SECTION 1

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This Combined Sewer Overflow (CSO) Master Plan was prepared to meet the conditions set forth in Special Condition A, Paragraph 4 of the February 6, 2009 Maine Pollutant Discharge Elimination System (MEPDES) permit and Waste Discharge License (WDL) issued jointly to the City of South Portland (City), the Portland Water District (PWD) and the Town of Cape Elizabeth (Town) for the Ottawa Road CSO. Per the conditions of the permit, the permit holders must submit a CSO Master Plan by December 31, 2011 including an implementation schedule to abate or eliminate the CSO. The following Section summarizes the investigations and analyses that were performed in order to complete this Plan report and provides conclusions and recommendations for the abatement of the Ottawa Road CSO. Additional information on the permit and permit requirements can be found in Section 2.

When reviewing this Plan, the reader should consider three very important questions:

1. ***What is the goal of this Plan?*** Ideally, the answer would be to set forth a plan to completely eliminate the Ottawa Road CSO for all precipitation events and groundwater conditions. In reality, a CSO that may discharge a few thousand gallons during a 1-year, 24-hour storm event (2.5 inches of precipitation in 24 hours) with dry ground conditions may discharge millions of gallons during a 10-year, 24-hour storm event (4.7 inches of precipitation in 24 hours) with saturated ground conditions. The cost of mitigating a few thousand gallons is vastly different than the cost of mitigating a few million gallons. In the case of the Ottawa Road Pump Station CSO, the events that resulted in the two largest overflow events by volume and the greatest instantaneous overflow rate both ranked as 1-year, 24-hour storms whereas storms with a lower recurrence interval resulted in lower volumes and overflow rates. *Therefore, the goal of the Plan, working in conjunction with Maine Department of Environmental Protection (MEDEP), is to define the mitigation level (e.g. a particular design storm or overflow rate) below which the CSO will be eliminated if complete*

elimination is not feasible or affordable and to set forth an action plan to implement the steps required to achieve that goal (e.g. construction projects or additional study).

2. ***What mitigation level will be acceptable to the MEDEP to define successful abatement or elimination of the CSO?*** Unfortunately, the answer to this question is not clearly defined by MEDEP, and it can vary from community to community. A few approaches that have been utilized are as follows:

   - Provide controls to eliminate CSO events generated by a certain design storm. The EPA CSO guidance document regularly refers to CSO flows generated during a 1-year, 24-hour recurrence interval storm or less[1].
   - Provide controls to reduce the total number of overflow events below a certain number each year. Criterion 1 of the presumptive approach outlined by EPA suggests no more than 4 overflow events per year.
   - Provide controls to reduce the total volume of overflow events below a certain value per year. Criterion 2 of the presumptive approach outlined by EPA suggests elimination or capture for treatment of no less than 85% by volume of the combined sewage collected during precipitation events on an annual average basis.

   The final approach selected for a community will depend on an analysis of the available CSO and precipitation data to define the parameters discussed in each of the approaches above as well as a cost-effective analysis of the various alternatives. This cost-effective analysis, otherwise known as a "knee of the curve" analysis, seeks to determine the cost of CSO abatement for various flow levels and to identify the point at which the abatement is no longer cost-effective or affordable by the community. For the purposes of this Plan, a peak CSO flow rate of 1,100 GPM has been targeted for the elimination goal of the Ottawa Road Pump Station. A five-year implementation scheduled is outlined in this Plan to accomplish this goal. Refer to Section 10 for a discussion of the "knee of the curve" analysis as well as why this level of mitigation and implementation schedule have been recommended.

[1] Combined Sewer Overflows: Guidance for Long-Term Control Plan, U.S. EPA Office of Water. EPA 932-B-05-002. September 1995.

3. ***What is the potential cost of abatement or elimination of the CSO?*** The cost of abating the CSO to the target mitigation level has been estimated at $2.36 million in October 2011 dollars (or $2.56 million over the five-year implementation period including inflation). Before pursuing mitigation of peak flow rates above 1,100 GPM, serious thought should be given to whether or not the public benefit of CSO elimination justifies the financial burden that would be placed on the communities. Refer to Sections 9 and 10 for information related to alternatives considered and associated costs.

1.1 SUMMARY

This section briefly outlines the history of the Ottawa Road CSO and summarizes the field investigations and hydraulic modeling that were completed to assist in the preparation of this Plan.

1.1.1 History

When the Ottawa Road Pump Station was built in 1977, a combined sewer overflow was constructed (but no originally licensed) adjacent to the pump station with an outfall to the Atlantic Ocean via Danforth Cove[2]. Due to increased CSO activity because of record rainfalls in both 2005 and 2006, the CSO rose on MEDEP's priority list for elimination or abatement. MEDEP briefly considered including abatement or elimination as a condition of the MEPDES permit renewal for the East End Wastewater Treatment Facility in Portland; however this idea was discarded as the facility is unrelated to the Ottawa Road CSO. Additionally they considered issuing an administrative consent order, but PWD had already hired Wright-Pierce (W-P) to conduct an initial study of alternatives to eliminate or abate the CSO. Through this study, it was determined that, given the magnitude of the overflows during significant wet weather events, there is no easy way to eliminate the CSO, such as a capacity upgrade at the pump station or an on-site storage tank. As such, the final recommendation of the study was to license the CSO

[2] It should be noted that the MEPDES permit refers to the cove as Danford Cove as this was the name referenced in the current edition of the Maine Atlas and Gazetteer© at the time. However; the correct name is Danforth Cove and that name will be used for purposes of this plan.

through MEDEP in order to eliminate the issue of non-compliance while a formal plan for mitigation was developed.[3] The CSO was licensed by MEDEP in 2009.

