Hazen

Conducting BMP Inspections During the Pandemic

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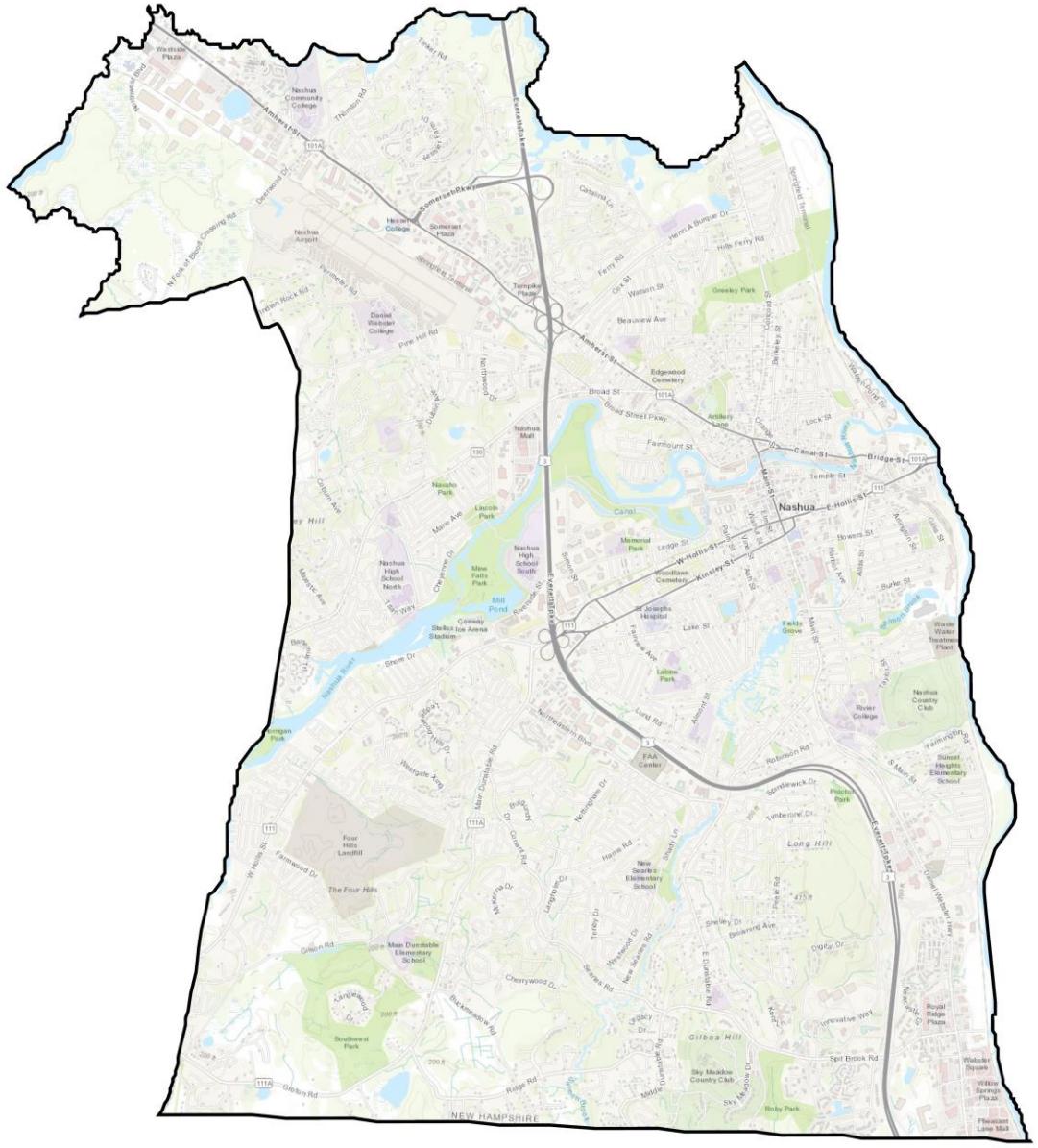
Presentation Topics

- Project Background
- Challenges
- Methodology
- Findings
- Recommendations

Project Background

Nashua Statistics

- 2nd largest city in New Hampshire
  - **Population - 91,000**
  - **Area - 31.7 square miles**
- Stormwater managed through both a separate drainage system (MS4) and a combined system
- In 2018 Nashua engaged Hazen to develop CMOM programs for both the sewer collection and drainage systems to support compliance with:
  - **The NPDES permit for the POTW**
  - **The NH Phase II MS4 General Permit**
- Approximately 280 stormwater outfalls into the Merrimack and Nashua Rivers and their tributaries
- 45 privately developed (now City-owned) stormwater BMPs
- The MS4 system is fully mapped



Nashua, New Hampshire

Project Background

Regulatory Requirements

POTW NPDES Permit Requirements

- Collection System Operation and Maintenance Plan
  - **Management goals, staffing, information management and legal authority**
  - **Condition Assessment**
  - **Funding**
  - **SSO tracking, reporting and prevention**
  - **I/I controls including public outreach to prevent private inflows**

MS4 Permit Requirements

- Stormwater Management Program
- MS4 Map
- 6 Minimum Measures
  - **Public Education & Outreach**
  - **Public Involvement and Participation**
  - **IDDE Program**
  - **Construction Site Runoff Control**
  - **Post-Construction Stormwater Management**
  - **Good Housekeeping and Pollution Prevention**
    - *Infrastructure Operation and Maintenance*

Project Background

Project Goals

Collection Systems

- Proactive versus reactive approach to operation and maintenance of its combined and separate sewer systems
- Prevent costly repairs and potential CWA violations to the Clean Water Act.
- The CMOM program will also serve as a tool for the City for budgeting future Capital Improvement Projects

MS4

- Develop a system wide O&M Plan for the drainage system that supports Nashua's compliance with the New Hampshire Phase II MS4 General Permit.
- Assess the condition and functionality of the stormwater infrastructure
- Proactive O&M approach to prevent costly repairs and potential violations to the Clean Water Act.
- Guide future capital improvement project planning and budgeting.

