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Narragansett Bay Watershed SCP
 North Easton Pond (RI0007035L-03)
South Easton Pond (RI0007035L-04)
 Middletown, RI

Key Findings

This SCP Report is for North Easton Pond (RI0007035L-03) located within the Narragansett Bay Watershed (Figure 1-A).

Table 1-A: Subwatershed Summary

Impairments	Evaluation Methodology	RIDOT Reduction Target (% / Load)	Existing Treatment	Potential Treatment	Runoff Reduction	Remaining RIDOT Reduction Target	NonRIDOT Treatment Credit
Total Phosphorus, Chlorophyll-A, Total Organic Carbon	TMDL Method	80% (15.8 lb/yr)	0	18.5 lb/yr	34.4 ac-ft	0	69%

Site Description

Subwatershed Description

- The subwatershed is located in Middletown, RI.
- The subwatershed is 778 acres and 24% impervious (183 acres).
- The South Easton Pond (RI0007035L-04) subwatershed was incorporated into the North Easton Pond (RI0007035L-03) subwatershed after a desktop review of topography revealed that no water enters South Easton Pond except for overflow from the North Easton Pond spillway.
- The general land uses within the subwatershed are commercial/industrial and medium-high density residential.

RIDOT Discharging Area

- RIDOT maintained property is 23.8 total acres and 14.8 impervious acres.
- No "Other RIDOT roadways" exist in this subwatershed.
- The subwatershed area (North and South Easton combined) decreased from approximately 1,038 acres to 778 acres (-25 percent) due to changes identified during review and site visits.
- There are no High Priority outfalls (Appendix 6).
- There are 8 Priority outfalls (Paragraph 20.b.).

- There are no RIDOT MS4 discharge points for which RIDOT must provide a schedule for initiating IDDE inspections (Appendix 8).
- There are no MS4 outfalls for which RIDOT shall identify upgradient interconnections (Appendix 9).
- There are no TMDL Priority outfalls.
- There are 13 incoming MS4 interconnections and 8 private incoming interconnections.
- There are 4 outgoing interconnections.

Non-Discharge Areas

- RIDOT did not identify any non-discharge areas.

Sewered/Combined Sewer Areas

- A portion of the subwatershed has been identified as a sewered area.
- There are no areas that discharge to a combined sewer system.

Reduction Target Development

- RIDOT's total phosphorus reduction target is 15.8 lb/yr.
- Total phosphorus and chlorophyll-a are covered by TMDL: Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island – September 2007. Priority outfalls were not identified as part of the TMDL, therefore RIDOT is required to coordinate with the Town of Middletown to identify all such outfalls.
- A TMDL for Newport Water's surface reservoirs and their tributaries is under development to address total phosphorus and total organic carbon impairments. South Easton Pond (RI0007035L-04) is currently planned to be included in this TMDL, however it has been combined with the North Easton Pond subwatershed.

Existing Stormwater Controls

- No STUs currently exist within the subwatershed.

Potential Enhanced Non-Structural Stormwater Controls

- RIDOT has identified that control measures are needed to reduce its phosphorus loading to achieve the RIDOT phosphorus reduction target.
- RIDOT will perform enhanced street sweeping within the Consent Decree designated Area of Interest (AOI).
- The TMDL states that RIDOT must perform enhanced street sweeping more frequently than required by the Consent Decree in areas contributing to TMDL Priority outfalls or any outfall, catch basin, or culvert associated with flooding problems. To RIDOT's knowledge, RIDOT does not contribute to any of these area within the subwatershed.

Potential Structural Stormwater Controls

- RIDOT has identified that structural control measures are needed to reduce its phosphorus loading to achieve the RIDOT phosphorus reduction target.
- RIDOT identified 16 opportunities for potential STUs within the subwatershed (Table 2-A) with a total phosphorus treatment credit of 16.3 lb/yr.
- This SCP includes areas that will be modified as part of a TIP project (as of November 2018) scheduled for the next 6 years within the subwatershed with an assumed 50% treatment level for a total phosphorus treatment credit of 2.2 lb/yr.

Table 2-A: STU Stormwater Controls Summary

STU ID	Stormwater Control Type	Catchment Area (ac)	Impervious Cover (ac)	Treatment Depth (in) (Depth of Runoff Treated)	Runoff Reduction (ac-ft)	Phosphorus Treatment Credit (lb/yr / %)	Estimated Cost	Cost per lb P Removed (\$/lb)	Retrofit Priority
SCP-NSE-006	Infiltration Swale	1.3	0.7	1.0	2.2	1.1 / 94.1%	\$19,400	\$17,798	1
SCP-NSE-007	Infiltration Swale	3.9	2.2	0.5	5.5	3.2 / 81.5%	\$25,100	\$7,771	1
SCP-NSE-009	Infiltration Swale	1.8	0.8	1.5	2.9	1.3 / 97.1%	\$26,200	\$19,699	1
SCP-NSE-011	Infiltration Swale	6.0	3.8	0.5	9.2	5.5 / 80.3%	\$34,900	\$6,392	1
SCP-NSE-013	Infiltration Swale	2.1	1.4	1.2	4.8	2.3 / 96.2%	\$34,100	\$14,698	1
SCP-NSE-016	TIP	0.2	0.2	0.0	0.4	0.1 / 45.0%	--	--	1
SCP-NSE-017	TIP	0.03	0.03	0.0	0.05	0.02 / 45.0%	--	--	1
SCP-NSE-029	TIP	0.5	0.3	0.0	0.6	0.2 / 45.0%	--	--	1
SCP-NSE-030	TIP	0.3	0.3	0.0	0.6	0.2 / 45.0%	--	--	1
SCP-NSE-031	TIP	1.2	0.9	0.0	1.7	0.6 / 45.0%	--	--	1
SCP-NSE-002	Infiltration Swale	2.1	1.0	0.5	2.5	1.4 / 79.8%	\$21,600	\$15,105	2
SCP-NSE-003	Bioretention Swale	0.2	0.2	0.8	0.1	0.1 / 47.1%	\$24,800	\$225,455	3
SCP-NSE-018	Infiltration Swale	0.1	0.03	2.6	0.1	0.05 / 98.4%	\$12,600	\$252,000	3
SCP-NSE-019	Bioretention Swale	0.3	0.2	0.6	0.1	0.2 / 43.9%	\$30,100	\$167,222	3
SCP-NSE-020	Bioretention Swale	0.4	0.3	0.8	0.1	0.2 / 48.0%	\$46,500	\$211,364	3
SCP-NSE-021	Bioretention Swale	0.1	0.1	1.0	0.03	0.05 / 53.0%	\$18,200	\$364,000	3
SCP-NSE-022	Bioretention Swale	0.5	0.3	0.3	0.04	0.1 / 29.8%	\$20,100	\$154,063	3
SCP-NSE-023	Bioretention Swale	0.5	0.4	0.3	0.1	0.2 / 31.9%	\$25,400	\$146,768	3
SCP-NSE-024	Bioretention Basin	0.2	0.1	1.4	0.1	0.1 / 57.1%	\$32,100	\$312,273	3
SCP-NSE-025	Bioretention Basin	1.1	0.7	0.2	0.1	0.3 / 27.3%	\$19,200	\$73,182	3
SCP-NSE-026	Bioretention Swale	0.3	0.2	1.0	0.1	0.2 / 53.5%	\$24,000	\$154,820	3
SCP-NSE-001	TIP	2.2	1.8	0.0	3.2	1.1 / 45.0%	--	--	3
							Percent RIDOT Reduction Reached	92%	
							Percent RIDOT Reduction Reached	101%	
							Percent RIDOT Reduction Reached	117%	
Total		25.4	15.9		34.4	18.5	414,300	--	

