Sep-2020
E. coli (col/100ml)		4.13
Tot. Res. Chlorine (mg/l)		0.23
Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 9th



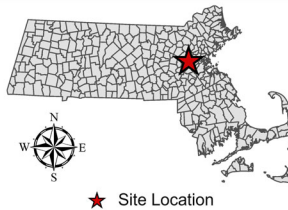
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

IMC-10



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

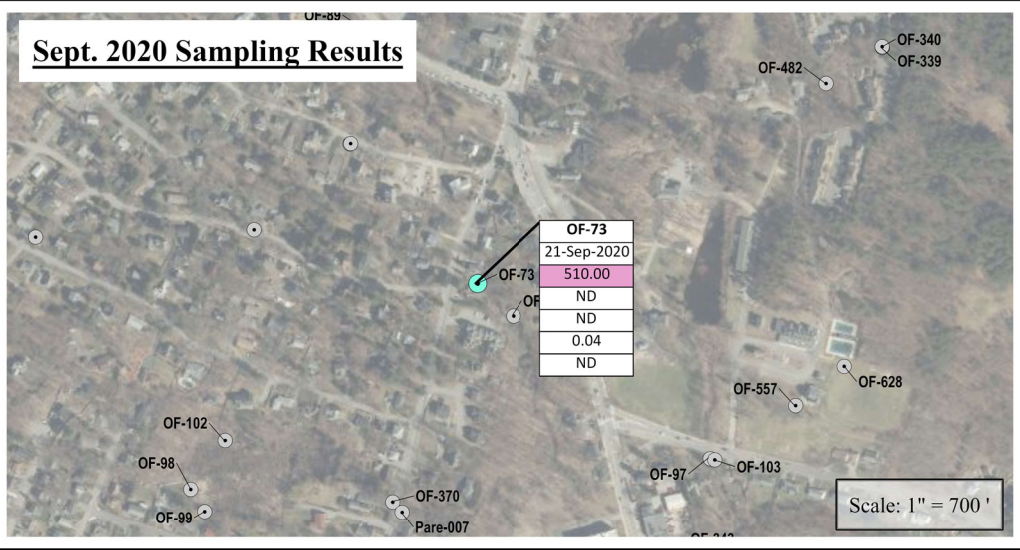


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

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- Bypass
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  - Stub
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  - Unknown Pipe Type

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- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
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  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	OF-9
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Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results  
May 10th



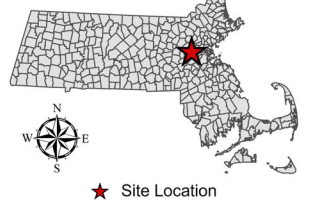
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 73



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

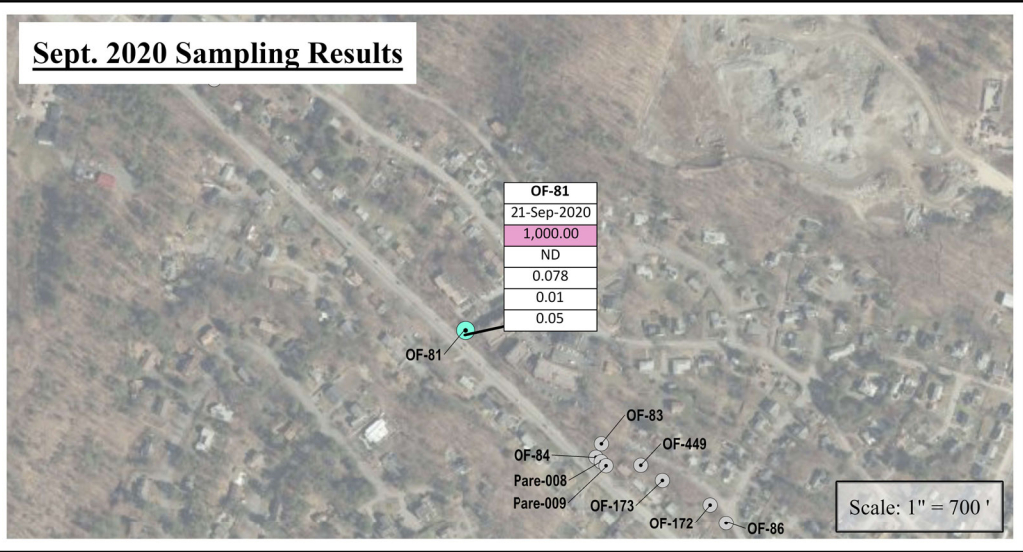


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

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- Task 3 Outfalls
- Remaining Outfalls
- Sewer Infrastructure**
  - Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
  - Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
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  - Unknown Pipe Type

- Stormwater Infrastructure**
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- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
  - Perennial Stream
  - Intermittent Stream
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  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	Sample Date	OF-9
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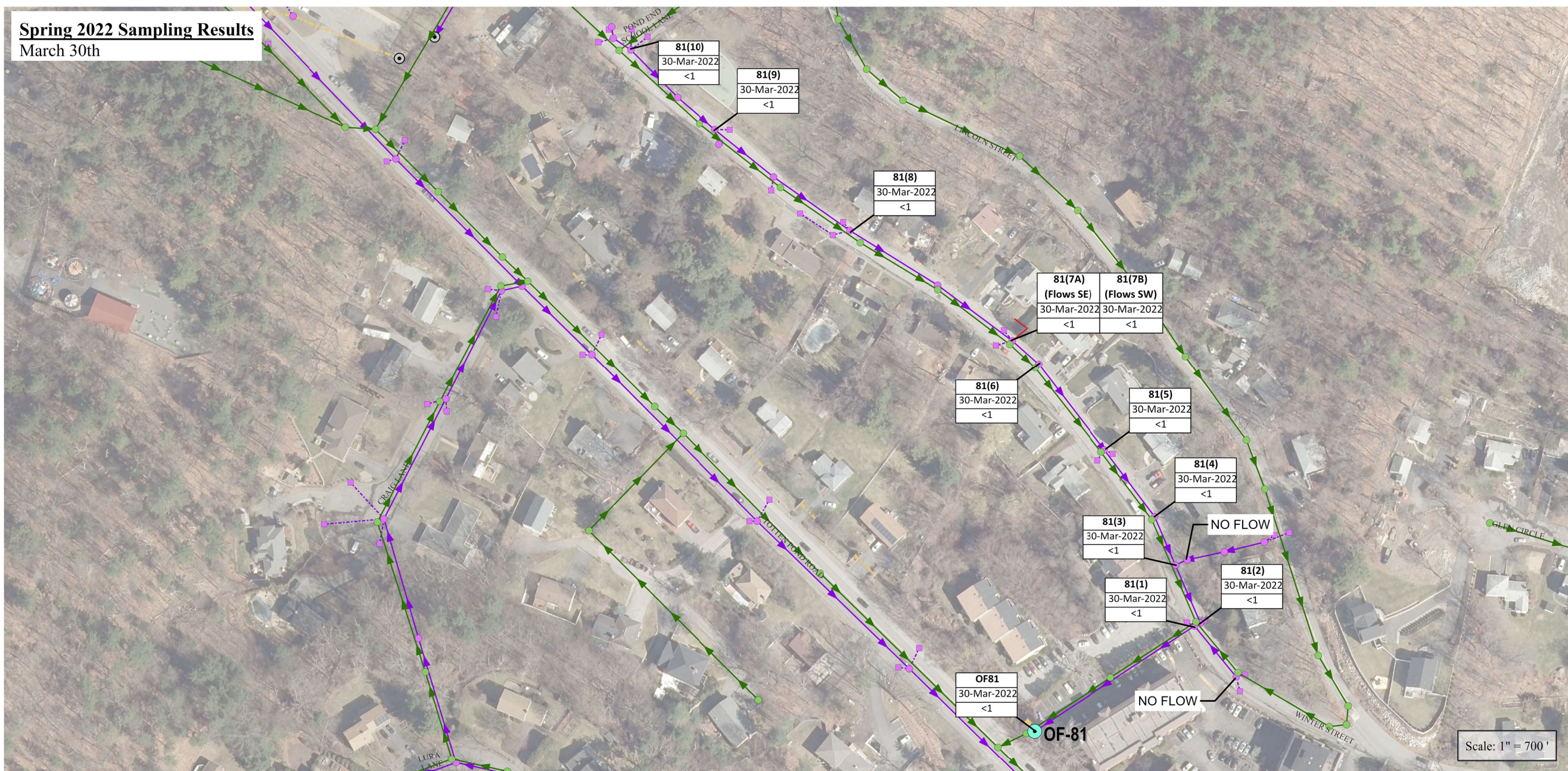
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