Project Background

Stormwater Management

Scope of Work

- The Engineering scope of services provided will be for a two-year period for development and implementation of Phase I Stormwater Management Plan (SWMP) which will address various requirements in the MS4 NPDES Phase II General Permit for New Hampshire.
  - Develop SWMP framework, written plan and proposed ordinance revisions
  - Develop practicable IDDE plan to comply with permit
  - CCTV and Manhole Inspections and Evaluations
  - **Detention Ponds, Green Infrastructure, Swirl Concentrators (Vortices) Inspections and Evaluations**
  - GIS Edits and Updates based on inspections and evaluations

Deliverables

- Written Stormwater Management Plan and Proposed Ordinance Revisions
- Written Illicit Discharge Detection and Elimination Plan
- CCTV and Manhole Inspection and Evaluation Report
- BMP Inspection and Evaluation Report
- GIS edits and updates provided periodically to the GIS administrator

Project Challenges

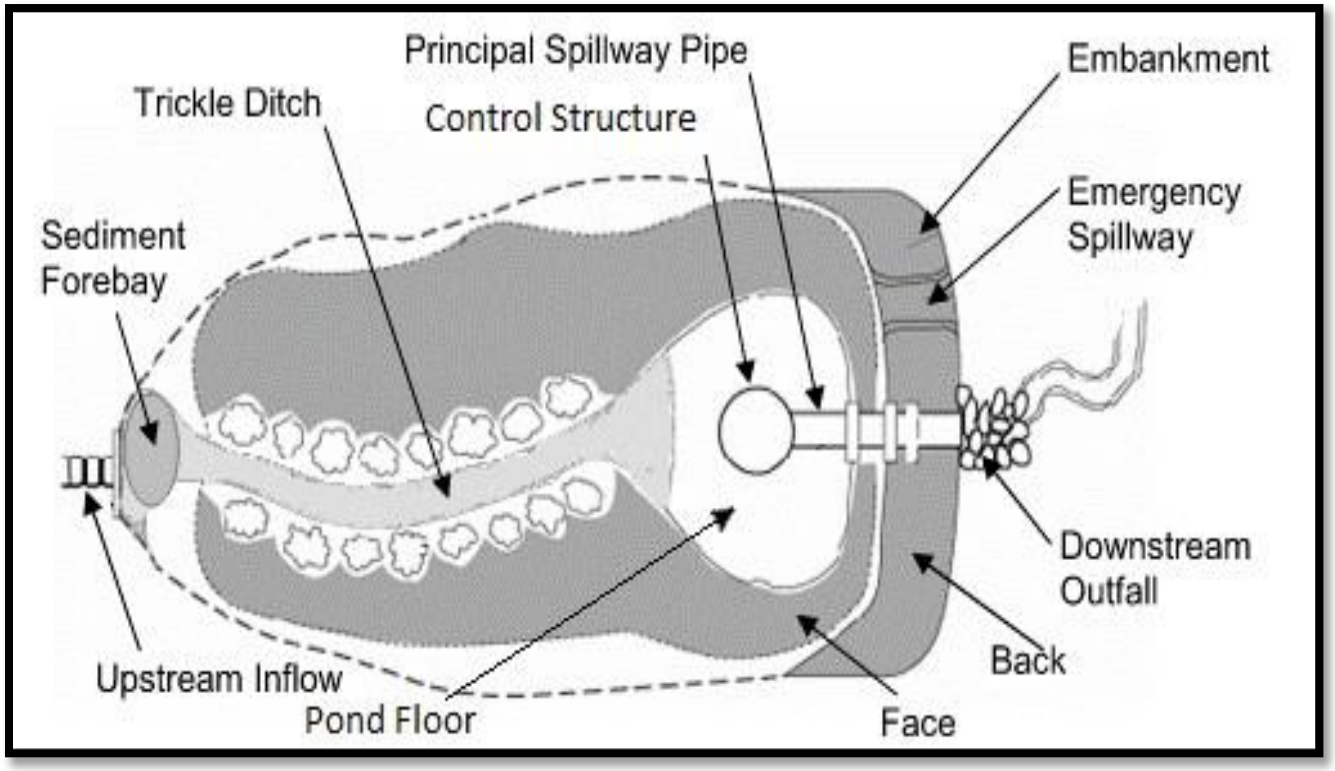
BMP Inspections and Evaluations

- Field inspector training impacted by COVID -19 Travel Restrictions
  - **Virtual training sessions instead of in the field training**
  - **2 Inspectors**
- COVID-19 Field Operations Guidance and Procedures
  - **Implement social distancing to 6 ft (2m) with co-workers, other on-site personnel, client representatives or members of the public**
  - **Separate Vehicles**
  - **Before troubleshooting components and systems that require multiple personnel, field personnel must discuss options to effectively evaluate components/systems while maintaining the 6 ft. social distancing standoff.**
  - **Wash and segregate field clothing**
  - **Wash or wipe down of lunch bags, backpacks, and laptop carriers is also recommended**
  - **Do not wear field boots/shoes home**
  - **Wear disposable gloves if available when taking off field clothing.**
  - **Personnel should avoid utilizing paper documents and shift to fully electronic documentation**
  - **Use of face coverings is required for all field work.**
- Access
  - **Many BMPs on or only accessible via private property**
  - **Access to most ponds was hindered by overgrown vegetation**