Site Description

Subwatershed Description

North Easton Pond (RI0007035L-03) is located within the Narragansett Bay Watershed (Figure 1-A). The subwatershed is located in Middletown, RI. The majority of the subwatershed is located in the southwestern region of Middletown, bordered to the east by the Maidford River subwatershed (RI0007035R-02A). The subwatershed begins at the top of North Easton Pond, where Bailey's Brook (RI0007035R-01) discharges. Aside from Bailey's Brook, the pond has one additional unnamed tributary that enters at the southeastern corner. This tributary originates as part of RIDOT's drainage system along Aquidneck Ave, becoming an open stream just west of Oceanview Drive. In the

southeastern corner of the pond is a spillway that overflows to South Easton Pond, which is connected to the earthen dam that separates the two ponds. South Easton Pond is impounded by an earthen embankment on all sides, with a spillway that discharges to Easton Bay at the southeastern corner of the pond. Runoff from surrounding areas does not enter South Easton Pond, but instead flows into a moat surrounding the embankment that conveys water to the Easton Bay discharge point. As a result, the North Easton Pond spillway is the only source of input to South Easton Pond. North Easton Pond receives runoff from the entire area between Valley Road (Route 214) and Aquidneck Ave (Route 138A) plus additional surrounding areas. This runoff reaches the water body via a combination of outfall discharge and overland flow. Valley Road and Aquidneck Ave are the only two RIDOT-maintained roads in the subwatershed. The Rhode Island Department of Environmental Management (RIDEM) water quality classification for the North Easton Pond is Class AA. Use goals associated with this classification include public drinking water supply, fish and wildlife habitat, and primary and secondary contact recreation. According to RIDEM's Clean Water Act (CWA) Integrated List of Waterbodies – Appendix A 2016 Index of Waterbodies and Category Listing,¹ the impairments affecting this waterbody segment are total phosphorus, chlorophyll-a (excess algal growth), and total organic carbon. RIDEM has classified North Easton Pond as a Category 5 waterbody that is not supporting public drinking water supply or fish and wildlife habitat. The waterbody is fully supporting primary and secondary contact recreation and is not assessed for fish consumption. The phosphorus impairment in North Easton Pond is covered by TMDL: Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island². According to this TMDL, the major sources of phosphorus in North Easton Pond “are Bailey’s Brook and to a lesser extent an unnamed tributary, stormwater, waterfowl, wastewater, erosion/sedimentation internal cycling, and perhaps Rhode Island Nursery properties.”

RIDOT maintained property in the subwatershed is 23.8 acres; 14.8 acres of which is impervious. ArcGIS online Figure 1/2 shows the subwatershed with the impaired waterbody segments, the Rhode Island Department of Transportation (RIDOT) maintained roadways, the RIDOT maintained property (catchment area) that is discharging to the waterbody, and the outfalls that are discharging to the waterbody. According to 2011 land use data obtained from the Rhode Island Geographic Information System (RIGIS),³ the subwatershed consists mostly of commercial, industrial, and medium- to high-density residential land uses.

RIDOT Discharging Area Description

ArcGIS online Figure 3 shows RIDOT maintained roadways and catchment areas, outfalls, catch basins, interconnections, and RIDEM-listed impaired water bodies located within the subwatershed, as discussed below.

¹ RIDEM, March 2018, 2016 Integrated Water Quality Monitoring and Assessment List – Appendix A 2016 Index of Waterbodies and Category Listing. Available at: <http://dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/iwr16.pdf>

² RIDEM, September 2007, Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island. Available at: <http://www.dem.ri.gov/programs/benviron/water/quality/rest/pdfs/eutropnd.pdf>

³ Rhode Island Department of Environmental Management, Rhode Island Department of Administration, Statewide Planning Program, Photo Science, Inc. www.rigis.org

Subwatershed Boundary Delineation

The RIDEM-provided subwatershed boundary was reviewed through desktop analysis and site visits. The existing delineation for North Easton Pond (RI0007035L-03) included an area of 365 acres and for South Easton Pond (RI0007035L-04) included an area of 673 acres. As a result of the review, the combined subwatershed area decreased from approximately 1,038 acres to 778 acres (-25 percent). A subwatershed boundary modification memo was sent to RIDEM on December 31, 2018 and is under review.

A revised subwatershed was delineated using automated ArcSWAT tools and 1-meter LiDAR elevation data. The new delineation differed significantly from the HUC14 delineation. Beyond the minor variations due to topographic data, four specific modifications were made to the North Easton Pond subwatershed boundary based on the following information:

1. A moat is present around the perimeter of South Easton Pond that drains into the channel that connects the outlet of South Easton Pond and Easton Bay. All overland flow that would otherwise discharge to South Easton Pond is intercepted by the moat and conveyed around its perimeter to the southern outlet and Easton Bay instead of discharging to the pond. The drainage records maintained by the City of Newport, the Town of Middletown, and RIDOT indicate that piped stormwater flows to the moat and does not enter South Easton Pond. Because the embankment and moat provide a hydrologic barrier to stormwater, the North and South Easton Pond subwatersheds were combined.
2. Based on the Town of Middletown's drainage information, in conjunction with RIDOT-mapped drainage interconnections, drainage from Longmeadow Ave and Continental Drive represents an incoming interconnection to Valley Road (RI-214) before interconnecting back to Town of Middletown infrastructure on Green End Ave and discharging to North Easton Pond. Lighthouse View Drive and Harvey Road neighborhoods drain to Green End Ave. The infrastructure along Green End Ave in this area drains west into the North Easton Pond subwatershed.
3. Based on historic aerial imagery, Town of Middletown drainage data, and RIDOT-mapped interconnections, runoff from the Goldenrod Drive subdivision enters two detention basins near the intersection with Valley Road before discharging to a tributary of Bailey Brook. An overflow structure visible on historic aerials was confirmed during a field visit. This structure connects the two basins under Goldenrod Drive. Nearby, an outgoing RIDOT interconnection on RI-138A discharges to a drainage ditch flowing between Goldenrod Drive and Longmeadow Ave. This drainage ditch reenters RIDOT's system as an incoming interconnection to Valley Road, ultimately discharging to North Easton Pond.
4. Based on the Town of Middletown's drainage information, in conjunction with RIDOT-mapped drainage interconnections, drainage from Morrison Ave, Prospect Ave, and Reservoir Road represents incoming interconnections to RIDOT's drainage system, all of which discharges to North Easton Pond.