March 30th



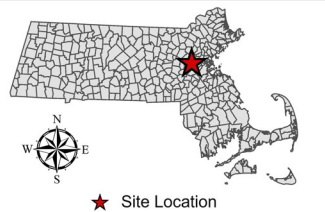
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 81



2022  
ILLICIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

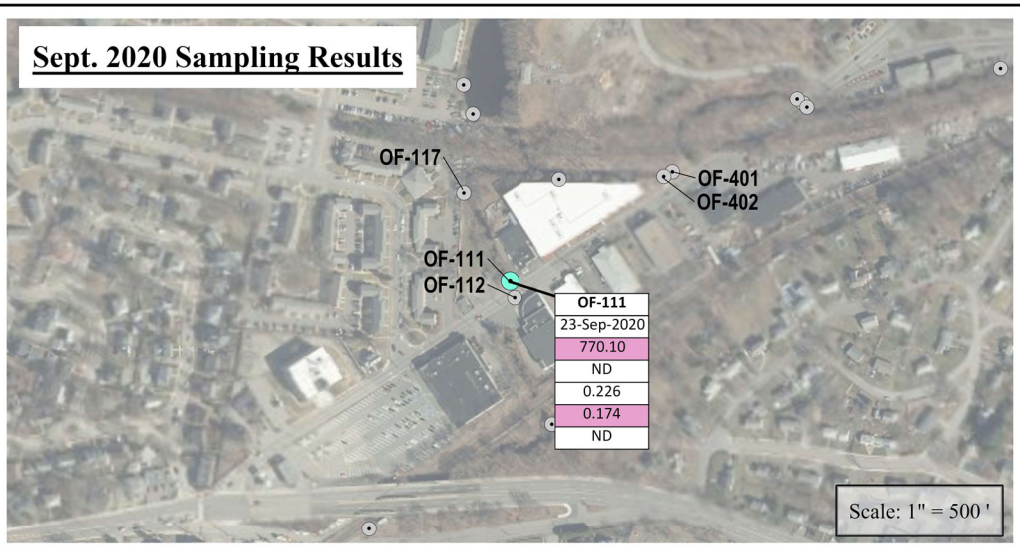


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
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  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
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- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
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Analytical Key:

Analytical Method	Outfall ID	OF-9
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Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

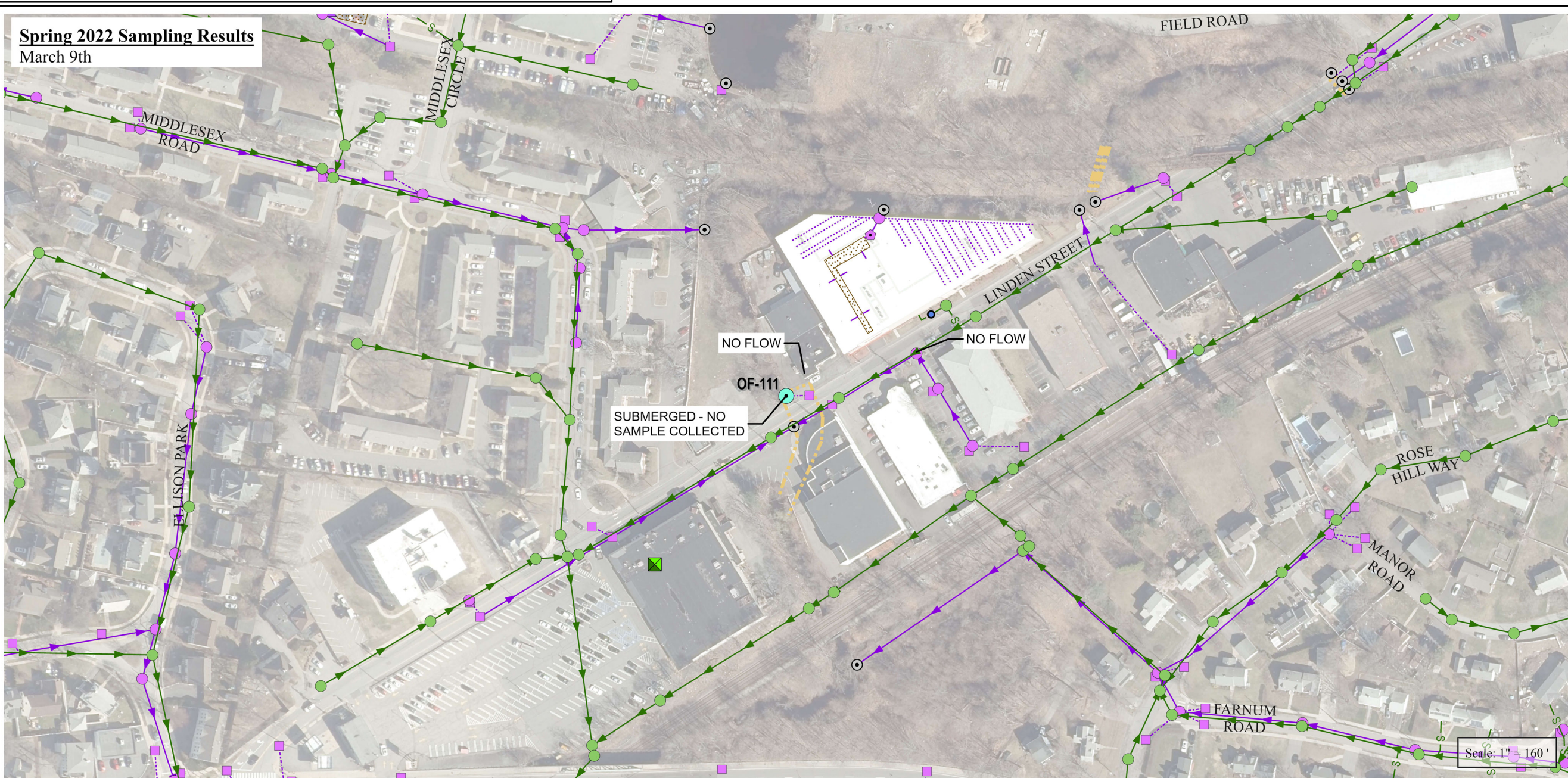
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

March 9th



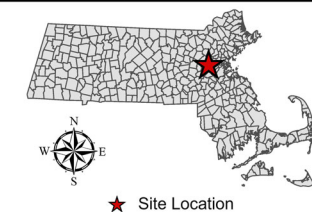
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 111



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

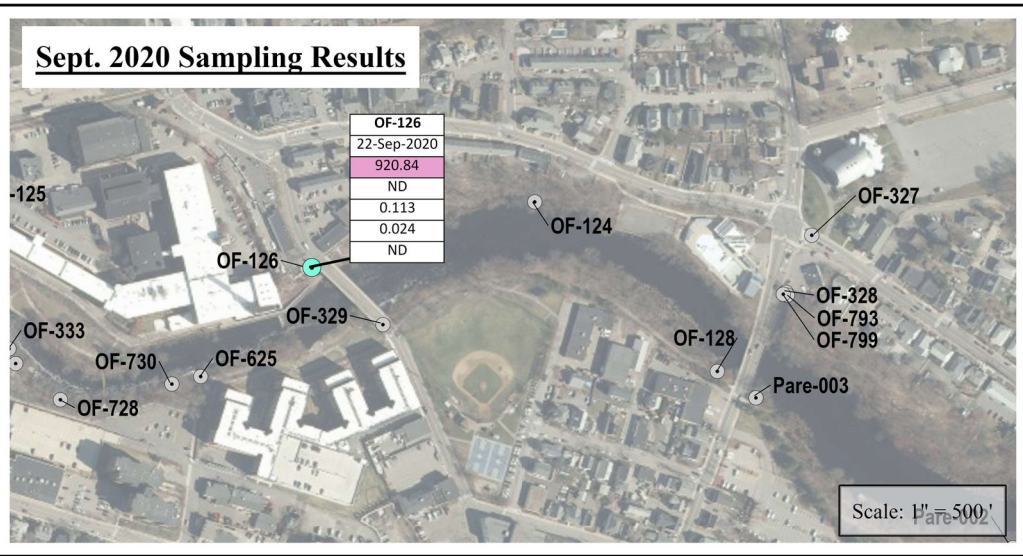


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

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- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
  - Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
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  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
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  - Force Main
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  - Gravity Drain
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  - Roof Drain
  - Trench Drain
  - Underdrain
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  - Culverts