BMP Inspections

BMP Structures – Detention Ponds

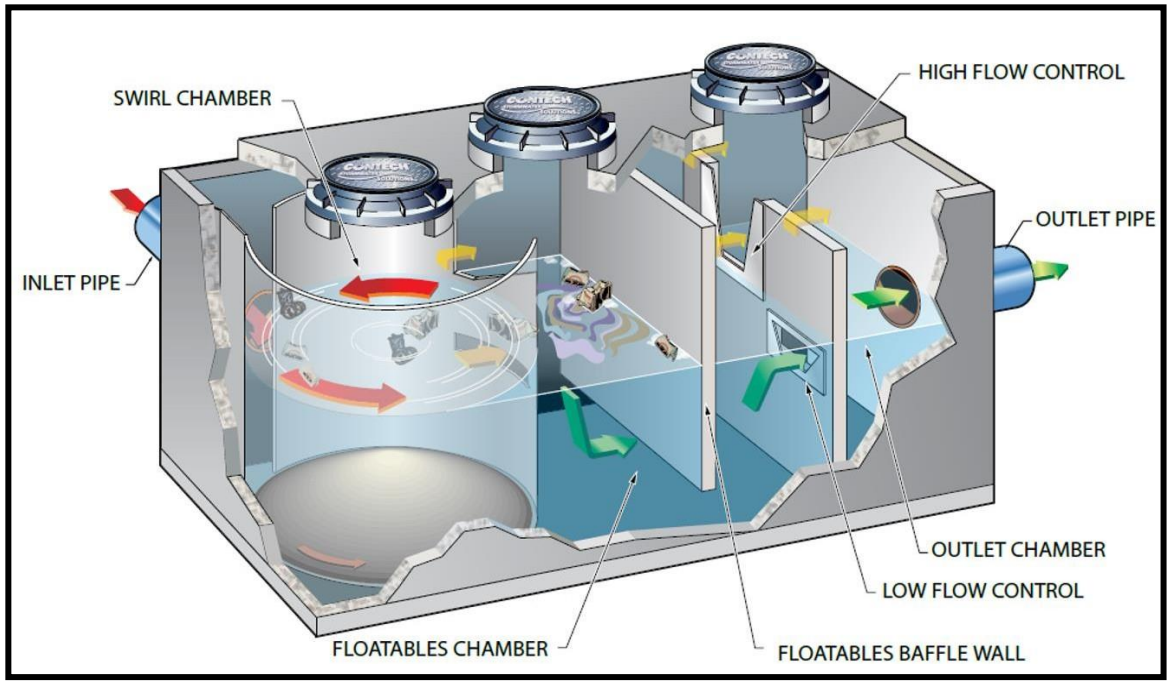
- Inflow structure
- Forebay/sediment trap
- Embankment
- Pond floor with low-flow channel
- Emergency spillway
- Outfall structure



BMP Inspections

BMP Structures – Water Quality Inlet

- Swirl chamber to promote gravitational separation of solids
- Baffle wall to trap floatables, oils and greases
- Weirs for control of low and high flows
- Regular maintenance to remove solids and floatables

