



Memorandum

To: *Upper Narragansett Bay Steering Committee*

From: *Cynthia Baumann, P.E.*

Date: *September 25, 2015*

Subject: **Warwick – Existing Level of Service**
UNB Regional Stormwater Management District Feasibility Study – Phase II

As part of the Upper Narragansett Bay Regional Stormwater Management District Feasibility Study, CDM Smith is to develop a 10-year cost of service estimate for each municipality related to the operations of the stormwater program. In developing this cost of service, CDM Smith first considered the existing stormwater level of service (LOS) provided by each municipality, the Rhode Island Department of Transportation (RIDOT), and the Narragansett Bay Commission (NBC) and from the corresponding stormwater budget for Fiscal Year (FY) 2015 (July 1, 2014 to June 30, 2015). For the purposes of the LOS analysis, the stormwater programs are divided into five categories:

- Program Administration – this component includes the management of the stormwater program as well as planning, engineering and other administrative responsibilities.
- Municipal Separate Storm Sewer System (MS4) Compliance – these are the activities that are done to achieve compliance with the MS4 permit. In some sense all of the components may consider MS4 compliance; however, for the purposes of this analysis, the activities include only those that have been added to the stormwater program to achieve compliance excluding administrative activities associated with soil erosion and control and post-construction stormwater requirements. Examples of such activities include mapping, inspection, annual reporting, public participation and training, and illicit discharge detection and elimination (IDDE).
- Operations and Maintenance (O&M) – this component includes the maintenance of the public stormwater system (i.e., stormwater assets) such as cleaning, street sweeping, and minor repair and replacement.
- Capital Improvement Program (CIP) – this component includes the design and construction of major capital assets for the purposes of flood control and/or stormwater quality improvements.

- Total Maximum Daily Load (TMDL) Compliance – these are the activities that need to be done to be in compliance with the specific TMDL requirements for those water bodies within each municipality that have a TMDL.

Provided in this memorandum is the consideration of the stormwater program for the City of Warwick.

Warwick’s Stormwater Program

The City of Warwick is located in the east-central portion of Rhode Island. To the east, the City is bounded by the Providence River, to the south by Greenwich Bay (with a small portion of the City south of the Bay), to the north by Cranston and to the west by West Warwick. Warwick had a population of 82,671 based on the 2010 Census and the 2013 estimated population is 81,971 (US Census Bureau, 2015). The City comprises about 35.05 square miles in area, with about 3,000 catch basins, 1,000 manholes, and 800 outfalls. The stormwater system has one structural best management practice (BMP) with the energy dissipater and sediment forebay at York Pond. The City has areas with combined sewers (83.5 percent) and separated sewers (16.5 percent). The overall system has not been completely mapped (about 15 to 20 percent completed). According to the self-assessment, a significant portion (90 percent) of the stormwater system is 50 years old or greater. Major water features include the Providence River, Greenwich Bay, Gorton Pond, Warwick Pond, Buckeye Brook, Hunt River and Pawtuxet River. **Figure 1** illustrates the City boundaries and major river systems.

A number of waterbodies in the City have TMDLs completed by the state. Buckeye Brook, Greenwich Bay, Hunt River, Meshanticut Brook (only a small portion of which is in Warwick), and Pierce River (also only a small portion in Warwick) have been assessed for bacteria, with sources being identified as stormwater runoff, waterfowl and wildlife, and malfunctioning onsite wastewater facilities. Gorton Pond, Sand Pond, and Warwick Pond have been assigned a TMDL for phosphorus, excessive algae and low dissolved oxygen (DO). Major sources include urban stormwater, waterfowl and internal recycling. TMDL phosphorus reductions for Gorton Pond, Sand Pond, and Warwick Pond are required to be 68 percent, 72 percent and 33 percent, respectively.

Level of Service (LOS)

For the purposes of this study, different levels of service have been defined and assigned standard values, with A being the highest and F being the lowest. These standard definitions facilitate evaluation of the LOS currently being provided by the City of Warwick stormwater program, and allow consideration of alternative levels of service.