As the City, PWD and the Town all have a vested interest in the Ottawa Road Pump Station and drainage area (refer to Section 2 for a discussion of infrastructure ownership and operation), negotiations were required to determine who would be the permit licensee. Ultimately, the Maine Pollutant Discharge Elimination System (MEPDES) Permit and the Maine Waste Discharge License (WDL) for the Ottawa Road CSO were issued jointly to the City, PWD and the Town.

Section 2 provides additional background on the history of the Ottawa Road CSO and pump station as well as the collection system.

1.1.2 Field Investigations and Hydraulic Modeling

PWD monitors flow at the Ottawa Road Pump Station and the CSO continuously (refer to Section 3 for a summary of CSO data analysis). In addition, a series of field investigations were conducted between April 2009 and September 2011 to assist in the development of this Plan including televised inspection of sewer pipes, manhole inspections, extended and instantaneous flow monitoring and smoke testing. The goals of the field investigations were as follows:

- To determine wastewater flows during dry and wet weather (results summarized in Section 4 and 5)
- To ascertain whether the source of infiltration and inflow (I/I) is primarily leaking manholes, pipe joints, pipe defects and connections (infiltration); roof drains, catch basins, foundation drains, sump pumps, etc. (inflow); or both within the drainage areas (results summarized in Sections 5, 6 and 7)

[3] Refer to Appendix B for a copy of the original technical memorandum issued summarizing the findings of the study as well as a follow-up memorandum addressing questions raised by the City's review of the original memorandum.

Additionally, InfoSWMM by Innovyze was used to develop a working hydraulic model of the Shore Road interceptor sewer. The purpose of the model was to help evaluate the impacts that an increase in flow rate from the Ottawa Road Pump Station would have on the downstream interceptor sewer and to help determine the best way to mitigate those impacts. The modeling efforts are summarized in Section 8.

1.2 LONG TERM CSO CONTROL ALTERNATIVES

Section 9 outlines the potential long-term control alternatives that were evaluated for the Ottawa Road CSO. In general, they included the following:

- Stand-Along Alternatives:
  - Alternative 1 - Infiltration/Inflow Removal
  - Alternative 5 - Satellite Treatment of CSO Flows (Swirl Concentrator)
- Combination Alternatives:
  - Alternative 6 - Infiltration/Inflow Removal AND Pump Station Capacity Upgrade[4]
  - Alternative 7 - Pump Station Capacity Upgrade AND Off-Line Storage for CSO Flow[5]
  - Alternative 8 - Infiltration/Inflow Removal AND Pump Station Capacity Upgrade AND Off-Line Storage of CSO Flow
  - Alternative 9 - Infiltration/Inflow Removal AND Satellite Treatment of CSO Flows (Swirl Concentrator)
  - Alternative 10 - Infiltration/Inflow Removal AND Pump Station Capacity Upgrade AND Satellite Treatment of CSO Flows (Swirl Concentrator)

[4] As noted in Section 9.3.2, alternatives were selected assuming that the capacity of the Family Field Pump Station would remain unchanged. The Family Field Pump Station (which is downstream from the Ottawa Road Pump Station) is already at capacity under existing peak flow conditions. Therefore, any upgrade to the Ottawa Road Pump Station will mean that an equal amount of I/I will need to be removed from the collection system between the two pump stations or that an off-line storage facility will be required. As such, a capacity upgrade at the pump station will not be considered as a stand-alone option.

[5] The closest location for an off-line storage tank is on the Town-owned property that has a ball field adjacent to the Family Field Pump Station. In order to convey the CSO flows from the Ottawa Road Pump Station and CSO location, the Ottawa Road Pump Station will require a significant capacity increase and the Shore Road interceptor will require upgrades. As such, an off-line storage tank will not be considered as a stand-alone option.

1.3 RECOMMENDED MITIGATION LEVEL, PLAN AND IMPLEMENTATION SCHEDULE

The analysis completed as part of this Plan confirmed the findings of the analysis of alternatives to mitigate or eliminate the CSO completed in 2007 (refer to Appendix B); that is, there is no simple solution to completely eliminate the Ottawa Road CSO. After review of alternatives evaluated as part of this plan, the City, PWD and the Town have all expressed a preference for I/I removal to abate or eliminate the CSO. Although it is not the least expensive alternative from a capital cost perspective, or the most preferable from a social or political perspective, it is preferred because it eliminates the cause of the problem rather than managing the effect of the problem (i.e. removal of illicit flows rather than constructing new facilities or facility upgrades to convey and/or treat illicit flows). Further, as noted previously, infrastructure downstream of the Ottawa Road Pump Station (including the Shore Road interceptor, Family Field Pump Station and possibly interceptors downstream of the Family Field Pump Station) is currently at maximum capacity during certain wet weather events so attempts to "push" more flow down the pipe would require downstream improvements which may not be necessary if sufficient I/I can be removed.