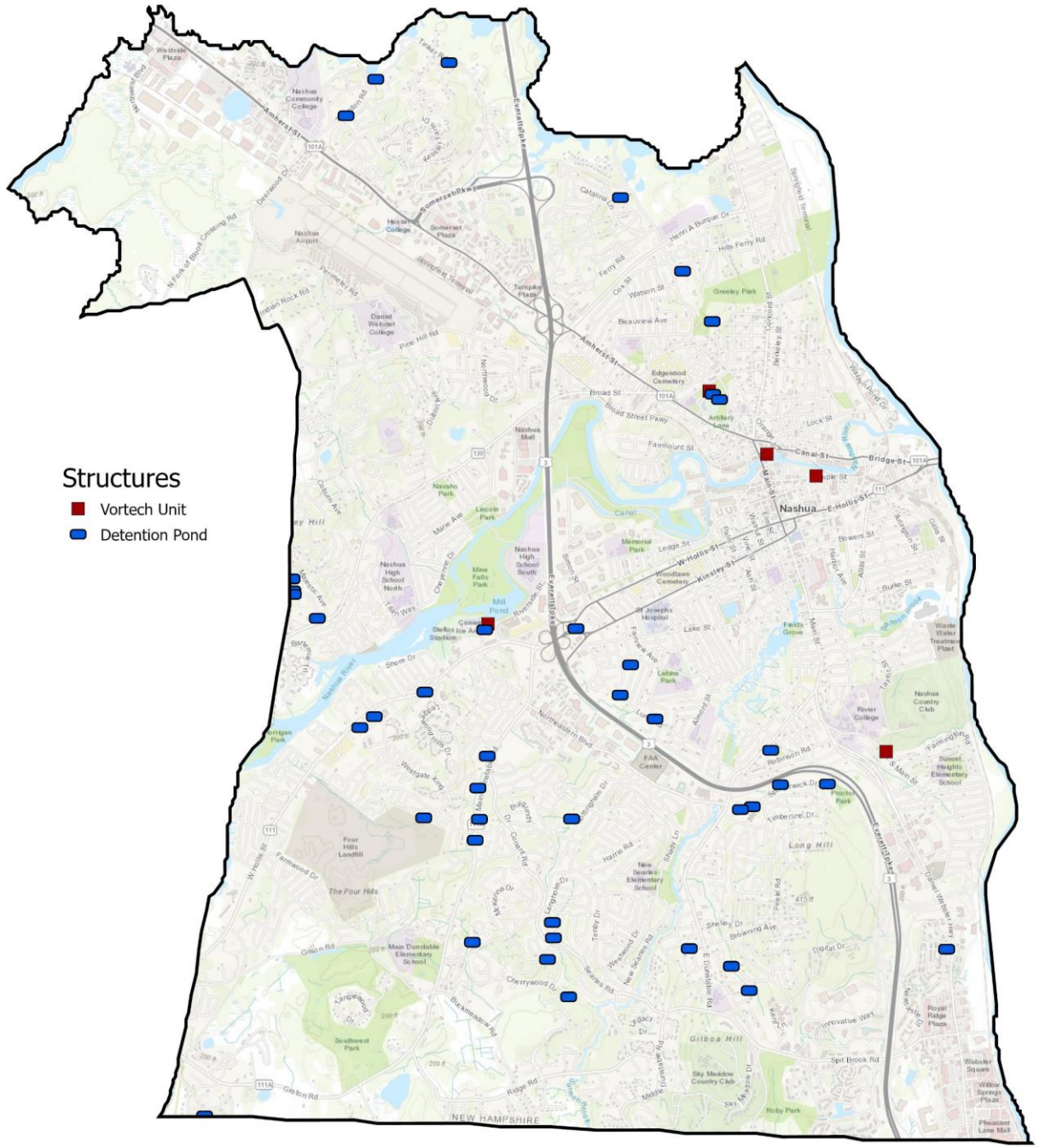


Typical Vortechs® System Schematic
Source: Contech Engineered Solutions LLC

BMP Inspections

Conducted during April, May and June of 2020

- 40 Detention Ponds
- 5 Water Quality Inlets
- 4-6 inspections/day
- Each BMP was evaluated for defects and reported via ESRI's Survey123
- All data collected during inspections, including videos, photographs, and reports, were uploaded to ArcGIS Online



Methodology

Severity Scoring

- At each BMP, defects were noted and assigned a severity score based on its impact to the functionality of the component inspected
- At each site, the investigators captured 360 photos.
- Surface level inspections were made for all underground structures using a pole camera to take pictures within the confined spaces, and measurements were taken with measuring tape and a stadia rod.

Scoring Key

1	High Priority / Non-functional
2	Moderate Priority / Approaching Non-functional
3	Low Priority / Functional
X	No Priority / Continue Routine Maintenance
NA	Not Applicable

Methodology

Prioritization

Recommendations and prioritization of corrective action were based on:	
• Criticality to the stormwater treatment or detention process	Such as blockages or damaged components
• Community impacts	Mosquito habitat or overgrown vegetation
• Urgency of rehabilitation	Immediate maintenance required
• Receiving water condition	Impaired waters or instream BMPs
• Encroachments/unintended alterations	Includes illicit discharges or physical alterations

Survey 123 Forms

Ponds/Wetlands

Nashua Pond/Wetland Inspection Form

Submitted By: hsmgleason

Submitted Time: 06/04/2020 12:25 PM

Scoring Key

1	High Priority / Non-functional
2	Moderate Priority / Approaching Non-functional
3	Low Priority / Functional
X	No Priority / Continue Routine Maintenance
NA	Not Applicable

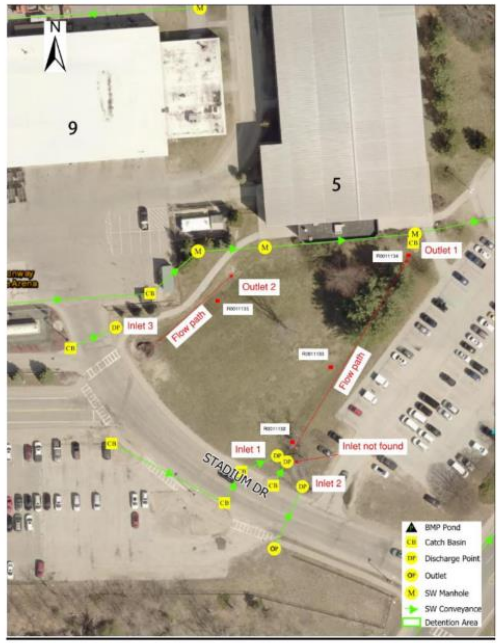
A. PROJECT INFORMATION

Inspecting Company	Hazen and Sawyer
1a. Inspector Name	Jacob Cantor
2a. Inspector Name	Madison Gleason
Date	Jun 4, 2020
Site ID	Does not exist
Facility ID	4 Riverside Dr
Address	4 Riverside Dr