Other RIDOT Roadways

Preliminary evaluation of this subwatershed determined RIDOT roads are properly identified and no "Other RIDOT roadways" exist in this subwatershed.

RIDOT Roadways

RIDOT maintained roadways in the subwatershed include: Valley Road and Aquidneck Ave. RIDOT maintains 23.8 acres of property (impervious and pervious) within the subwatershed, all of which are directly or indirectly discharging to North Easton Pond with 14.8 acres of impervious cover. The RIDOT direct and indirect discharging areas include the following:

Table 3-A: Direct and Indirect Discharging Areas

RIDOT Roadway	Roadway Type	ROW Description	Adjacent Land Use	Drainage System
Valley Road	two lane roadway with sidewalk on one side, ~10-ft shoulders	Right-of-Way (ROW) width ranging from 70- to 200- feet	medium-high density residential, commercial/industrial, brushland	partially closed drainage system with indirect discharge to North Easton Pond
Aquidneck Ave	two lane roadway with sidewalk on one side (not along all ROW)	ROW width ranging from 45- to 110- feet	medium-high density residential and commercial	partially closed drainage system with indirect discharge to North Easton Pond

Outfall Catchment Delineation

RIDOT catchment areas by discharge location within the subwatershed are summarized in Appendix A-A. Catchments in the North Easton Pond subwatershed were delineated based on a desktop review of RIDOT drainage data, 1-meter resolution LiDAR data, Google Earth, and 3-inch resolution aerial imagery. The RIDOT Right-of-Way (ROW) boundary was determined based on parcel boundaries obtained from the Town of Middletown. Non-RIDOT catchments were delineated only for those RIDOT catchments containing a potential STU. For many of these catchments, non-RIDOT contributing areas comprise a significant portion of the total catchment area. Delineations for non-RIDOT catchment areas were determined using the tools listed above but also took into account the presence of several stormwater management systems located in the industrial park between Valley Road and Aquidneck Ave. Areas appearing to drain to existing offsite treatment systems were excluded from non-RIDOT catchments to avoid double-counting of treated area. The majority of runoff from this industrial park collects in a series of drainage swales along the east side of Valley Road that conveys stormwater to the five outfalls that discharge to a narrow vegetated buffer adjacent to the pond. 7 outfalls are located along Aquidneck Ave that drain most of Aquidneck from Newman Road south, discharging to the unnamed tributary of North Easton Pond. Aquidneck Ave near the intersection with Green End Ave drains to an outgoing interconnection to the Town MS4, which runs west down Green End Ave, briefly re-enters the RIDOT system at the intersection with Valley Road, then exits again before discharging to the pond at the mouth of Bailey's Brook. Catchments were confirmed by a field visit that took place in October 2018. The field visit confirmed general questions regarding roadway crown, superelevation, drainage patterns, infrastructure, location of utilities, and identification of other potential constraints.

Illicit Discharge Detection and Elimination Priority Outfalls

There are 19 mapped RIDOT outfalls within the North Easton Pond subwatershed. This does not include one mapped outfall that is a culvert located where the unnamed tributary enters North Easton Pond. There are no High Priority outfalls (as defined in Appendix 6) located in the subwatershed. There are also no RIDOT MS4 discharge points for which RIDOT must provide a schedule for initiating IDDE inspections (per Appendix 8). There are no MS4 outfalls for which

RIDOT shall identify upgradient interconnections (per Appendix 9). There are 8 Priority outfalls (as defined in Paragraph 20b) in the subwatershed where dry-weather discharge was noted during outfall mapping and dry-weather screening (ArcGIS online Figure 3):

- OF-291 – Valley Road, adjacent to 31 John Clarke Road, indirect discharge to North Easton Pond
- OF-MH-47432 – Valley Road, adjacent to 97 John Clarke Road, indirect discharge to North Easton Pond
- OF-277 – 227 Aquidneck Ave, indirect discharge to unnamed tributary
- OF-CB-63446 – Aquidneck Ave, adjacent to 70 Reservoir Road, indirect discharge to unnamed tributary
- OF-281 – 389 Aquidneck Ave, indirect discharge to unnamed tributary
- OF-17833 – Intersection of Aquidneck Ave and Oceanview Drive (South), direct discharge to unnamed tributary (is start of tributary)
- CB-CB-63844 – Intersection of Aquidneck and Green End Ave, indirect discharge, outgoing interconnection
- CB-21046 – 850 Aquidneck Ave, indirect discharge, outgoing interconnection

Follow-up dry-weather sampling at these Priority outfalls will occur by June 30, 2019 where samples of non-stormwater discharge will be collected and analyzed as described in Paragraph 20d of the Consent Decree.

TMDL Priority Outfalls

There are no TMDL Priority outfalls located in the subwatershed.

Interconnections

Interconnections are shown on ArcGIS online Figure 3. RIDOT utilized RIDOT and Town of Middletown drainage data, local topography, and surface drainage patterns to identify possible interconnections.

MS4: RIDOT identified 13 locations where the Town of Middletown municipal separate storm sewer system (MS4) ties into the RIDOT drainage system (incoming interconnections) and 4 locations where RIDOT drainage ties into the municipal drainage system adjacent to their property (outgoing interconnections).

Private: The desktop review, drainage system mapping, and field visits identified 8 potential private interconnections. The owners of these interconnections are unknown.

RIDOT reviewed its Physical Alterations Permit Application (PAPA) database. This database lists permits requested by adjacent properties to tie into the RIDOT storm drainage system and includes an analysis of the applicant's contribution to the RIDOT storm drainage system. The current PAPA database lists 3 interconnections within the subwatershed (permit numbers 70430, 81001, 121126), none of which are currently mapped as an interconnection in RIDOT's online mapping database. 2 additional interconnections on Aquidneck Ave are listed in the PAPA database (permit numbers 30826 and 060331-A) but it is uncertain whether or not they are in the subwatershed as there are no address records. RIDOT will add all private interconnections for which the owner is unknown to its IDDE program to verify that only stormwater flows are being discharged and will have the owners file for a PAPA. Further, RIDOT will review future PAPA permit requests for compliance with its TAC 0071

– PAPA Guidance – Public and Private Tie-Ins to the State’s Drainage System and its RIPDES permit and to ensure that only stormwater flows are being introduced to their system.

Non-Discharge Areas

RIDOT did not identify any non-discharge areas in the subwatershed.

Sewered/Combined Sewer Areas

A portion of the subwatershed has been identified as a sewered area. Based on mapping from RIDEM, all of the RIDOT ROW includes areas that are sewered by the City of Newport as shown in ArcGIS online Figure 3.