As discussed in the LOS Protocol, a matrix has been developed to assist in understanding the different levels of service as they relate to the five major program areas (refer to **Table 1**). Within this matrix, the first column contains the LOS alphabetical value ranging from A to F with LOS A being the best. Subsequent column headings are provided for the program areas, and each box



Upper Narragansett Bay Regional Stormwater Management Feasibility Study Phase II

Warwick Existing LOS Technical Memo

Figure 1: Project Area

August 2015

City of Warwick, RI

-  City of Warwick
-  Hydrology
-  Road



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within the matrix contains a brief description of the key elements required to achieve the given LOS for each program area.

Table 1 – General Level of Service (LOS) Criteria

Level of Service	Program Administration	MS4 Compliance	O&M Activities	CIP Projects	TMDL Compliance
A	Comprehensive Planning + Full Implementation Capabilities	Exemplary Permit Compliance	Full Preventative & 100% Routine	10-year Plan	Exemplary Permit Compliance
B	Pro-active Planning + Systematic CIP Implementation Capabilities	Pro-Active Permit Compliance	Mixture of Routine and Inspection Based	20-year Plan	Pro-Active Permit Compliance
C	Priority Planning + Partial CIP Implementation Capabilities	Minimal Permit Compliance	Inspection Based	40-year Plan	Minimal Permit Compliance
D	Reactionary Planning + Minimal CIP Implementation Capabilities	Below Minimum Permit Compliance	Responsive Only Complaint Based	50-year Plan	Below Minimum Permit Compliance
F	No Planning + No CIP Implementation Capabilities	Non-Compliance	Less Than Full Response to All Complaints	75-year or More Plan	Non-Compliance

The matrix and LOS descriptions combined with the costs of the current program provide a basis for understanding the relative differences between the increasing levels of service and the associated connected program improvements needed to increase the LOS. Ultimately, this will provide a basis for determining the revenue required to fund each LOS.

Existing LOS

CDM Smith considered the existing LOS for the City of Warwick through interviews with City staff and review of available MS4 reports, stormwater documents, and the City’s FY 2015 Budget. A description of each of the stormwater management components is provided below.

Program Management

The self-assessment reports that watershed studies were completed for the Brush Neck Cove Watershed only. The following lists the assessments completed:

- *Assessment of Retrofit Feasibility of Selected Storm Water Systems in Brush Neck Cove Watershed, Southern Rhode Island Conservation District (October 2002)*
- *Drainage Assessment for Brushneck Cove Stormwater Management Improvements, Crossman Engineering, Inc. (November 2011)*

This indicates that addressing the flooding control or water quality needs of the City is being done “as needed.” Also, in 2011, a study of the Tascatucket Brook Watershed was completed to identify the potential for stormwater attenuation and source reduction. Based also on the self-assessment, there appears to be adequate staff to manage the program and provide engineering. For the purposes of this assessment, the Warwick LOS for Program Management is LOS D, characterized as some planning and minimal CIP implementation capabilities.

MS4 Compliance

Based on the self-assessment, it appears that each of the components of the MS4 permit are being achieved. Highlights of the existing program include:

- Public awareness is achieved with the use of “Save The Bay” education programs for public schools. “Save The Bay” volunteers also support storm drain marking.
- Public awareness is provided by the Warwick webpage and through mail outs and an informational brochure.
- Public involvement is offered through neighborhood cleanups, pet waste stations, and participation in the Buckeye Brook Coalition.
- Mapping of the MS4 system has been completed on paper maps and the GIS conversion is on-going.
- Catch basins and manholes are inspected during maintenance.
- A sediment and erosion control ordinance is being updated to achieve the goals of the MS4 permit.
- Post-construction controls are inspected by the Engineering Division and O&M plans are to be submitted to the City.
- In all, 395 catch basins were inspected and cleaned in 2014.

Further discussion with the Rhode Island Department of Environmental Management (RIDEM) revealed that the City of Warwick was issued a notice of intent for not being in compliance with

their MS4 permit. Based on this information, the Warwick MS4 compliance LOS can be characterized as F.