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- Treatment
- Water Quality Indicator
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- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
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  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	Sample Date	OF-9
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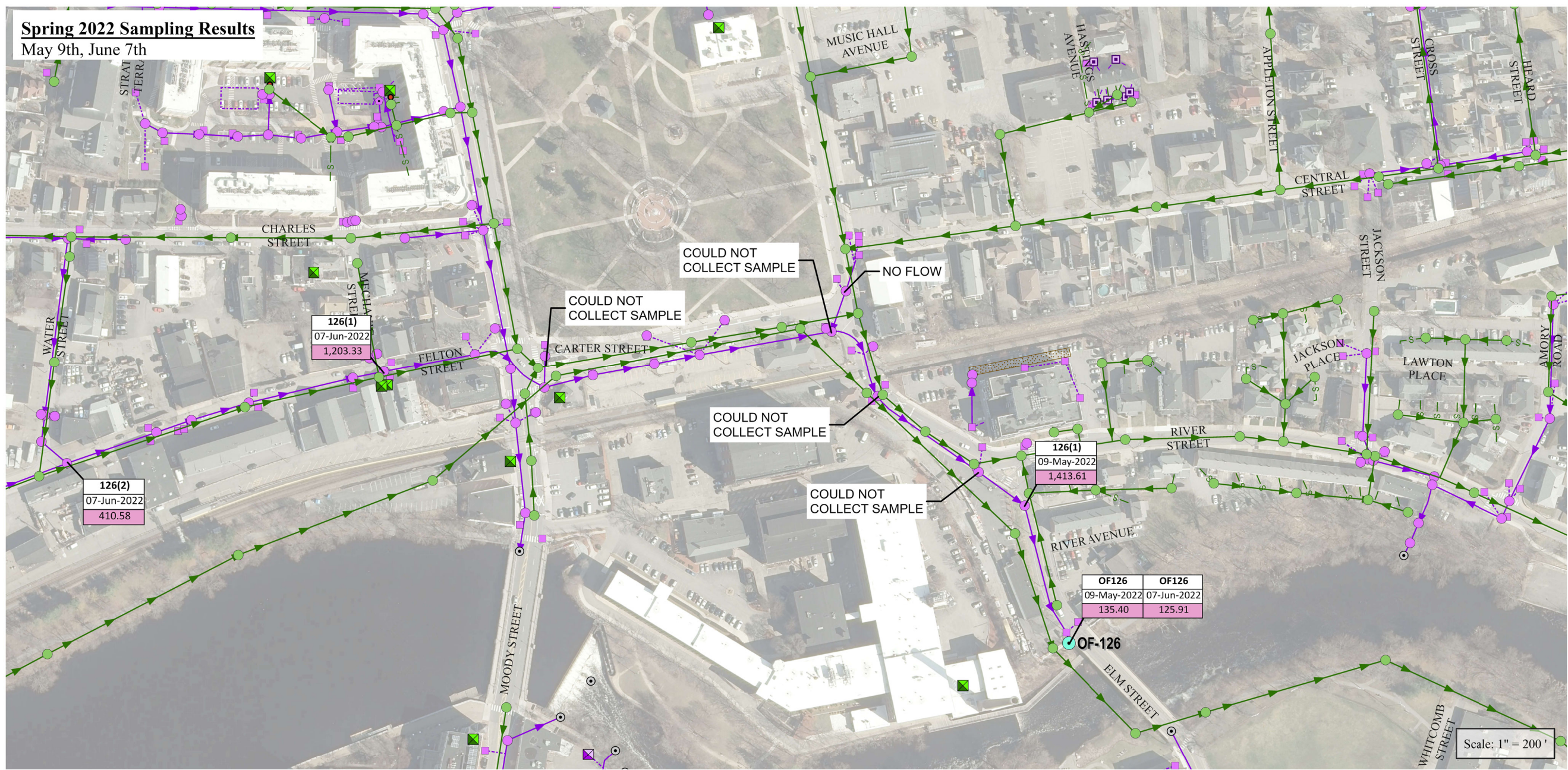
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 9th, June 7th



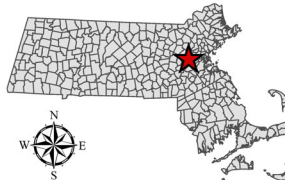
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 126



2022  
ILLICIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

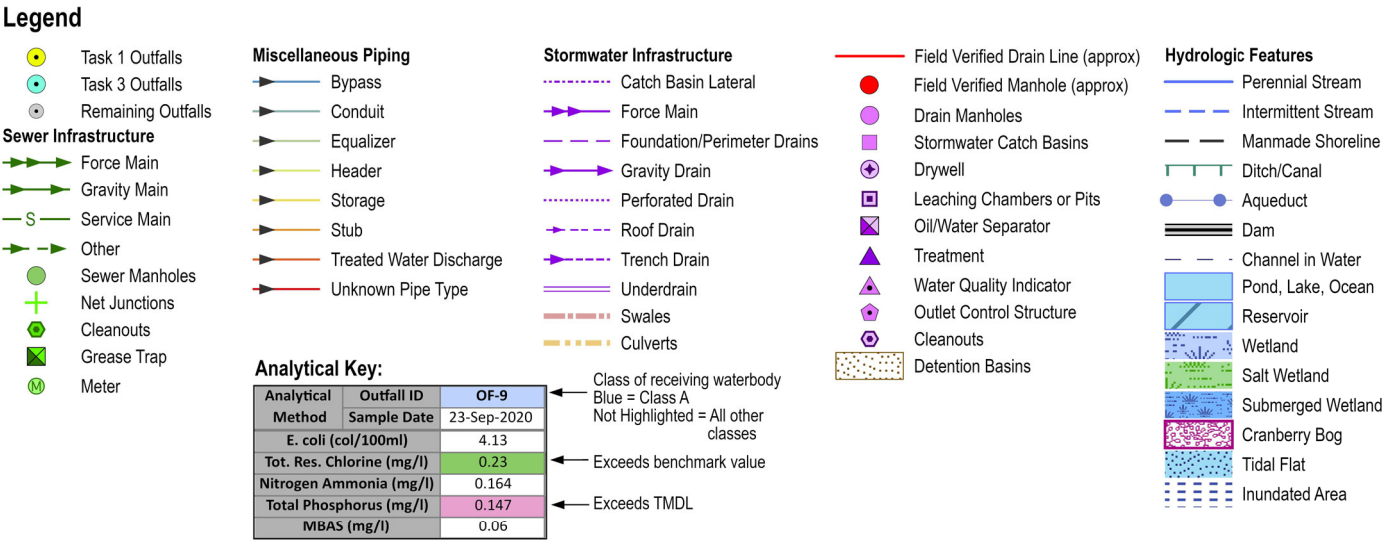
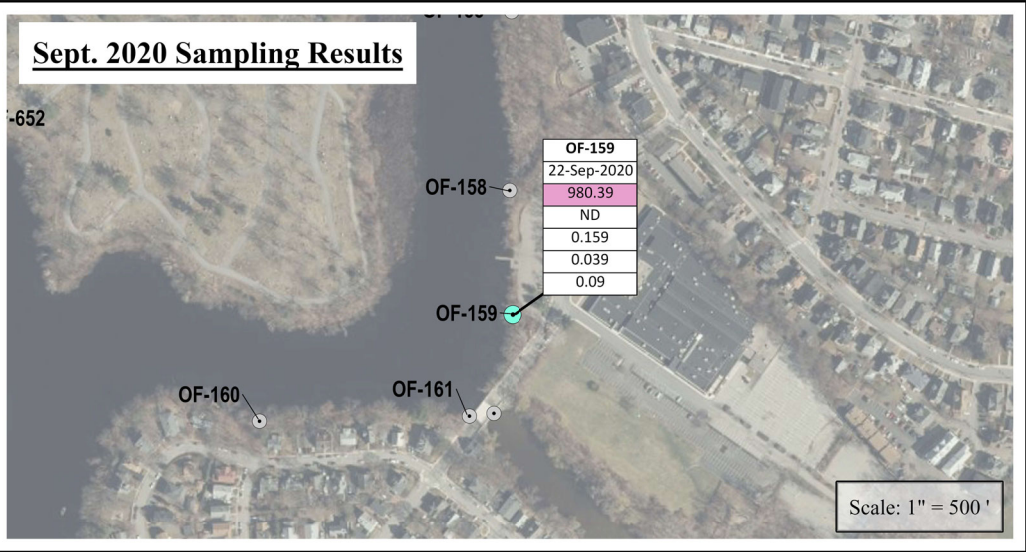
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WALTHAM, MA 02451