B. WEATHER CONDITIONS

Last Rainfall Date	May 16, 2020
Last Rainfall Amount	0.34"
Current weather conditions?	Sunny
Current temperature?	75°F

C. BMP Diagram



D. INSPECTION SUMMARY

Inspector Comments	Downstream channel of inlet 2 may have some pooling. Inlet 3 and outlet pipe 2 are not connected to this pond but is still relevant to inspection. All structures are functioning. Outfall structure was a manhole and was not accessible.
Functional?	Yes

1. Inspection Summary Overall Score

Total of 1 - High Priority / Non-functional	0
Total of 2 - Moderate Priority / Approaching Non-functional	2
Total of 3 - Low Priority / Functional	6

Maintenance Recommendation

Control Structure: Debris, sediment and vegetation has built up inside and around the outlet pipes. Remove debris and clear the full length of the pipes (Moderate Priority).

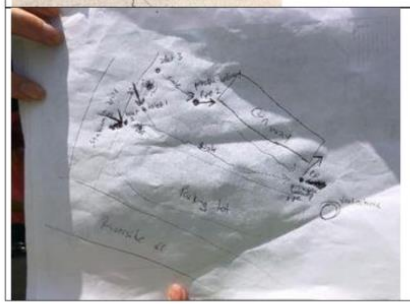
Pond Floor: Perform minor regrading to improve drainage and fix bare spots by inflows 1 and 2 (Low Priority).

Inflows: Debris, sediment and vegetation has built up inside and around the inflow pipes. Remove debris and clear the full length of the pipes (Moderate Priorityx2).

E. ACCESSIBILITY

Access Comments	Accessible from the street, is within the grass area inform of the Conway arena
Overall Facility Access Score	X - No Priority / Continue Routine Maintenance

Overall Facility Access Photo



Survey 123 Forms

Ponds/Wetlands

F. CONTROL STRUCTURE

Function	BMP
Orifice Size	12 in
Type	Pipe End
Damage/Deterioration Score	X - No Priority / Continue Routine Maintenance
Vegetation/External Obstructions Score	X – No Priority/Continue Routine Maintenance
Photos	

1. **Principal Spillway Pipe, Upstream End**

Number of Pipes	1

a. **Principal Spillway Pipe No. 1**

Blockage	3 - Low Priority / Functional
Blockage Description/Dimensions	Blocked by rip rap but functioning
Spalling/Deterioration Score	X - No Priority / Continue Routine Maintenance
Spalling/Deterioration Description/Dimensions	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Score	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Description/Dimensions	X - No Priority / Continue Routine Maintenance
Photos	

4 Riverside Dr 5

b. **Principal Spillway Pipe No. 2**

Blockage	3 - Low Priority / Functional
Blockage Description/Dimensions	Filled with rip rap
Spalling/Deterioration Score	X - No Priority / Continue Routine Maintenance
Spalling/Deterioration Description/Dimensions	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Score	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Description/Dimensions	X - No Priority / Continue Routine Maintenance
Photos	

4 Riverside Dr 6

G. DAM / BERM AND EMERGENCY SPILLWAY

Sep Auxiliary Spillway	No
Emergency Spillway Material	N/A

1. **Toe Soft Spots: X - No Priority / Continue Routine Maintenance**
2. **Slope Erosion: X - No Priority / Continue Routine Maintenance**
3. **Bare Spots: X - No Priority / Continue Routine Maintenance**
4. **Animal Holes: X - No Priority / Continue Routine Maintenance**

Slope Face Slope Score	3 - Low Priority / Functional
Photos	
Slope Face Slope Photo	

5. **Woody Vegetation**

Slope Face Slope Score	X - No Priority / Continue Routine Maintenance
Crest Score	X - No Priority / Continue Routine Maintenance
Backslope Slope Score	X - No Priority / Continue Routine Maintenance
Emergency Spillway Score	X – Not Applicable
Crest Photo	

6. **Overgrown Non-woody Veg.: X - No Priority / Continue Routine Maintenance**
7. **Trash / Debris / Sediment: X - No Priority / Continue Routine Maintenance**
8. **Alterations: X - No Priority / Continue Routine Maintenance**
9. **Other: X - No Priority / Continue Routine Maintenance**
10. **Emergency Spillway: X - No Priority / Continue Routine Maintenance**

4 Riverside Dr 7

H. OUTFALL STRUCTURE / PSP DOWNSTREAM END

Material	Plastic
Size	12"
End Type	Manhole
Pipe Total	1

1. **Outfall Pipe No. 1**

Photos – Buried manhole found but unable to enter.	