There are no areas in the subwatershed that discharge to a combined sewer system.

Flow and Water Quality Monitoring Data

As part of this SCP, RIDOT reviewed the following sources for existing flow and water quality monitoring data:

- TMDL: Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island
- University of Rhode Island (URI) Watershed Watch
- Groundwater Elevation Data

TMDL: Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island

Sampling of North Easton Pond was conducted on three different occasions in 2002 by RIDEM staff. The results showed that the mean total phosphorus concentration was 110 µg/l, greater than the 25 µg/l limit established by RIDEM. Samples were also tested for dissolved phosphorus, chlorophyll, and dissolved oxygen.

URI Watershed Watch⁴

The URI Watershed Watch does not have any monitoring sites within the North Easton Pond subwatershed.

Groundwater Elevation Data

Groundwater elevation data was obtained from the United States Department of Agricultural National Cooperative Soil Survey and includes soil classification, standard groundwater depths, and infiltration rates.

⁴ University of Rhode Island (URI) Watershed Watch. Available at: <https://web.uri.edu/watershedwatch/uri-watershed-watch-monitoring-data/>

Reduction Target Development

The impairments affecting North Easton Pond (RI0007035L-03) are total phosphorus, chlorophyll-a, and total organic carbon. The phosphorus and chlorophyll-a impairments are covered by the Statewide Eutrophic Ponds TMDL developed in 2007.

TMDL Method

The Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island TMDL includes the pollutant reduction target for phosphorus. Table 4-A-1 provides a summary of the TMDL phosphorus reduction target information for the subwatershed of North Easton Pond (RI0007035L-03) and the RIDOT phosphorus reduction target for RIDOT discharge areas.

Table 4-A-1: TMDL Method: Pollutant Reduction Target Summary

Applicable TMDLs:	Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in Rhode Island – September 2007			
Subwatershed Total Area:	778 acres			
Subwatershed Total IC Area (%):	183 acres (24%)			
RIDOT Contributing Total Area to Waterbody:	23.8 acres			
RIDOT Contributing Total IC Area to Waterbody:	14.8 acres			
Pollutants of Concern	Required TMDL Phosphorus Reduction Target (%)	Phosphorus Load Rate (lb/ac/yr) ¹	Current RIDOT Load (lb/yr)	Required RIDOT Phosphorus Reduction Target (lb/yr) ²
Phosphorus	80%	1.3	19.8 lb/yr	15.8 lb/yr

¹ Phosphorus loading rate is based upon USGS SELDM Analysis.

² Total required RIDOT pollutant reduction target (lb/yr) calculated as the required TMDL phosphorus reduction target percentage multiplied by the pollutant loading rate (lb/ac/yr) multiplied by the area of RIDOT impervious cover in the subwatershed that discharges to the impaired water body segment.

Additional TMDL Requirements

The following lists the TMDL information and recommendations applicable to RIDOT for this subwatershed:

- Sources of phosphorus in North Easton Pond include Bailey's Brook, an unnamed tributary, stormwater, waterfowl, wastewater, and erosion/sedimentation and internal cycling.
- RIDOT is required to increase street sweeping beyond the required twice-annual schedule in areas draining to Priority outfalls and other outfalls associated with flooding problems. It is recommended that RIDOT also perform regular maintenance of its stormwater infrastructure. RIDOT is also required to implement STUs throughout the subwatershed to remove phosphorus from stormwater and continue to inspect and sample outfalls for dry-weather discharge.
- There are no specific TMDL requirements regarding outfalls in the subwatershed because the TMDL did not identify any outfalls within the subwatershed. Per the Stormwater Management section of the TMDL, Middletown should continue to locate Priority areas to identify and eliminate illicit discharges in the North Easton Pond subwatershed.

Non-Stormwater Related Impairments

The North Easton Pond subwatershed (RI0007035L-03) is not impaired by non-stormwater related impairments.

Existing Stormwater Controls

No stormwater treatment units (STUs) currently exist to treat stormwater from RIDOT's property directly or indirectly discharging to North Easton Pond (RI0007035L-03). Under existing conditions, RIDOT's estimated directly contributing annual phosphorus load exceeds the TMDL RIDOT phosphorus reduction target.

Potential Enhanced Non-Structural Stormwater Controls

RIDOT has identified that control measures are needed to reduce its effective phosphorus loading within the contributing subwatershed to achieve the required RIDOT phosphorus reduction target. RIDOT did not identify any potential non-structural stormwater controls beyond what is required in the Consent Decree.

Stormwater Controls Description

Per the TMDL for North Easton Pond, sources of pollution in the subwatershed include stormwater, waterfowl, wastewater, and erosion/sedimentation and internal cycling. Significant run-on occurs in the subwatershed, mainly from residential, commercial/industrial, and agricultural land.

As part of compliance with the Consent Decree, RIDOT will be performing enhanced street sweeping (estimated two times per year) within the Consent Decree designated Area of Interest (AOI). These roadways include a total of 2.4 miles containing 14.8 impervious acres within this subwatershed, shown on ArcGIS online Figure 2.

Potential Structural Stormwater Controls

RIDOT has identified that structural control measures in addition are needed to reduce its phosphorus loading within the contributing subwatershed to achieve the required RIDOT phosphorus reduction target. Appropriate locations are potentially available for control measures, as shown in ArcGIS online Figure 4.

Specific stormwater controls have been identified that may be considered for implementation, as described in the following section. See sub-section Evaluation of Infeasible Stormwater Controls for more information regarding locations where retrofit STUs are not currently feasible.

Stormwater Controls Description

RIDOT identified specific locations and several general locations for potential structural STUs within this subwatershed. ArcGIS online Figure 4 shows potential STU locations with catchment areas, including non-RIDOT areas and Appendix C-A lists site-specific constraints.

Below are descriptions of the potential STUs including location, conceptual design, RIDOT ROW treated, hydrologic soil group based on United States Department of Agriculture National Cooperative Soil Survey, major constraints, and any partnership required.

SCP-NSE-002

SCP-NSE-002 is an infiltrating bioretention curb inlet planter located along the east side of Valley Road just south of the intersection with Green End Ave. The proposed location is approximately 400 feet long, adjacent to 524 Valley Road. The majority of the STU catchment area is outside the RIDOT ROW. The bioretention planter will consist of discrete bioretention cells with walls to increase treatment capacity and reduce its footprint due to grading. The STU involves retrofitting the existing sidewalks, where stormwater will enter via curb inlets along the road and pass through pretreatment systems at each inlet. An overflow system will be designed to bypass flows in excess of the design volume back to RIDOT's storm drain system. The soils in this area are mapped as hydrologic group A, so this STU will be designed to infiltrate to the underlying soil, depending on the local depth to groundwater and soil infiltration capacity. Because of this, the STU is tagged as an infiltration swale for accounting purposes. Additional constraints include potential for tree roots and underground water/sewer lines in the vicinity of the STU.

