Evaluation of Phosphorus Removal Alternatives, Wastewater Treatment Facility, Newport, New Hampshire

Prepared for:

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Town of Newport, New Hampshire

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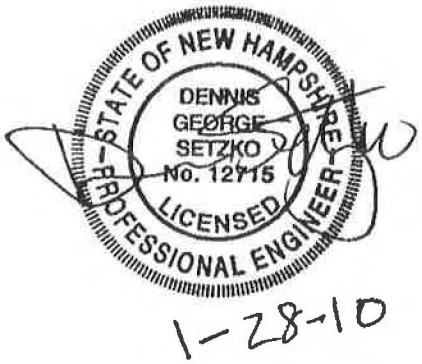

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I. EXECUTIVE SUMMARY

A. PROJECT OVERVIEW

The United States Environmental Protection Agency (EPA) reissued the Town of Newport's NPDES Wastewater Discharge permit (NPDES Permit NH0100200, effective July 1, 2007). This permit contains new discharge limits for total phosphorus. The monthly average phosphorus limit is currently 0.42 mg/L. The treatment plant does not currently meet this limit. April 1st thru October 31st and 1.0mg/L November 1st thru March 31st

The Environmental Protection Agency then issued Newport an Administrative Consent Order dated March 6, 2009. The Order requires the Town to prepare and submit an alternatives analysis, final plans and specifications, and to construct the Wastewater Treatment Facility upgrade necessary to achieve and maintain compliance with the phosphorus limits of the NPDES permit. The Order contains timelines for compliance the most important of which is a report of phosphorus removal alternatives to be delivered by January 31, 2010 and completion of these improvements by October 2012. This report is to meet the January 31 compliance deadline.

The Facilities Planning process also included a review of the existing wastewater treatment plant. Reviewed in detail are the condition of the existing treatment plant facilities and how the structures and processes may best be utilized to meet the future wastewater treatment needs of the Town. The Plan also includes a review of the current plant flows and process loadings and projects the needs for wastewater treatment in the community for the 20 year period starting after construction of the new facilities are complete. Evaluations of viable treatment alternatives were performed, and recommendations are made for the most cost effective process to meet the stated permit limits.

B. EXISTING AND FUTURE CONDITIONS

The flow at the treatment plant currently averages 0.7 million gallons per day. The flow projections for the future are that the plant flows in the year 2032 are projected to be 0.84 million gallons per day, with a commensurate organic loading, to accommodate population increases, growth in the surrounding area, and commercial and industrial

growth. The treatment plant is currently designed and permitted to discharge 1.3 million gallons per day (mgd) to the Sugar River. Even though the permitted value is higher than the planning value, it is recommended that this permitted capacity be maintained so as to keep plant capacity for future growth beyond this planning period.

C. PHOSPHORUS REMOVAL

At the start of this project, a team of nutrient removal experts was assembled to review the available methods of total phosphorus removal and discuss the options that fit the needs of Newport best. Technical and operations experts from AECOM met to develop a short list of total phosphorus removal processes to be investigated further. The currently available technologies were evaluated qualitatively based on their capital cost, operating cost, energy use, ease of operation and maintenance, ability to address lower effluent limits, and minimal impact on the current treatment process. Three technologies were identified for pilot testing and ultimately two were pilot tested. These two include:

1. Coagulation followed by direct filtration;
2. Ballasted sedimentation process

The third ~~was~~ process was not pilot tested because the filter supplier elected not to participate in the piloting and the type of process, upflow filtration, while viable,was ultimately not deemed suitable for Newport because of hydraulic loading, past experience in Newport with similar units, and its higher capital and operating cost.

Pilot testing for these two technologies was completed at the end of November, 2009. The results show that both technologies are able to meet the phosphorus discharge limit of 0.42 mg/L. After the pilot testing, full-scale design proposals from both manufacturers were evaluated. A present worth analysis was completed based on the proposals. The analysis shows that the coagulation followed by direct filtration process is more cost effective than the ballasted sedimentation process.