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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED





**PARE CORPORATION**  
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

**OUTFALL 159**

2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

LINCOLN LEXINGTON ARLINGTON  
WALTHAM  
WESTON BELMONT  
WATERTOWN  
NEWTON BOSTON

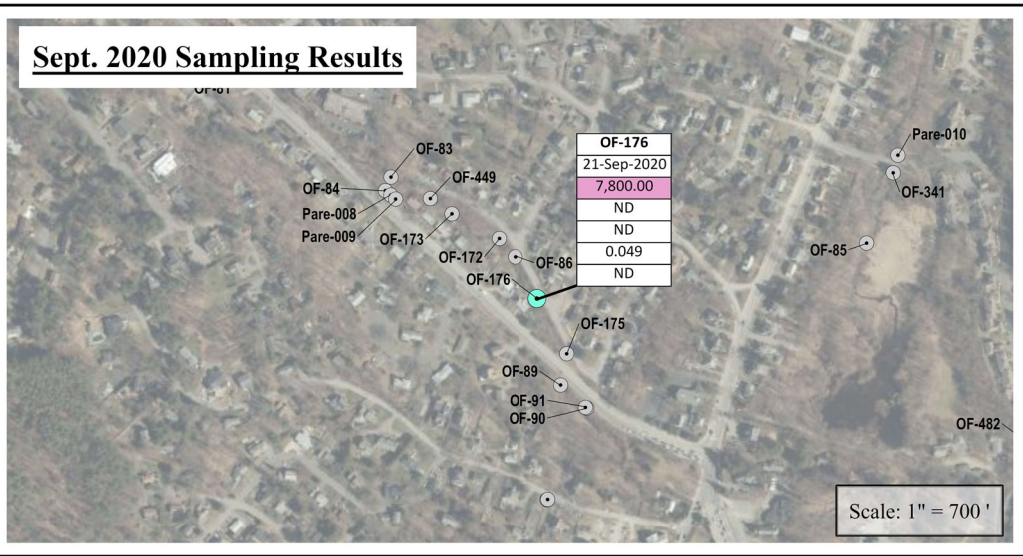
Site Location

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PROJECT NO.: 20104.01  
DATE: 07/27/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
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  - Grease Trap
  - Meter

- Miscellaneous Piping**
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  - Header
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- Detention Basins

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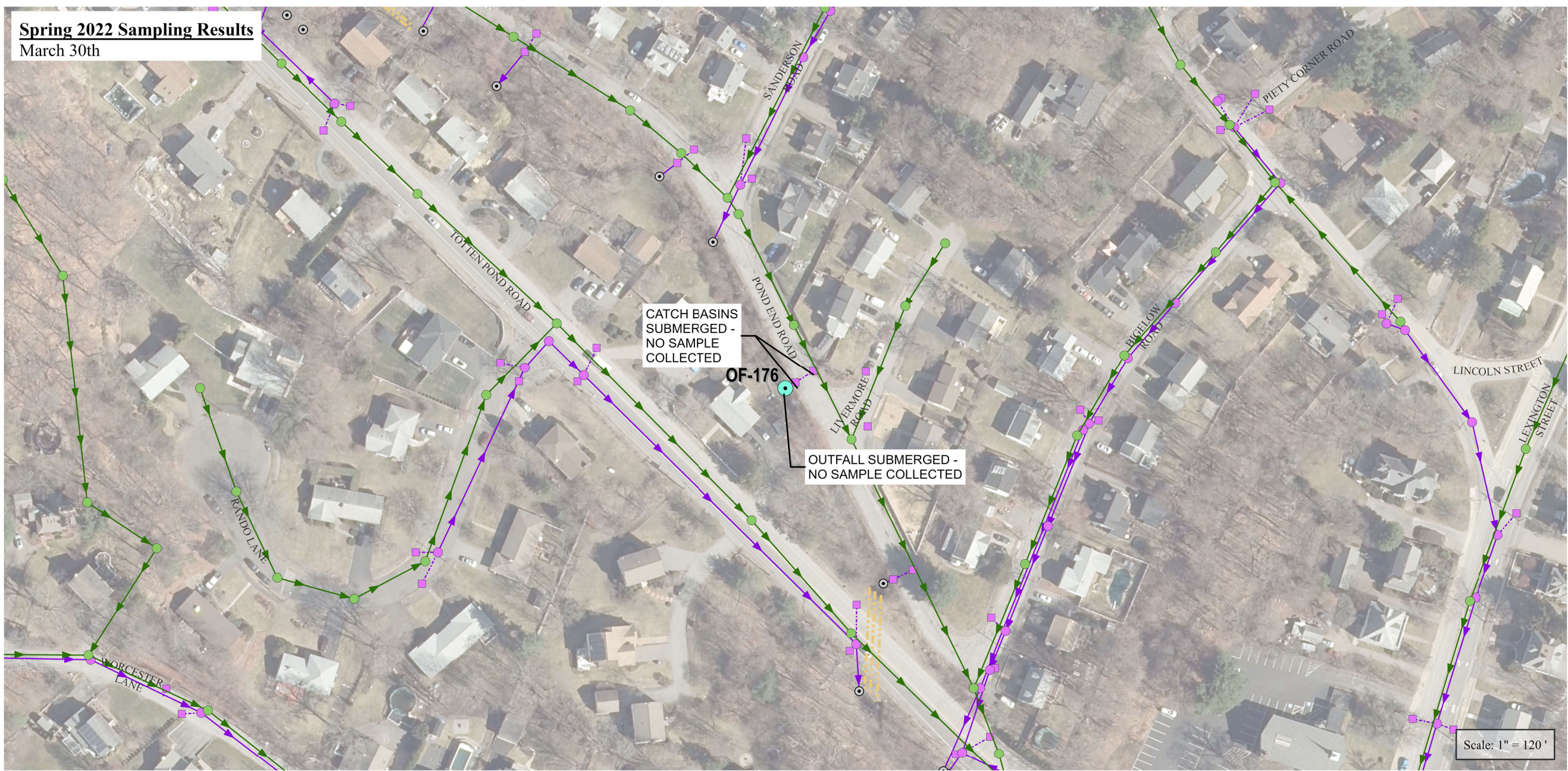
Class of receiving waterbody  
Blue = Class A  
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Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

March 30th



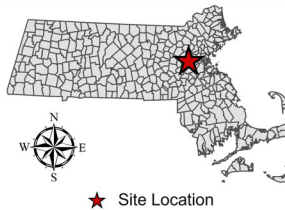
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 176



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

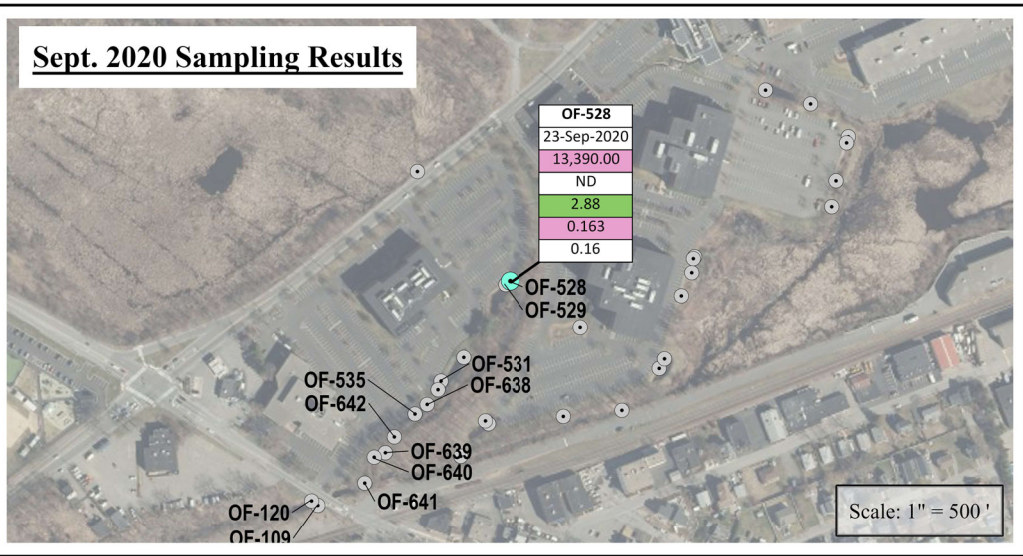


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
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- Stub
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- Unknown Pipe Type