SCP-NSE-003

SCP-NSE-003 is a bioretention swale located directly across the street from the previously described bioretention planter on Valley Road, in the open area next to the road within the RIDOT ROW. The majority of the STU catchment area is within the ROW. The swale will collect stormwater from the west side of the ROW as it flows downhill to the intersection with Green End Ave. Water will enter through two localized inlets (no curbing) with pretreatment systems. An overflow system will be designed to bypass flows in excess of the design volume back to RIDOT's storm drain system. Poor soils in the area and potentially high groundwater will prevent infiltration, so an underdrain will be installed and connected to the downstream catch basin at the intersection to the north. Due to a more limited ROW on this side of the road, grading easements may be required. The adjacent property is owned by Middletown Historical Society.

SCP-NSE-006, SCP-NSE-007, SCP-NSE-009, SCP-NSE-011, SCP-NSE-013

These STUs involve retrofitting the existing drainage swale located along the east side of Valley Road with a series of infiltration swales. The existing swale extends from just south of Johnny Cake Hill to about 300 feet north of the intersection of Valley and Aquidneck Ave. The combined length of the swales is about 1,900 feet. The swales currently receive a significant amount of runoff from the uphill industrial park to the east from a combination of direct overland runoff, interconnections, and other drainage infrastructure. The majority of the swales is unvegetated and well-maintained, however along several stretches it is vegetated with brush and in some places large bushes and trees.

The majority of the STU catchment area is outside the RIDOT ROW. Stormwater will enter the swales through a series of deep sump catch basins installed under the sidewalk, providing pretreatment before discharging to the swales. The swales currently have an overflow system in place, as water over a certain depth will exit the swales via adjacent catch basin inlets that discharge to outfalls under Valley Road. The soils in the area are mapped as hydrologic group A,

so this STU will be designed to infiltrate to the underlying soil, depending on the depth to groundwater and soil infiltration capacity.

SCP-NSE-018

SCP-NSE-018 is an infiltration swale proposed along Aquidneck Ave adjacent to the Aquidneck School property (70 Reservoir Road) and the intersection with John Clarke Road. It will be located between two utility poles. The entirety of the STU catchment area is within the RIDOT ROW, as a berm will be constructed along the side of the swale opposite the road to prevent offsite runoff from entering the system. Stormwater from the ROW will enter the swale via localized inlets (no curbing) with pretreatment systems. An overflow system will be designed to bypass flows in excess of the design volume back to RIDOT's storm drain system. The soils in the area are mapped as hydrologic group A, so this STU will be designed to infiltrate to the underlying soil, depending on the local depth to groundwater and soil infiltration capacity. Constraints include the utility poles and overhead wires and two adjacent trees that are offset from the road by approximately 15 feet.

SCP-NSE-019, SCP-NSE-021, SCP-NSE-022, SCP-NSE-023

These STUs are bioretention swales proposed along Aquidneck Ave adjacent to the Aquidneck School (70 Reservoir Road) and Middletown Little League (389 Aquidneck Ave) properties. The RIDOT ROW extends about 12 feet from the edge of the pavement. Slightly more than half of the catchment area for these STUs is within the ROW. The majority of the roadway's catch basins are on the same side of the road, and in most cases the swales will be located just upstream from a catch basin. Stormwater will enter the swales via localized inlets (no curbing) with pretreatment systems. Overflow systems will be designed to bypass flows in excess of the design volume back to RIDOT's storm drain system. Poor soils in the area will prevent infiltration, so an underdrain will be installed and connected to the next downstream catch basin. Potential constraints include utility poles located within the ROW, as well as two fire hydrants.

There is an existing detention basin in the school field adjacent to SCP-NSE-019 that drains to the roadway where this STU is proposed. SCP-NSE-019 will have a raised berm that will divert flow from the field past the swale and into the next downstream catch basin. This berm will prevent runoff and treated water from the field from entering SCP-NSE-019, however run-on will still occur from a portion of the adjacent parking lot. The three other STUs will also receive and treat offsite run-on.

SCP-NSE-020

SCP-NSE-020 is a bioretention swale proposed along Aquidneck Ave on the side of the road opposite the Aquidneck School (70 Reservoir Road). The ROW on this side of the road extends approximately 8 feet beyond the edge of the pavement. Several planted trees exist close to the ROW boundary, but space is available to implement a swale here, just upstream of a RIDOT catch basin and outfall. The STU catchment area is entirely within the RIDOT ROW, consisting of the northwest half of the roadway extending from this downstream catch basin to an eroded pavement swale about 760 feet upstream. Due to the limited drainage infrastructure on this side of the road, curbing will be installed to direct flow from the road into the STU. This flow will enter the swale via localized inlets with pretreatment systems. An overflow system will be designed to bypass flows in excess of the design volume into the downstream catch basin. Poor

soils in the area will prevent infiltration, so an underdrain will be installed and connected to the downstream catch basin.

SCP-NSE-024

SCP-NSE-024 is a bioretention curb inlet planter proposed along the northwest side of Aquidneck Ave in the open space between the Maritime Simulation Institute (344 Aquidneck Ave) driveway and Oceanview Drive, a distance of 160 feet. The STU catchment area is entirely within the RIDOT ROW. The bioretention planter, similar to SCP-NSE-002 but without infiltration, will have a maximum width of 4 feet with concrete walls (no side slopes) and will have two inlets with pretreatment systems, one of which will be just upstream of the catch basin located near the corner of Oceanview Drive. The STU will be designed to overflow back into the roadway and continue downstream for flows that exceed the design volume. Poor soils in the area will prevent infiltration, so an underdrain will be installed that will drain directly to the adjacent brook. There is a guardrail along the side of the road here, so construction of a planter would require adjustment of the guardrail. The open space between the edge of pavement and the adjacent vegetation is approximately 10 feet, although the ROW only extends approximately 6.5 feet beyond the pavement. An easement may be required if a bioretention swale with side slopes is determined to be the preferred option.

SCP-NSE-025

SCP-NSE-025 is a bioretention basin located on the lawn of 404 Aquidneck Ave, just north of the driveway. At its narrowest, the RIDOT ROW extends 20 feet across the lawn from the edge of the pavement. The ROW extends even farther onto the lawn just to the north of the proposed location, however there are several trees and a utility pole in this wider area that would prevent implementation of an STU. Furthermore, the proposed location was chosen because the catch basin on the street can be bypassed via a curb inlet to maximize the catchment area. The majority of the catchment area is within the RIDOT ROW, although some run-on will enter the system from Prospect Drive and the Paradise Motel driveway due to the superelevated roadway. Stormwater will enter the STU via a curb inlet and pass through a pretreatment system. An overflow system will be designed to bypass flows in excess of the design volume back into RIDOT's storm drain system. Poor soils in the area will prevent infiltration, so an underdrain will be installed and connected to the next downstream catch basin located on the other side of the driveway. A 3-foot pipe runs underneath the property along the edge of the road, receiving flow from the nearby catch basins. This pipe will prevent the STU from being directly adjacent to the curb. The lawn is maintained and visible from the adjacent house, thus construction of the STU will require outreach to the property owner.