I. POND FLOOR / POOL

Water Level Inconsistent with Plans Score	X - No Priority / Continue Routine Maintenance
Obstruction Score	X - No Priority / Continue Routine Maintenance
Overgrown Vegetation Score	X - No Priority / Continue Routine Maintenance
Erosion/Bare Spots Score	X - No Priority / Continue Routine Maintenance
Other Score	Not Applicable
Photos	

Bare Spots by Inflows 1 and 2

Survey 123 Forms

Ponds/Wetlands

J. **UPSTREAM INFLOW(S)**

1. **Upstream Inflow Pipe No. 1**

End Type/Overland	Pipe End
Pipe Material	Concrete
Pipe Size	12 in
Blockage Score	2 - Moderate Priority / Approaching Non-functional
Obstruction Score	X - No Priority / Continue Routine Maintenance
Erosion/Undermining Score	X - No Priority / Continue Routine Maintenance
Spalling/Deterioration Score	3 - Low Priority / Functional
Separation/Misaligned Joints Score	X - No Priority / Continue Routine Maintenance
Overgrown Vegetation/Tree Removal Score	X - No Priority / Continue Routine Maintenance
Handrail Status Score	NA - Not Applicable
Downstream Channel Condition Score	X - No Priority / Continue Routine Maintenance
Other Score	



4 Riverside Dr 10

2. **Upstream Inflow Pipe No. 2**

End Type/Overland	Pipe End
Pipe Material	Concrete
Pipe Size	20 in
Blockage Score	3 - Low Priority / Functional
Obstruction Score	X - No Priority / Continue Routine Maintenance
Erosion/Undermining Score	X - No Priority / Continue Routine Maintenance
Spalling/Deterioration Score	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Score	X - No Priority / Continue Routine Maintenance
Overgrown Vegetation/Tree Removal Score	X - No Priority / Continue Routine Maintenance
Handrail Status Score	NA - Not Applicable
Downstream Channel Condition Score	X - No Priority / Continue Routine Maintenance
Other Score	
Photos	


4 Riverside Dr 11

3. **Upstream Inflow Pipe No. 3**

End Type/Overland	Pipe End
Pipe Material	Concrete
Pipe Size	20in
Blockage Score	2 - Moderate Priority / Approaching Non-functional
Obstruction Score	3 - Low Priority / Functional
Erosion/Undermining Score	X - No Priority / Continue Routine Maintenance
Spalling/Deterioration Score	X - No Priority / Continue Routine Maintenance
Separation/Misaligned Joints Score	X - No Priority / Continue Routine Maintenance
Overgrown Vegetation/Tree Removal Score	X - No Priority / Continue Routine Maintenance
Handrail Status Score	NA - Not Applicable
Downstream Channel Condition Score	X - No Priority / Continue Routine Maintenance
Other Score	
Photos	




4 Riverside Dr 12

K. **OTHER**

Encroachments Score	X - No Priority / Continue Routine Maintenance
Encroachments Location	
Modifications Score	X - No Priority / Continue Routine Maintenance
Modifications Location	
Mosquito Habitat Score	X - No Priority / Continue Routine Maintenance
Mosquito Habitat Location	
Evidence of Possible Illicit Discharge Score	X - No Priority / Continue Routine Maintenance
Evidence of Possible Illicit Discharge Location	

Survey 123 Forms

Vortechs

Nashua Vortechs Inspection Form

Scoring Key

1	High Priority / Non-functional
2	Moderate Priority / Approaching Non-functional
3	Low Priority / Functional
X	No Priority / Continue Routine Maintenance
NA	Not Applicable

A. PROJECT INFORMATION

Inspecting Company	Hazen and Sawyer
1a. Inspector Name	Jacob cantor
2a. Inspector Name	Madison Gleason
Date	6/4/2020
Facility ID	D8032
Address	Panther Drive and Riverside St

B. WEATHER CONDITIONS

Last Rainfall Date	May 16
Last Rainfall Amount	0.34"
Current weather conditions?	
Current temperature?	65 F

D8032 1

C. BMP Diagram

D. INSPECTION SUMMARY

1. **Inspection Summary Overall Score**

Total of 1 - High Priority / Non-functional	1
Total of 2 - Moderate Priority / Approaching Non-functional	0
Total of 3 - Low Priority / Functional	2

Maintenance Recommendation

While the facility is functioning as intended, maintenance is recommended to ensure the continued functionality of the facility. The following measures are recommended:

Trash, debris and sediment was found inside the swirl chamber, floatables chamber and outlet chamber. It is recommended to removal these materials.

All manhole structures, weirs, pipes and orifices appear sound.

E. ACCESSIBILITY

Access Comments	Access from parking lot in Conway Arena and Panther Drive.
Overall Facility Access Score	X – No Priority / Continue Routine Maintenance
Overall Facility Access Photo	

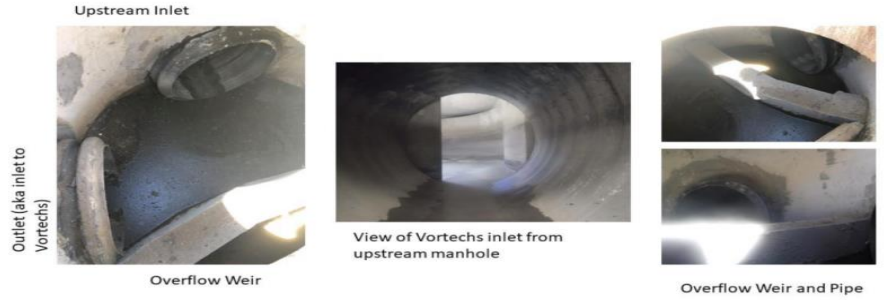
Survey 123 Forms

Vortechs

F. Upstream Inlet Manhole

Rim to Water Level	4.8’
Inlet Pipe - Rim to Invert	4.8’
Inlet Pipe - Rim to Crown	3.2’
Outlet Pipe (to Vortechs) – Rim to Invert	4.8’
Outlet Pipe (to Vortechs) – Rim to Crown	2.7’
Overflow Pipe – Rim to Invert	No Measurement
Overflow Pipe – Rim to Crown	No Measurement
Rim to Overflow Weir	3.7’
Manhole Condition Score	X – No Priority / Continue Routine Maintenance
Inlet Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance
Outlet Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance
Overflow Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance

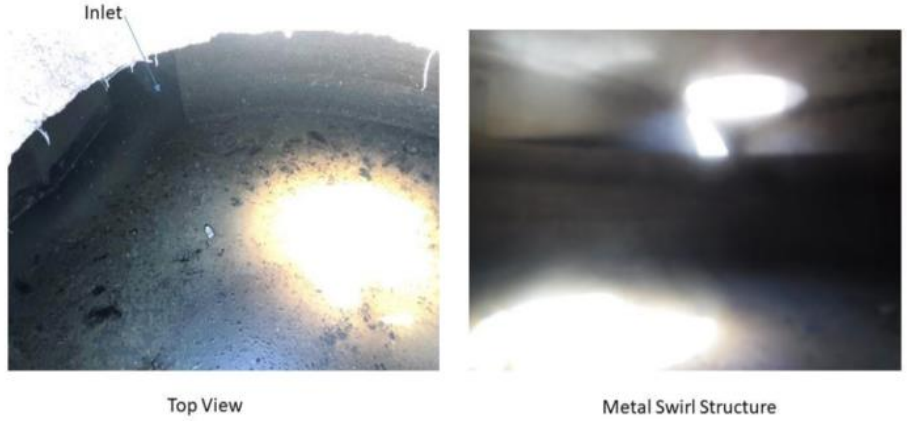
Manhole 1 – Upstream Inlet Manhole



G. Swirl Chamber

Rim to Sediment	6.3’
Rim to Water Level	4.4’
Sediment Score	1 – High Priority / Non-Functional
Manhole Condition Score	X – No Priority / Continue Routine Maintenance
Metal Structure Condition Score	X – No Priority / Continue Routine Maintenance

Manhole 2 – Swirl Chamber



Survey 123 Forms

Vortechs

H. Flotation Chamber

Rim to Water Level	4.4’
Rim to Swirl Chamber Weir	2.4’
Rim to Bottom of Chamber	8’
Manhole Condition Score	X – No Priority / Continue Routine Maintenance
Sediment Score	3 Low Priority / Functional

Manhole 3 – Floatables Chamber

I. Effluent Chamber

Rim to Water Level	4.4’
Outlet Pipe – Rim to Invert	4.4’
Outlet Pipe – Rim to Crown	No Measurement
High Flow Weir	2.7’
Low Flow Orifice – Rim to Top	3.7’
Low Flow Orifice – Rim to Bottom	5.3’
Sediment Score	3 – Low Priority / Functional
Outlet Pipe Condition Score	X – No Priority / Continue Routine Maintenance
Outlet Pipe Blockage Score	X – No Priority / Continue Routine Maintenance
High Flow Weir Score	X – No Priority / Continue Routine Maintenance
Low Flow Orifice Score	X – No Priority / Continue Routine Maintenance
Manhole Condition Score	X – No Priority / Continue Routine Maintenance

Manhole 4 – Outlet Chamber

Outlet

High Flow Weir and low flow orifice.

Survey 123 Forms

Vortechs

J. Effluent/Outfall Manhole

Rim to Water Level	4.5’
Inlet Pipe (From Vortechs) - Rim to Invert	4.5’
Inlet Pipe (From Vortechs) - Rim to Crown	2.5’
Overflow Pipe – Rim to Invert	No Measurement
Overflow Pipe – Rim to Crown	No Measurement
Manhole Condition Score	X – No Priority / Continue Routine Maintenance
Inlet Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance
Outlet Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance
Overflow Pipe – Blockage Score	X – No Priority / Continue Routine Maintenance