While the field investigations completed in the public easements during the development of this Plan (e.g., manhole inspections, TV inspection of pipelines and smoke testing) were helpful in locating some illicit connections and finding some failing infrastructure, more work will be required to pinpoint the highest value areas for I/I reduction. Since it appears that the majority of the I/I flows are coming from homes, additional investigations of private infrastructure will be required before actual I/I reduction projects can be developed. The data from this work, coupled with the current data from TV inspection of sewers, manhole inspections, flow monitoring, smoke testing, etc. will provide the information required to develop the most effective I/I reduction programs.

As such, we recommend the following plan to reach the mitigation level of 1,100 GPM. The Year 1 work will commence once the CSO Master Plan has received final local and regulatory approval as well as comments from the public.

- Year 1
  - Begin additional investigations including home inspections and potentially additional instantaneous flow monitoring within the Ottawa Road Pump Station drainage area
  - Design of Phase I I/I Reduction Project
- Year 2
  - Complete additional investigations
  - Construct Phase I I/I Reduction Project
- Year 3
  - Complete design of Phase II I/I Reduction Project(s)
- Year 4
  - Begin construction of Phase II I/I Reduction Project(s)
  - Complete preliminary design for the Ottawa Road Pump Station upgrade
- Year 5
  - Complete construction of Phase II I/I Reduction Project(s)
  - Begin CSO Master Plan update

Table 1-1 below summarizes the proposed plan along with the associated costs in current and future dollars.

The importance of a phased approach for CSO abatement cannot be emphasized enough. Implementation of any project should be followed by flow monitoring to determine the ultimate result of the project. At a minimum, it is strongly recommended that the flow meter in the cross-country line between South Portland and Cape Elizabeth be maintained over the next five years and beyond to track total flows from each municipality and to monitor the effectiveness of I/I reduction projects. This information will be essential to the development of the CSO Master Plan update.

TABLE 1-1
5-YEAR IMPLEMENTATION SCHEDULE AND COSTS

Description	Budget Estimate In Current Dollars[1]	Budget Estimate in Future Dollars[2]
Year 1		
• Begin additional investigation	$100,000	$100,000
• Design Phase I I/I Reduction Project	$67,000	$67,000
Year 2		
• Complete additional investigation	$50,000	$52,000
• Construct Phase I I/I Reduction Project	$402,000	$414,000
Year 3		
• Design Phase II I/I Reduction Project	$229,000	$243,000
Year 4		
• Begin construction of Phase II I/I Reduction Project	$687,000	$751,000
• Complete preliminary pump station upgrade design[3]	$40,000	$43,000
Year 5		
• Complete construction of Phase II I/I Reduction Project	$687,000	$774,000
• Begin CSO Master Plan Update	$100,000	$112,000
Total Cost	**$2,362,000**	**$2,556,000**

Notes:
1. Current dollars are based on an ENR Index of 9146 for October 2011.
2. Future dollars are based on an inflation rate of three percent per year.
3. The pump station is reaching the end of its design life and may require some minor improvements during the 5-year implementation schedule period. However, it is preferable to wait until the impact of the I/I reduction is known before completely replacing the pump station as it will likely influence any potential increase in pumping capacity.

1.4 FINANCING AND FINANCIAL IMPACT

While the method utilized to fund these improvements is up to each individual party, for the purposes of this plan it has been assumed that the costs associated with the recommended implementation plan outlined above will likely be financed by Maine Municipal Bond Bank and MEDEP using the State Revolving Loan Fund (SFR) and by the communities using sewer user fees or tax increment funding.

As noted in Table 1-1 above, the total project cost in 2011 dollars is $2,362,000. If this entire project cost was funded through one loan, the annual debt payment would be $152,000 based on a 20 year payback period at 2.5% interest and assuming that total project cost is financed in the first year. The current annual sewer user rate for South Portland is about $418 which is 0.86% of the median annual income and the current annual sewer user rate for Cape Elizabeth is about $928 which is 1.1% of the median annual income (refer to Table 1-2 for a summary of this data).

While the impact on sewer user fees for each community has not been calculated, construction of these projects, along with other projects that impact the sewer rates, are expected to result in significant sewer user fee increase for both communities.

TABLE 1-2
SEWER USER RATES AND PERCENT OF MEDIAN HOUSEHOLD INCOME

	South Portland	Cape Elizabeth
Present Sewer Rate per 100 CF	$4.18	$37.70/ $4.95[1]
Average Annual Residential Charge (10,000 CF/year)	$418	$928
2009 Median Annual Household Income	$48,483	$86,012
New Sewer Rate Percent of Household Income	0.86%	1.1%

Notes:
1. Cape Elizabeth charges $37.70 for the first 100 CF and $4.95 for each additional 100 CF or fraction of 100 CF per month.