SCP-NSE-026

SCP-NSE-026 is a bioretention swale located on the west side of Aquidneck Ave adjacent to 430 Aquidneck Ave. It is just north of an open stormwater conveyance channel that enters the 3-foot pipe described as part of SCP-NSE-025. This STU is proposed in an open but well-maintained area in the ROW that is separated from the abutting property by tall bushes and trees. The STU catchment area is entirely within the RIDOT ROW, extending up Aquidneck Ave to Ocean View Drive. The slope in this area is between 6 and 7 percent, which would require the swale to have a series of check dams. Significant excavation may be necessary at the top of the swale to reduce the effective slope of the system. The slope and excavation will allow water to enter the STU from the upstream catch basin, located about 50 feet from the top of the swale, by retrofitting

the existing pipe to discharge to a pretreatment system before entering the swale itself. An additional direct inlet with a pretreatment cell will be constructed to allow runoff to enter the system from the portion of the road downstream from the catch basin. An overflow system will be designed to bypass flows in excess of the design volume into the downstream channel. Poor soils in the area will prevent infiltration, so an underdrain will be installed that will drain directly to the manhole located just north of the open channel where it currently discharges.

TIP STUs

The RIDOT Transportation Improvement Plan (TIP) identifies RIDOT projects that are scheduled to be designed and constructed in the near future.

Appendix D-A lists the TIP projects (as of November 2018) scheduled for the next 6 years within the subwatershed. Areas that will be modified as part of a TIP project where potential STU locations were not identified are included within this SCP with an assumed 50% treatment level. Stormwater controls will be included in TIP projects to the maximum extent practicable.

SCP-NSE-001

- TIP ID: 1359
- TIP Year: 2024
- TIP Category: Pavement Capital Program
- Project Name: Rt 214, Valley Rd (Green End Ave to East Main Rd)
- Municipality: Middletown
- Description: Resurfacing the roadway, limited sidewalk replacement and handicapped ramp installation.

SCP-NSE-016, SCP-NSE-017

- TIP ID: 5070
- TIP Year: 2020
- TIP Category: Pavement Capital Program
- Project Name: Rt 138A, Aquidneck Ave (Valley Rd to Purgatory Rd)
- Municipality: Middletown
- Description: Resurfacing the roadway, limited sidewalk replacement and handicapped ramp installation

SCP-NSE-029, SCP-NSE-030, SCP-NSE-031

- TIP ID: 1355
- TIP Year: 2018
- TIP Category: Pavement Capital Program
- Project Name: Rt 138A, Aquidneck Ave (East Main Rd to Green End Ave)
- Municipality: Middletown
- Description: Resurfacing the roadway and drainage and sidewalk improvements (one side).

Limited ROW STUs

RIDOT did not identify any roadways with limited ROW STUs.

Infeasible Stormwater Controls

Through this evaluation, RIDOT determined that certain areas of the direct and indirect discharging area are not feasible for retrofit stormwater controls. These locations are shown in ArcGIS online Figure 4 with specific constraints listed in Appendix C-A. In general, constraints included proximity to environmental resources and physical constraints limiting the construction and/or function of a potential STU. Although some constraints are manageable via creative design and permitting, other constraints or the combination of multiple constraints make locations prohibitive for retrofit STUs. These locations may be feasible for STUs in the future if conditions change and will be evaluated as transportation designs occur.

Stormwater Controls Calculations

Calculations showing phosphorus treatment credit for potential stormwater controls are attached as Appendix B-A and summarized in Table 1-A.

Implementation

Existing and potential enhanced non-structural and structural controls are summarized in Table 5-A below.

Table 5-A: Stormwater Controls Summary

STU ID	Stormwater Control Type	Catchment Area (ac)	Impervious Cover (ac)	Treatment Depth (in) (Depth of Runoff Treated)	Runoff Reduction (ac-ft)	Phosphorus Treatment Credit (lb/yr / %)	Estimated Cost	Cost per lb P Removed (\$/lb)	Retrofit Priority
SCP-NSE-006	Infiltration Swale	1.3	0.7	1.0	2.2	1.1 / 94.1%	\$19,400	\$17,798	1
SCP-NSE-007	Infiltration Swale	3.9	2.2	0.5	5.5	3.2 / 81.5%	\$25,100	\$7,771	1
SCP-NSE-009	Infiltration Swale	1.8	0.8	1.5	2.9	1.3 / 97.1%	\$26,200	\$19,699	1
SCP-NSE-011	Infiltration Swale	6.0	3.8	0.5	9.2	5.5 / 80.3%	\$34,900	\$6,392	1
SCP-NSE-013	Infiltration Swale	2.1	1.4	1.2	4.8	2.3 / 96.2%	\$34,100	\$14,698	1
SCP-NSE-016	TIP	0.2	0.2	0.0	0.4	0.1 / 45.0%	--	--	1
SCP-NSE-017	TIP	0.03	0.03	0.0	0.05	0.02 / 45.0%	--	--	1
SCP-NSE-029	TIP	0.5	0.3	0.0	0.6	0.2 / 45.0%	--	--	1
SCP-NSE-030	TIP	0.3	0.3	0.0	0.6	0.2 / 45.0%	--	--	1
SCP-NSE-031	TIP	1.2	0.9	0.0	1.7	0.6 / 45.0%	--	--	1
SCP-NSE-002	Infiltration Swale	2.1	1.0	0.5	2.5	1.4 / 79.8%	\$21,600	\$15,105	2
Percent RIDOT Reduction Reached									92%
Percent RIDOT Reduction Reached									101%

SCP-NSE-003	Bioretention Swale	0.2	0.2	0.8	0.1	0.1 / 47.1%	\$24,800	\$225,455	3
SCP-NSE-018	Infiltration Swale	0.1	0.03	2.6	0.1	0.05 / 98.4%	\$12,600	\$252,000	3
SCP-NSE-019	Bioretention Swale	0.3	0.2	0.6	0.1	0.2 / 43.9%	\$30,100	\$167,222	3
SCP-NSE-020	Bioretention Swale	0.4	0.3	0.8	0.1	0.2 / 48.0%	\$46,500	\$211,364	3
SCP-NSE-021	Bioretention Swale	0.1	0.1	1.0	0.03	0.05 / 53.0%	\$18,200	\$364,000	3
SCP-NSE-022	Bioretention Swale	0.5	0.3	0.3	0.04	0.1 / 29.8%	\$20,100	\$154,063	3
SCP-NSE-023	Bioretention Swale	0.5	0.4	0.3	0.1	0.2 / 31.9%	\$25,400	\$146,768	3
SCP-NSE-024	Bioretention Basin	0.2	0.1	1.4	0.1	0.1 / 57.1%	\$32,100	\$312,273	3
SCP-NSE-025	Bioretention Basin	1.1	0.7	0.2	0.1	0.3 / 27.3%	\$19,200	\$73,182	3
SCP-NSE-026	Bioretention Swale	0.3	0.2	1.0	0.1	0.2 / 53.5%	\$24,000	\$154,820	3
SCP-NSE-001	TIP	2.2	1.8	0.0	3.2	1.1 / 45.0%	--	--	3
Percent RIDOT Reduction Reached 117%									
Total		25.4	15.9		34.4	18.5	414,300	--	

RIDOT will implement this SCP through:

1. Non-Constructed Measures
2. RIDOT New Construction and Re-Construction Projects
3. Retrofit Projects

RIDOT constructs STUs as part of either programmed or retrofit projects until the RIDOT phosphorus reduction target is met.