Manhole 5 – Downstream Effluent

Findings

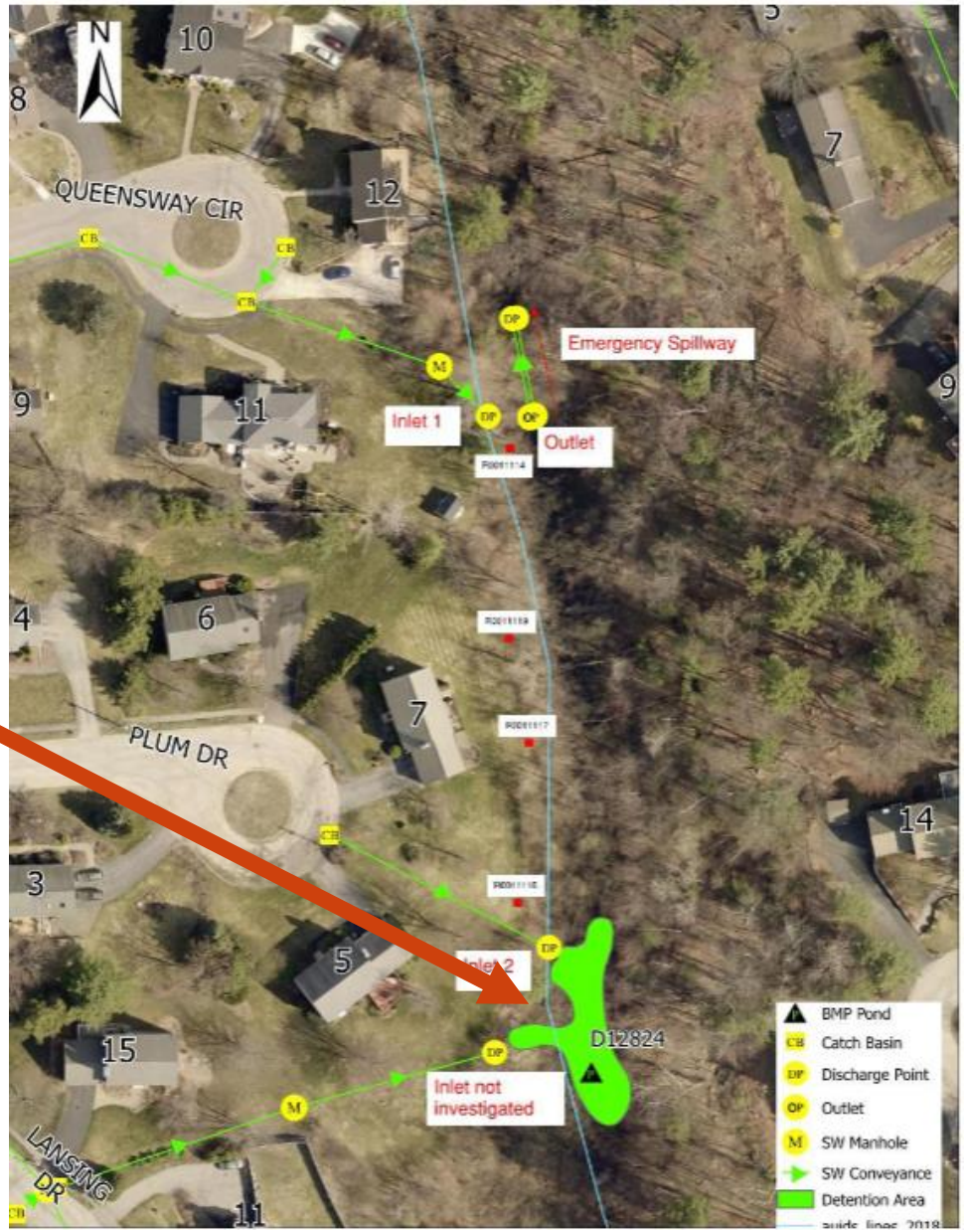
Detention/Retention Ponds

- Common Defects
  - Overgrown Vegetation
  - Blockages
  - Structural issues
  - Alterations/Encroachment
  - Erosion

Findings

Detention/Retention Ponds

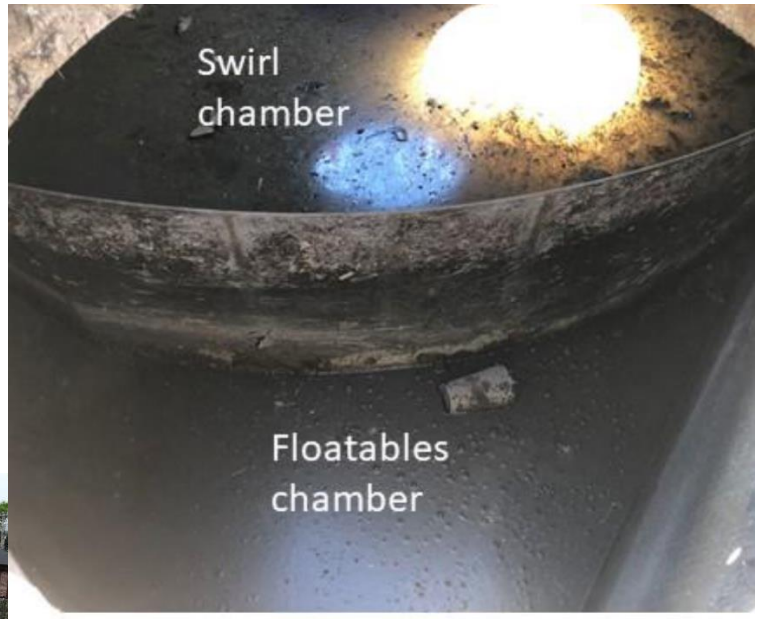
- Four ponds were found to be installed in jurisdictional waters
  - **D12824 77 Plum Dr**
  - D12826 Alford Ln
  - D12827 11 Greenock Ln
  - D12828 23 Elaine Dr



Findings

Vortechs

- Observed build up of sediment and floatables
- Most structural components appear sound
- Some manhole covers damaged and/or rusted



Recommendations

Ponds/Wetlands

- Remove vegetation (39 BMPs)
- Restore flow channels (19 BMPs)
- Repair Structures (16 BMPs)
- Remove debris and regrade pond floor (15 BMPs)
- Mitigate erosion (5 BMPs)
- Retrofits to remove ponds from jurisdictional waters (4 BMPs)
- Investigate potential illicit discharges (2 BMPs)

Vortechs

- Remove Sediment, Debris, Blockages (5 BMPs)
- Replace Rim and Covers (1 BMP)

Thank You!