Stormwater Infrastructure

- Catch Basin Lateral
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Hydrologic Features

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Analytical Key:

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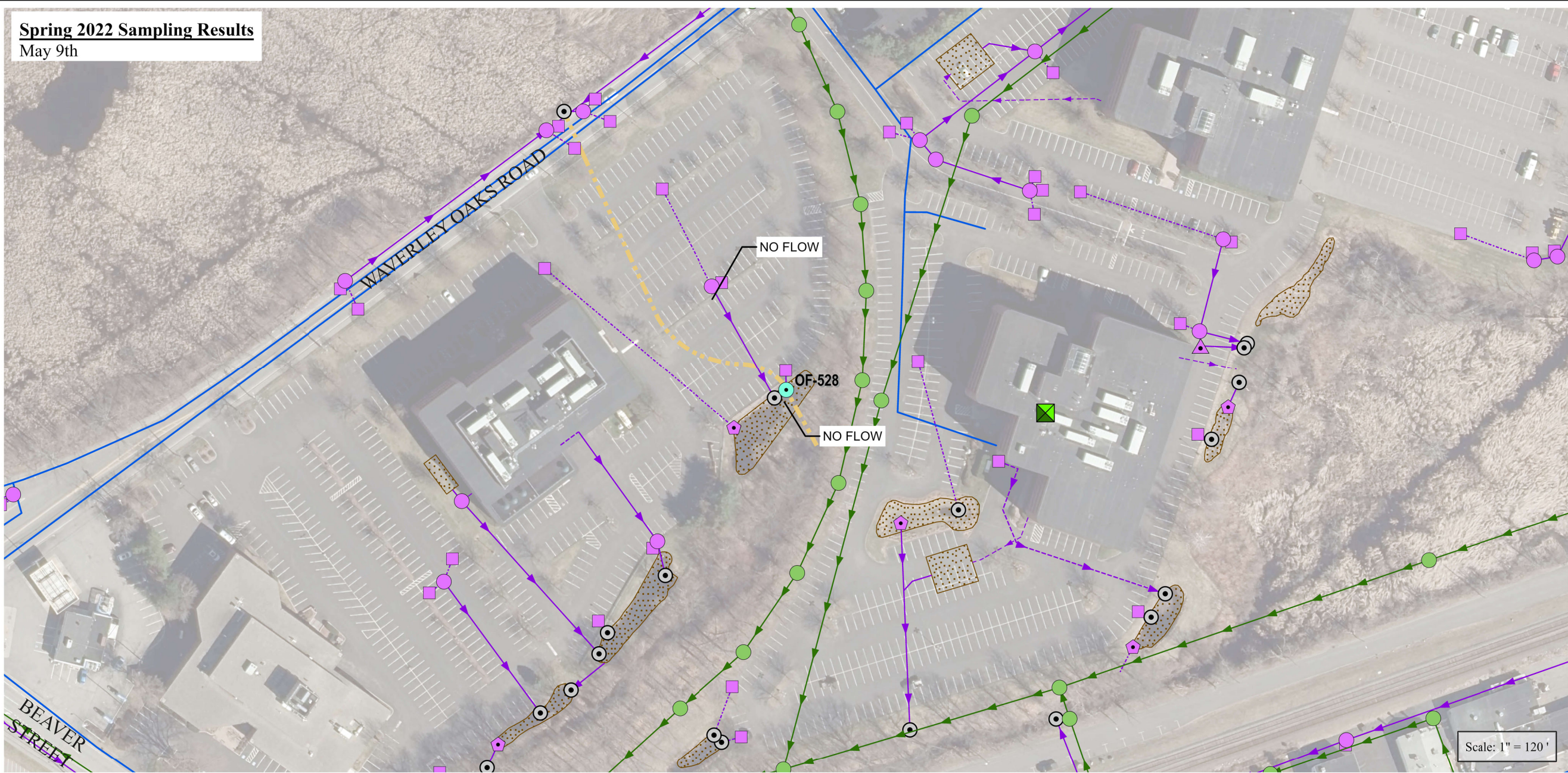
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 9th



ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 528



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

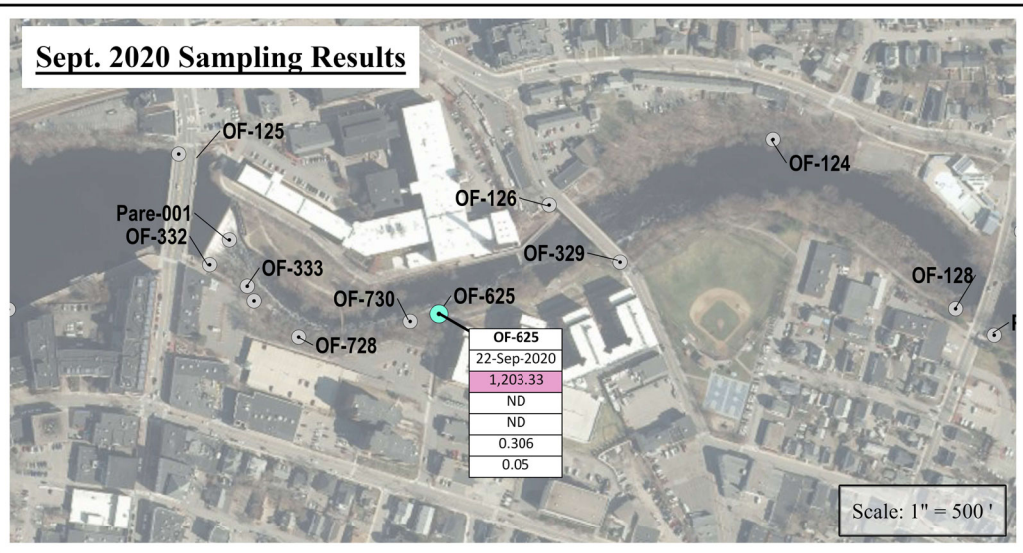


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PROJECT NO.: 20104.01  
DATE: 07/27/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
- Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
- Drywell
- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	Sample Date
E. coli (col/100ml)	OF-9	23-Sep-2020
Tot. Res. Chlorine (mg/l)	0.23	
Nitrogen Ammonia (mg/l)	0.164	
Total Phosphorus (mg/l)	0.147	
MBAS (mg/l)	0.06	

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 2nd



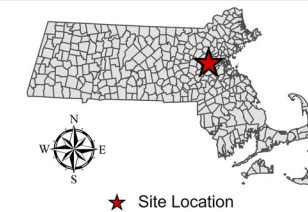
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL 625