The following lists RIDOT's planned actions to meet TMDL requirements, including controls identified in Table 5-A:

- Identify Priority outfalls
 - RIDOT Action: RIDOT will work with the Town of Middletown to identify all TMDL Priority outfalls in the subwatershed per guidelines in Section 4.2 of the TMDL.
- Implement structural BMPs to treat stormwater for phosphorus
 - RIDOT Action: This SCP documents RIDOT's plan to implement structural BMPs to treat phosphorus.

Non-Constructed Measures

RIDOT has performed various actions toward compliance with the municipal separate storm sewer system (MS4) General Permit:

- Middletown and RIDOT are MS4 operators in the North Easton Pond subwatershed and have prepared Phase II Stormwater Management Plans (SWMP). The entire subwatershed is regulated under the Phase II program. In 2009, stormwater outfalls and catch basins throughout Middletown were mapped as part of Phase II requirements.
- RIDOT's SWMPP and its 2011 Compliance Update outline its goals for compliance with the MS4 General Permit. It should be noted that RIDOT has chosen to enact the General Permit

statewide, not just for the urbanized and densely populated areas that are required by the permit. RIDOT has finished mapping its outfalls throughout the state and is working to better document and expand its catch basin inspection and maintenance programs along with its BMP maintenance program. Storm Water Pollution Prevention Plans (SWPPP) are being utilized for RIDOT construction projects.

- RIDOT will also perform enhanced street sweeping on all RIDOT roads in the subwatershed per the Consent Decree (as defined by paragraph 41), as these roads indirectly drain to a Newport Water Supply Reservoir (North Easton Pond).

RIDOT New Construction and Re-Construction

New and re-construction projects whose scope and limits have been defined at the time of SCP development are included within this SCP with an assumed 50% treatment level. Funding for the resurfacing project on Aquidneck Ave from East Main Road to Green End Ave (TIP ID 1355) begins in 2018. Funding for the resurfacing project on Aquidneck Ave from Valley Road to Purgatory Road (TIP ID 5070) begins in 2020. Funding for the resurfacing project on Valley Road from East Main Road to Green End Ave (TIP ID 1359) begins in 2024. No potential STUs were proposed in areas within these project limits for this subwatershed.

Retrofits

Retrofit STUs have been identified as part of this SCP. Table 5-A includes estimated costs and implementation priority for these controls. Cost estimates for STUs were obtained from guidance in EPA's memo "Methodology for developing cost estimates for Opti-Tool", RIDOT Weighted Average Unit Prices for calendar years 2017 and 2018, and experience from prior stormwater projects. Costs from EPA's memo have not been adjusted to the current year. Average unit costs were developed based on a typical STU retrofit scenario and include considerations for mobilization and demobilization, soil erosion and sediment control, contingency, engineering and design fees, and construction administration. Individual STU costs were then adjusted based on STU size, with larger systems being more cost-effective than smaller systems. Cost estimates presented in this SCP should be considered as Order of Magnitude as defined by the American Association of Cost Engineers and are expected to be accurate within a plus 50% or minus 30% range as they were developed without detailed engineering data.

STU retrofit priorities were determined based on per-acre cost of IC reduction, constructability, and necessity for achieving the RIDOT IC reduction target. STUs more difficult and/or expensive to implement were generally given lower priority, unless they are necessary for achieving the reduction target, in which case they were tagged as priority 1 or 2. STUs located in TIP areas were given retrofit priorities based on the project start date, where near-term projects are higher priority and longer-term projects are lower priority.

Table 6-A shows the implementation schedule for the major milestones for design and construction of the retrofit STUs. Although these target implementation dates have been identified at this time based on the STU prioritization, RIDOT may implement certain STUs on an alternate schedule if cost efficiencies are identified. Examples of potential cost saving opportunities include:

- Constructing STUs along a highway corridor that spans multiple SCP subwatersheds at the completion of all associated SCPs
- Modifications in planned roadway project timelines or scopes
- Identification of partnering opportunities.

Table 6-A: Structural Controls Target Implementation Schedule

STU Priority Level	Feasibility & Scope Start	Recommended Target Dates by		
		Design Start	Construction Advertise	Construction Finalized
Priority Level 1	June 2019	January 2021	June 2022	June 2023
Priority Level 2	June 2021	January 2023	June 2024	June 2025
Priority Level 3	June 2023	As Needed to Fulfill Target	As Needed to Fulfill Target	As Needed to Fulfill Target

Note: Target dates are based on an assumed EPA approval within six months of SCP submittal. The dates only apply to STU's that are determined feasible and are needed to fulfill the required RIDOT reduction target.

Municipal and Private Partnerships

There are no existing or proposed partnerships, therefore Appendix E-A is not included. RIDOT will continue to evaluate opportunities for municipal and private partnerships that may allow for construction of stormwater controls on non-RIDOT property.

IDDE Activities

RIDOT has completed IDDE dry-weather screenings at its outfalls within this subwatershed.

During system mapping activities, dry-weather discharge was noted at 6 outfalls (OF-291, OF-MH-47432, OF-277, OF-CB-63446, OF-281, OF-17833). Dry-weather flow was also observed at an interconnection that is both incoming and outgoing that leaves RIDOT's system to the Town of Middletown MS4 at the intersection of Aquidneck and Green End Ave (CB-63844). Another outgoing interconnection on Aquidneck Ave (CB-21046) had dry-weather flow at the time of screening. Outfalls are shown in ArcGIS online Figure 3. Follow-up dry-weather sampling at these outfalls will occur by June 30, 2019 where samples of non-stormwater discharge will be collected and analyzed as described in Paragraph 20d of the Consent Decree. Between April 1 and November 30, 2019, RIDOT will inspect the outfalls where flow was not observed during dry weather under wet-weather conditions and analyze samples for parameters listed in Paragraph 21c.

Public Outreach

During development of this SCP, RIDOT met with the Town of Middletown on May 11, 2018. RIDOT conveyed the Consent Decree requirements and the SCP Plan development schedule and made a request for available stormwater system mapping data. RIDOT will continue coordination with the Town of Middletown to share data, findings, and plans for improvements.