Operations & Maintenance (O&M)

The O&M program for the City can be characterized as inspection-based and complaint-based. Street sweeping within the City is routine with all streets swept once a year from April to August. Catch basin cleaning is done from May to September mostly on a reactive, complaint-based process. With this practice, about 30 percent of the catch basins are maintained each year. However, a significant portion (90 percent) of the stormwater system is relatively old (50 years and greater) which may soon cause repair and replacement to dominate the O&M program.

Overall, the O&M program for Warwick can be characterized as a mixture of informal inspection-based and reactionary (complaint-based), yielding a LOS of D.

Capital Improvement Program (CIP)

According to the self-assessment, some CIP funding has been provided historically from a drainage bond while some has been provided by the General Fund. Review of the FY 2015 Budget did not reveal an identifiable CIP budget. According to the self-assessment, some CDBG funding is available for Oakland Beach Avenue/Suburban Parkway intersection where bioretention is to be installed in the median. Nevertheless, the self-assessment identified 6 potential areas of concern. These areas were identified as described in **Attachment A** and depicted on **Figure 2** and do not encompass the potential costs to achieve the TMDL and water quality goals defined by the state. In order to develop a stormwater CIP plan each area would require an evaluation, development of recommendations, engineering design, permitting and preparation of plans and specifications in order to construct the recommended improvements. As a result, with no stormwater CIP needs currently planned, this represents a CIP LOS of F.

TMDL Compliance

The City of Warwick has seven TMDLs that affect water bodies within the City limits:

- “TMDL Analysis for the Buckeye Brook Watershed” dated December 2008
- “TMDLs for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island” dated September 2007
- “TMDL Analysis for Greenwich Bay Waters” dated December 2005
- “RI Statewide TMDL for Bacteria Impaired Waters – Hunt River Watershed Summary” dated September 2011
- “Fecal Coliform TMDL Development for Hunt River, Rhode Island” dated February 2001
- “RI Statewide TMDL for Bacteria Impaired Waters – Meshanticut Brook Watershed Summary” dated June 2011



Upper Narragansett Bay Regional Stormwater Management Feasibility Study Phase II

Warwick Existing LOS Technical Memo

Figure 2: Capital Improvement Projects

August 2015

City of Warwick, RI

-  City of Warwick
-  Hydrology
-  Road
-  Capital Improvement Project Area



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- “RI Statewide TMDL for Bacteria Impaired Waters – Pierce River Watershed Summary” dated August 2014

Formal notification from the RIDEM regarding TMDL requirements has not been issued to any TMDLs approved by the US Environmental Protection Agency (EPA) after October 2010. No action is currently required by the City of Warwick for these TMDLs. For TMDLs approved by the US EPA before October 2010, Warwick is mandated to meet TMDL requirements. **Table 2** below lists the TMDL requirements of the City and the status of each.