2022  
ILLICIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

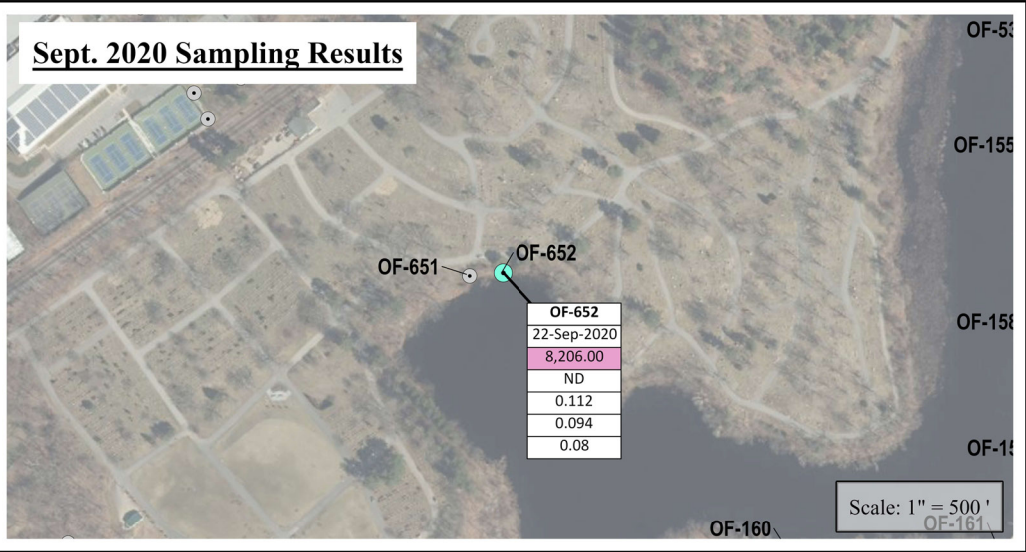
DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451



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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED





**Legend**

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
- Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
- Drywell
- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

**Analytical Key:**

Analytical Method	Outfall ID	Sample Date
	OF-9	23-Sep-2020
E. coli (col/100ml)		4.13
Tot. Res. Chlorine (mg/l)		0.23
Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

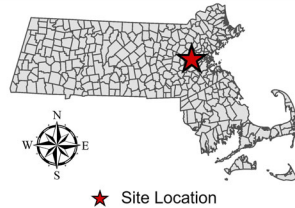


**OUTFALL 652**



**2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM**

**DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451**

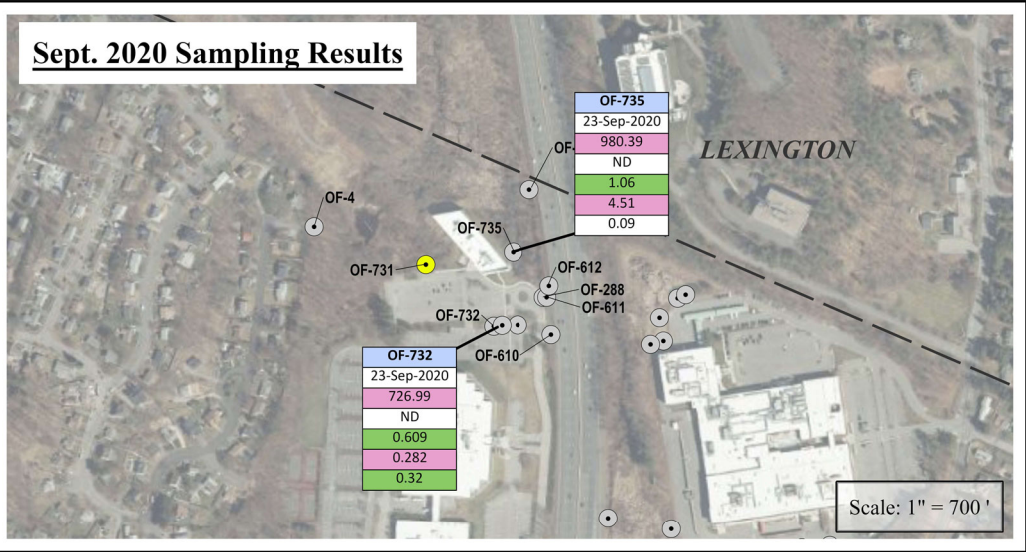


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PROJECT NO.: 20104.01  
DATE: 07/27/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
  - Gravity Main
  - Service Main
  - Other
  - Sewer Manholes
  - Net Junctions
  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
- Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
- Drywell
- Leaching Chambers or Pits
- Oil/Water Separator
- Treatment
- Water Quality Indicator
- Outlet Control Structure
- Cleanouts
- Detention Basins

- Hydrologic Features**
- Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
  - Aqueduct
  - Dam
  - Channel in Water
  - Pond, Lake, Ocean
  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
  - Cranberry Bog
  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	Sample Date	OF-9
E. coli (col/100ml)		23-Sep-2020	4.13
Tot. Res. Chlorine (mg/l)			0.23
Nitrogen Ammonia (mg/l)			0.164
Total Phosphorus (mg/l)			0.147
MBAS (mg/l)			0.06

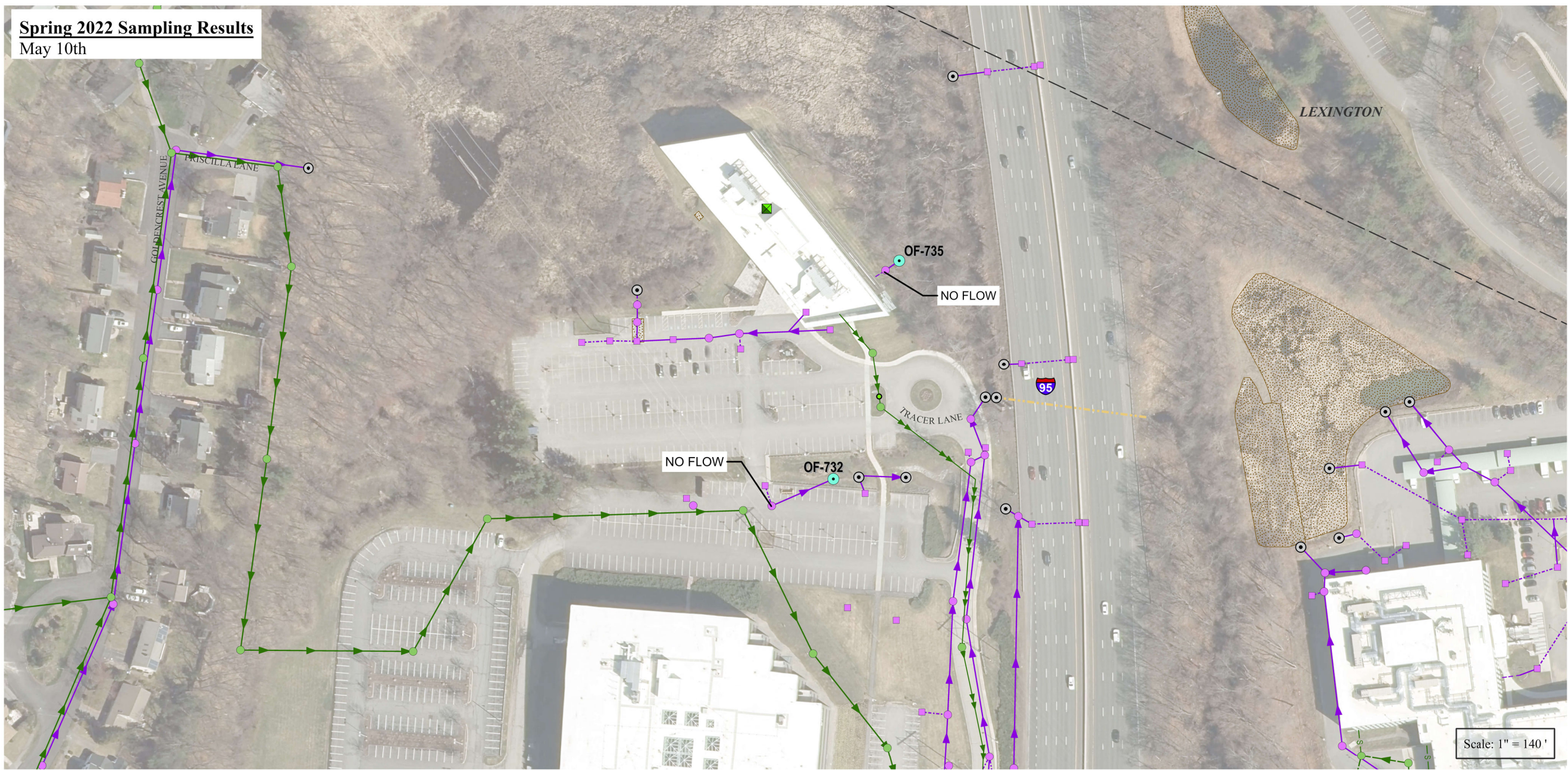
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

May 10th



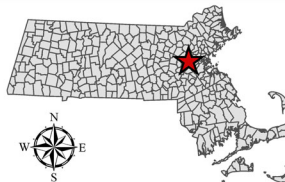
**PARE CORPORATION**  
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALLS 732 & 735