STU Operations and Maintenance Plan

Existing and newly constructed STUs will be inspected, operated, and maintained to ensure functionality and longevity of the STUs. The inspection, operation, and maintenance procedures for STUs are consistent with those outlined in RIDEM's Stormwater Design and Installation Standards

Manual, amended in March 2015,⁵ and include inspections and maintenance that is customized to the functioning components of the STU.

Next Steps

In the year following submission of this SCP, RIDOT will develop feasibility studies for all Priority 1 STUs listed in Table 2-A. These feasibility studies will further evaluate site characteristics and constraints, including soil infiltration rates, utility conflicts, and catchment areas to each potential STU. In addition, a 30% design, 90% design, PS&E and required Contract Advertising Documents and as-build plans will be developed for each of the Priority 1 STUs.

⁵ Rhode Island Stormwater Design and Installation Standards Manual, Rhode Island Department of Environmental Management and Coastal Resources Management Council, Amended March 2015. Accessed: <http://www.dem.ri.gov/pubs/regs/regs/water/swmanual15.pdf>.

APPENDIX A-A
NORTH EASTON POND (RI0007035L-03)

RIDOT DISCHARGING AREA SUMMARY

Appendix A-A: RIDOT Discharging Area Summary

Structure ID	Discharge Location	Description	Total Area (ac)	Impervious Cover (ac)	Pervious Cover (ac)	Pervious Cover Types
CB-63340	MS4	Outgoing Interconnection	3.2	2.4	0.8	Grass/ Forest
OF-CB-6847	Wetland	24" metal pipe w/ headwall	1.2	0.9	0.3	Grass/ Forest
OF-299	Wetland	18" concrete pipe w/ headwall	0.4	0.3	0.1	Grass/ Forest
OF-291	Unknown	24" concrete pipe w/ headwall	0.4	0.3	0.1	Grass/ Forest
OF-MH-47432	Unknown	24" concrete pipe w/ flared end	0.8	0.6	0.2	Grass/ Forest
OF-280	Non-Wetland	18" concrete pipe w/ headwall	1.1	1.0	0.1	Grass/ Forest
OF-CB-14905	Unknown	Unknown	0.6	0.6	0.0	None
OF-16120	Non-Wetland	12" concrete pipe w/ headwall	0.2	0.2	0.0	None
OF-MH-4560068	Non-Wetland	12" concrete pipe w/ headwall	0.03	0.03	0.0	None
OF-MH-63443	Non-Wetland	12" concrete pipe	0.3	0.3	0.0	None
OF-277	Wetland	24" metal pipe w/ flared end	0.3	0.2	0.1	Grass/ Forest
OF-CB-21053	Non-Wetland	12" metal pipe	0.1	0.1	0.1	Grass/ Forest
OF-CB-21052	Stream/River	12" metal pipe	0.6	0.4	0.2	Grass/ Forest
OF-CB-63446	Wetland	12" metal pipe	0.3	0.2	0.1	Grass/ Forest
OF-281	Wetland	24" concrete pipe	0.3	0.2	0.1	Grass/ Forest
OF-17833	Stream/River	36" concrete pipe w/ headwall	3.3	2.4	0.9	Grass/ Forest
CB-28238	MS4	Outgoing Interconnection	0.3	0.3	0.0	Grass/ Forest
CB-CB-63844	MS4	Outgoing Interconnection	0.5	0.3	0.2	Grass/ Forest
CB-21046	MS4	Outgoing Interconnection	1.2	0.9	0.3	Grass/Forest

Note: For outfalls with no Structure ID, the next available upstream structure ID is used.

APPENDIX B-A
NORTH EASTON POND (RI0007035L-03)

STORMWATER CONTROLS
POLLUTANT CALCULATIONS

APPENDIX C-A
NORTH EASTON POND (RI0007035L-03)

IDENTIFIED CONSTRAINTS
FOR STU IMPLEMENTATION

Catchment ID	Environmental Constraints														Physical Constraints							Access Constraints		Other	STU Recommended					
	FEMA Floodplain (FIRM)	Inundation Surfaces (RIGIS)	Outstanding Resource Waters (RIGIS)	Surface Water Protection Areas (RIGIS)	Freshwater Wetlands (RIGIS)	OWTS Critical Resource Area (RIDEM)	Coastal Features (CRMC)	Endangered Species (RI Natural Heritage Program)	Environmental Justice Area (RIDEM)	Open Space / Conservation Land (RIGIS)	Cultural / Historic Resources (RIGIS)	Underground Storage Tanks (RIDEM)	Leaking Underground Storage Tanks (RIDEM)	CERCLIS/National Priority List (US EPA)	Environmental Land Use Restriction (RIDEM)	Other Resource Area	Non-RIDOT Property / Limited Right-Of-Way	Soils (Poor Infiltration Capacity) (Urban Fill)	Groundwater Resources	Ledge (Bedrock)	Existing Vegetation	Steep Slopes	Elevated Topography	Utilities		Safety	Road Closure	Other		
PT-NSE-003				X													X												X	
PT-NSE-004				X													X	X												X
PT-NSE-009				X																									X	
PT-NSE-010				X																	X								X	
PT-NSE-012				X																	X								X	
PT-NSE-014				X																	X								X	
PT-NSE-016				X							X																		X	
PT-NSE-027				X							X	X												X					X	
PT-NSE-028				X							X	X						X						X					X	
PT-NSE-029				X												X	X				X								X	
PT-NSE-031				X																				X					X	
PT-NSE-032				X																				X					X	
PT-NSE-033				X																	X								X	
PT-NSE-035				X												X	X							X					X	
PT-NSE-037				X							X																		X	
PT-NSE-040				X																		X							X	
TP-NSE-001				X												X	X							X					X	
TP-NSE-022				X												X								X					X	
TP-NSE-023				X												X								X					X	
TP-NSE-046				X														X						X					X	
TP-NSE-047				X							X	X				X	X							X					X	
TP-NSE-048				X								X					X							X					X	
NF-NSE-002				X																										
NF-NSE-005				X																										

APPENDIX D-A
NORTH EASTON POND (RI0007035L-03)

TIP PROJECTS

Appendix D-A: TIP Projects Scheduled for FY 2019-2025 as of November 2018

TIP ID	TIP Project Name	Location	TIP Project Description	TIP Project Status
1359	Rt 214, Valley Rd	Green End Ave to Rt 138	Pavement Capital Program	2024-2025
5070	Rt 138A, Aquidneck Ave	Valley Rd to Purgatory Rd	Pavement Capital Program	2020-2021
1355	Rt 138A, Aquidneck Ave	East Main Rd to Green End Ave	Pavement Capital Program	2018-2019

FIGURE 1-A
NORTH EASTON POND (RI0007035L-03)
SUBWATERSHED OVERVIEW