Table 2 – Summary of TMDL Requirements for Warwick

Impaired Water	TMDL Requirements	
	Outstanding	Fulfilled
Buckeye Brook Watershed	<ul style="list-style-type: none"> ■ Provide implementation plan to investigate sources of elevated bacteria levels in the Knowles and Lockwood Brooks. ■ Public education and outreach in the watershed. ■ Revise SWMPP to address revisions to local ordinances in regards to construction/post construction runoff control. ■ Complete the identification, mapping and determination of ownership of all outfalls. ■ Prioritize outfalls for BMP construction. Develop phased schedule for completing catchment area analyses, design, and construction of structural BMPs. 	No Actions Have Yet Been Fulfilled for this TMDL.
Eutrophic Ponds – Gorton, Sand, and Warwick Ponds	<ul style="list-style-type: none"> ■ Public education and outreach in the watersheds of Gorton, Sand, and Warwick Ponds. ■ Investigate the feasibility of increased street sweeping and/or stormwater maintenance. ■ Street sweeping in the priority areas more frequently than the required twice-annual schedule. ■ Prioritize IDDE within catchments associated with the outfalls identified in the TMDL. ■ Revise SWMPP to address revisions to local ordinances in regards to construction/post construction runoff control. ■ Complete the identification, mapping and determination of ownership of all outfalls to the ponds. ■ Prioritize outfalls for BMP construction. Develop phased schedule for completing catchment area analyses, design, and construction of structural BMPs. 	No Actions Have Yet Been Fulfilled for this TMDL.
Greenwich Bay Waters	<ul style="list-style-type: none"> ■ Public education and outreach in the watershed. ■ Target IDDE and dry weather flow sampling in areas not slated for sewers. ■ Stormwater volume reductions requirements for development & redevelopment of commercial and industrial properties. ■ Complete the identification, mapping and determination of ownership of all outfalls to Greenwich Bay. ■ Prioritize outfalls for BMP construction. Develop phased schedule for completing catchment area analyses, design, and construction of structural BMPs. 	<ul style="list-style-type: none"> ■ Proposed Brushneck Cove Stormwater Management Improvements – Asylum Road. Design for the improvements are ready for bid once funding for the project is allocated. ■ Proposed bio-retention basin and vegetated swales within the median of Suburban Parkway. Design of the basin and swales are at 60% and should be completed by November 2015.

Based on the self-assessment, it appears that minimal measures are being taken to address TMDL requirements.

Additional revenue is needed to address the TMDL requirements recently identified by the RIDEM. While the costs to address TMDL needs are more speculative, they are anticipated to be significant. Based on the minimal TMDL implementation effort, this represents a TMDL LOS F.

Summary of Existing LOS

In summary, the existing stormwater management program for the City of Warwick can be characterized as LOS F, described as adequate administration but with few stormwater plans available, non-compliant MS4 activities, average maintenance and very limited CIP capabilities.

Stormwater Program Costs

From the assessment of the costs of the existing stormwater program for the City of Warwick, the total budget for stormwater activities is estimated at \$546,581 per year as shown in **Table 3**. **Table 3** is based on the percentage of time spent by Public Works staff on stormwater activities as identified by Warwick staff – this identified the total labor for stormwater activities. Also, using the Proposed Budget FY 2015 for Warwick, a factor was developed to help estimate the total budget from the raw salary: the factor was estimated at 1.253. **Table 3** then estimates the salaries and multiplies the result by this factor to estimate the total existing expenses. The majority of the budget today is spent on O&M activities (almost 72.3 percent) which is consistent with the LOS D assigned to that program. The per capita expenditure for stormwater programs in Warwick is about \$6.67 per capita. This equates to a LOS of F.

Table 3 - Summary of Existing Stormwater Expenses for Cranston

Category	Total Budget	% of Total
Program Management	\$118,596	21.7%
MS4 Compliance ¹	\$32,884	6.0%
O&M	\$395,101	72.3%
CIP	\$0	0.0%
	\$546,581	100.0%

Attachment A
Capital Improvement Projects

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Capital Improvement Projects - Warwick

Project ID	CIP Project	Description
WA01	Bellow Street Drainage System Improvements	Flooding issue related to the Pawtuxet River. May have been resolved with dam removal. Assuming flooding still an issue, evaluate flood protection
WA02	Crowne Plaza Drainage System Improvements	The Crowne Plaza filled in their detention basin and connected to the City's drainage system. They installed a 36-inch pipe and connected it to a 24-inch pipe creating a potential flooding area. Perform a drainage evaluation to determine necessary drainage improvements.
WA03	Post Road & Goodwin Street Drainage System Improvements	Drainage system improvements to address localized flooding at intersection low spot in residential area.
WA04	Meadow Street Drainage System Improvements	Drainage system improvements to mitigate localized flooding where drainage system and tributary to Harig Brook intercept.
WA05	Arnold's Neck Drive Drainage System Improvements	Drainage system improvements to address localized roadway flooding in a tidally influenced area.
WA06	Apponaug Cove Drainage System Improvements	Drainage system improvements to address flooding in residential area in Apponaug Cove.