2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

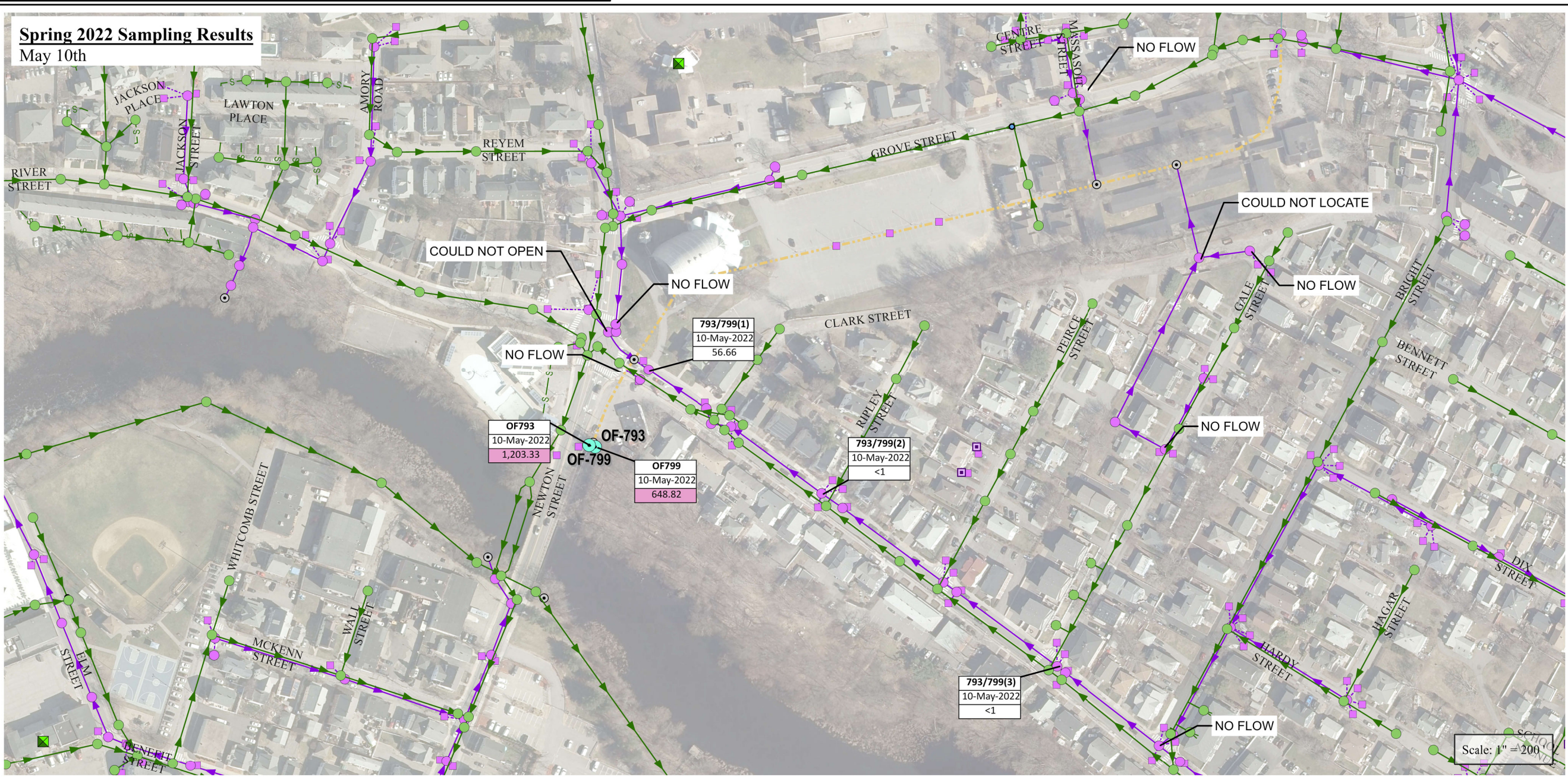
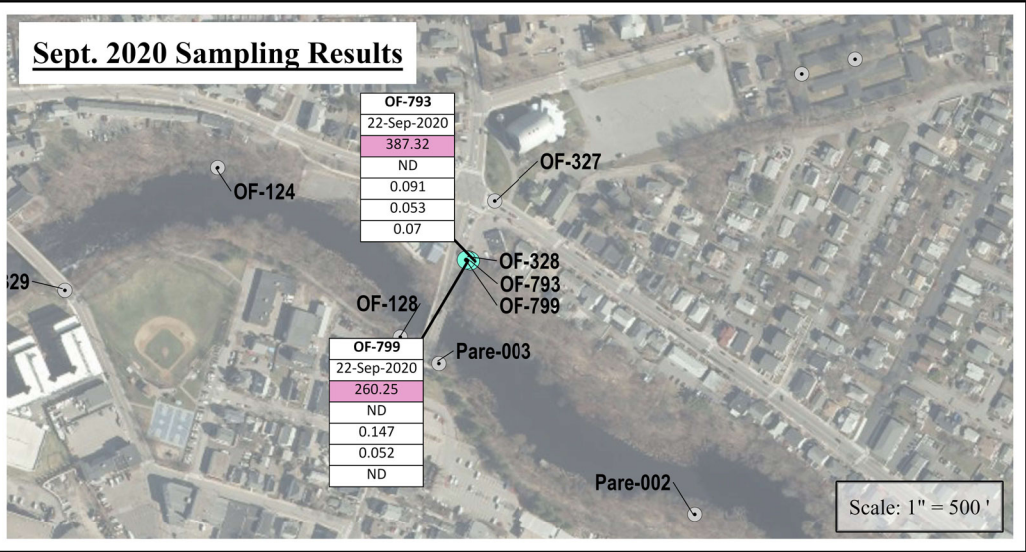
DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451



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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED





**Legend**

- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
- Sewer Infrastructure**
- Force Main
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  - Cleanouts
  - Grease Trap
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- Miscellaneous Piping**
- Bypass
  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
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  - Perforated Drain
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  - Culverts

- Field Verified Drain Line (approx)
- Field Verified Manhole (approx)
- Drain Manholes
- Stormwater Catch Basins
- Drywell
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- Treatment
- Water Quality Indicator
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- Cleanouts
- Detention Basins

- Hydrologic Features**
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  - Submerged Wetland
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**Analytical Key:**

Analytical Method	Outfall ID	OF-9
E. coli (col/100ml)	Sample Date	23-Sep-2020
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MBAS (mg/l)		0.147
		0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

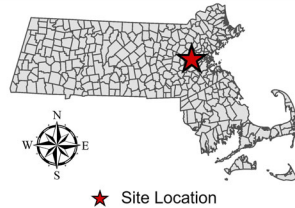
Exceeds TMDL

**OUTFALLS 793 & 799**



**2022  
ILLCIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM**

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451

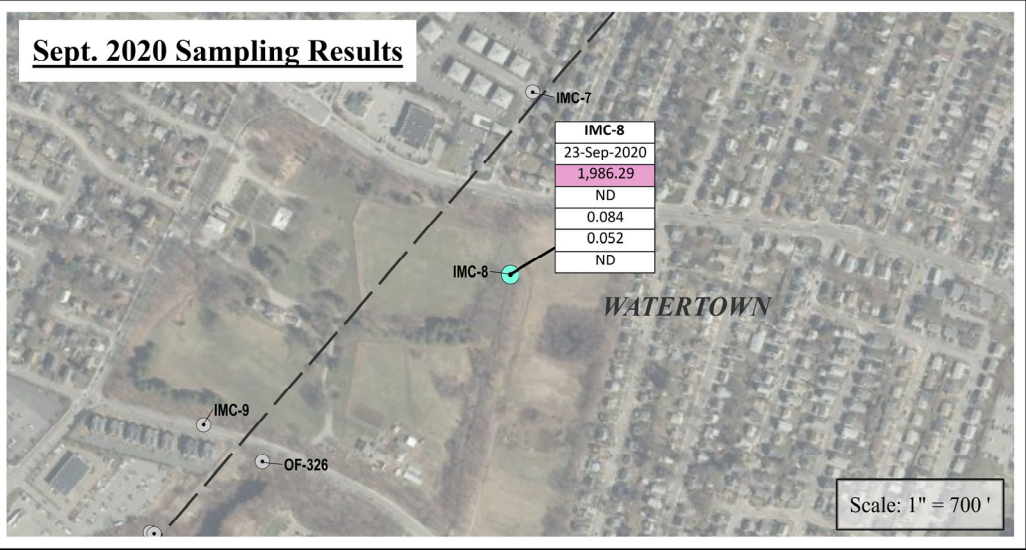


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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED



Sept. 2020 Sampling Results



Legend

- Sewer Infrastructure**
- Task 1 Outfalls
  - Task 3 Outfalls
  - Remaining Outfalls
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  - Service Main
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  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
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  - Conduit
  - Equalizer
  - Header
  - Storage
  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
- Catch Basin Lateral
  - Force Main
  - Foundation/Perimeter Drains
  - Gravity Drain
  - Perforated Drain
  - Roof Drain
  - Trench Drain
  - Underdrain
  - Swales
  - Culverts

- Field Verified**
- Field Verified Drain Line (approx)
  - Field Verified Manhole (approx)
  - Drain Manholes
  - Stormwater Catch Basins
  - Drywell
  - Leaching Chambers or Pits
  - Oil/Water Separator
  - Treatment
  - Water Quality Indicator
  - Outlet Control Structure
  - Cleanouts
  - Detention Basins

- Hydrologic Features**
- Perennial Stream
  - Intermittent Stream
  - Manmade Shoreline
  - Ditch/Canal
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  - Reservoir
  - Wetland
  - Salt Wetland
  - Submerged Wetland
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  - Tidal Flat
  - Inundated Area

Analytical Key:

Analytical Method	Outfall ID	OF-9
	Sample Date	23-Sep-2020
E. coli (col/100ml)		4.13
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Nitrogen Ammonia (mg/l)		0.164
Total Phosphorus (mg/l)		0.147
MBAS (mg/l)		0.06

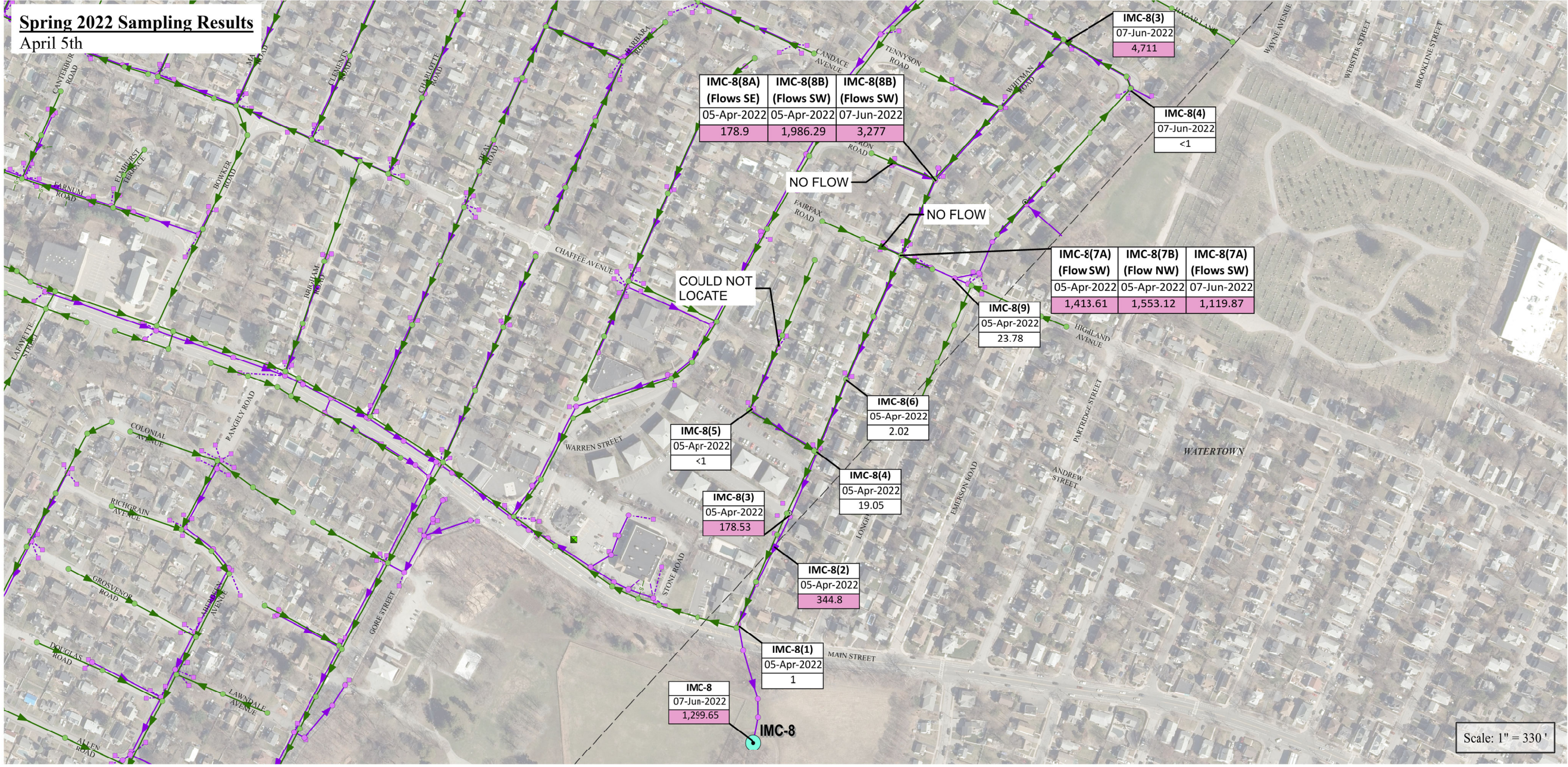
Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

Spring 2022 Sampling Results

April 5th



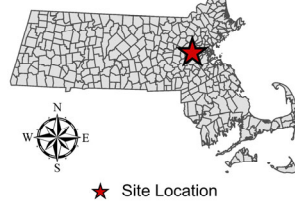
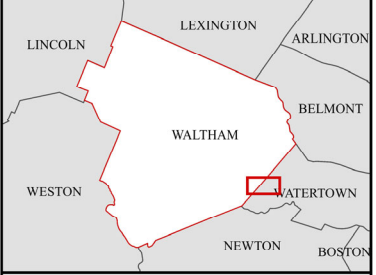
ENGINEERS - SCIENTISTS - PLANNERS  
8 BLACKSTONE VALLEY PLACE  
LINCOLN, RI 02865  
401-334-4100

OUTFALL IMC-8



2022  
ILLICIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451



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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED

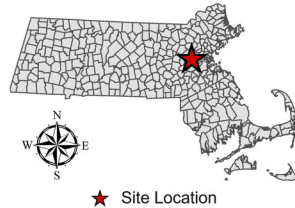


**OUTFALL 95  
(DCR STRUCTURE 23903)**



2022  
ILLICIT DISCHARGE  
DETECTION  
AND  
ELIMINATION  
PROGRAM

DEPARTMENT OF  
PUBLIC WORKS  
WALTHAM, MA 02451



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PROJECT NO.: 20104.01  
DATE: 07/26/2022  
SCALE: AS NOTED

**Legend**

- Task 1 Outfalls
- Task 3 Outfalls
- Remaining Outfalls
- Sewer Infrastructure**
  - Force Main
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  - Sewer Manholes
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  - Cleanouts
  - Grease Trap
  - Meter

- Miscellaneous Piping**
  - Bypass
  - Conduit
  - Equalizer
  - Header
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  - Stub
  - Treated Water Discharge
  - Unknown Pipe Type

- Stormwater Infrastructure**
  - Catch Basin Lateral
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- Drain Manholes
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- Water Quality Indicator
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- Cleanouts
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- Hydrologic Features**
  - Perennial Stream
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  - Salt Wetland
  - Submerged Wetland
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  - Inundated Area

**Analytical Key:**

Analytical Method	Outfall ID	OF-9
E. coli (col/100ml)	Sample Date	23-Sep-2020
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MBAS (mg/l)		0.147
		0.06

Class of receiving waterbody  
Blue = Class A  
Not Highlighted = All other classes

Exceeds benchmark value

Exceeds TMDL

**Spring 2022 Sampling Results**  
May 2nd