In-ground discharge of the treated wastewater in lieu of discharge to the Sugar River was another alternative that was also evaluated. This option provides some advantages over other treatment processes mostly related to reduction in treatment levels allowed. Its disadvantages include high initial costs. In the case of Newport, ground discharge of the wastewater does not appear viable based on a review of the available data. It is likely

that the two sites selected for in-ground discharge have a high water table and portions may be located in the flood plain. Additionally, pursuing an in-ground discharge would require meeting groundwater standards meaning that the current wastewater plant would need to be upgraded to address nitrate to 10 mg/L – an expensive option and not needed for phosphorus removal. These issues coupled with other mitigating circumstances including contamination of groundwater with treated wastewater, preclusion to use the site for a water supply, and the possibility of future treatment limits for micro-constituents renders in-ground discharge an idea that would not serve the needs of the community well.

D. POTENTIAL FUTURE PERMIT LIMITS

AECOM also has had contact with NHDES and EPA regarding potential future permit limits. Our evaluation is that there is a possibility that the total phosphorous limit could eventually be reduced to as low as 0.16 mg/L and a reasonable estimate for a future total nitrogen limit is 8 mg/L. There is no indication at this time that either of these lower limits is under discussion for implementation.

E. RECOMMENDED PLAN

AECOM recommends that a full scale version of one of the piloted processes, coagulation followed by direct filtration, be constructed at the Newport wastewater treatment facility for removal of phosphorus to the current permit level of 0.42 mg/L.

The reasons for not suggesting addressing potential future limits discussed in the above section at this time is as follows:

- the phosphorus removal process selected, coagulation followed by filtration, is needed for lower treatment levels regardless;
- it is too premature to say when, or if ever, new permit limits will be enacted;
- there is no consensus as to what these lower levels will be;
- lower permit limits may be so far into the future that new technologies become available to address these new permit needs.

Included with the phosphorus removal project are additional unit processes that will become necessary. This includes upgrades to the solids handling system and other

miscellaneous work. The estimated cost to construct this option is $5,238,000 in 2012 dollars.

F. EXISTING SYSTEMS

As part of this Plan, AECOM evaluated the existing unit processes that are not related to phosphorus removal. This evaluation determined that they were in good repair and operating condition. Some unit processes, not necessarily related to phosphorus removal, will eventually need to be replaced either due to mechanical age, lack of spare parts, inefficient equipment, safety concerns, and treatment process impacts. These recommended improvements include upgrades to grit removal facilities and ultraviolet radiation disinfection facilities among other smaller improvements. It is recommended that these improvements be included in a capital improvement plan. They could also be included in the phosphorus removal project if desired. The estimated cost of these improvements is $2,226,000 in current dollars and is in addition to that recommended above for the phosphorus removal needs.

The total cost of the phosphorus removal improvements and existing system improvements is therefore $7,464,000.

G. FUNDING AND SCHEDULE

This project is eligible for funding through the New Hampshire Department of Environmental Services Revolving Fund and likely USDA Rural Utilities. The Town is eligible to receive a low interest loan for the phosphorus removal project and for some of the other upgrades. The project will be retroactively eligible on a first built, first served for DES State Aid Grants if they are reinstated. For USDA funding, upward of 70% of the project cost may be eligible for grants.

It will take approximately 10 months to design the project and approximately 16-18 months to construct the new facilities. Approval of the project by NHDES, EPA and other authorities at milestone stages is also required. Including these approvals, and assuming that engineering work begins by June 2010, the construction is expected to be complete before October 2012.

1. INTRODUCTION

A. FACILITIES PLANNING - PROJECT OVERVIEW

A Facilities Plan is a comprehensive document that investigates the improvements necessary at a wastewater treatment plant to achieve current and future State and Federal water quality goals while providing for expected future growth within the sewer service area for a 20-year planning period.

The need for this Facilities Plan is twofold. First, the Environmental Protection Agency (EPA) reissued the Town of Newport's NPDES Wastewater Discharge permit (NPDES Permit NH0100200), effective July 1, 2007. This permit contains new discharge limits for total phosphorus. From April 1 to October 31 maximum average monthly limit is 0.42 mg/l. From November 1 to March 31 maximum average monthly limit is 1.0 mg/l. The permit also includes monitoring and reporting requirements for ammonia nitrogen, aluminum, and orthophosphorous (Nov 1 th March 31). A copy of the permit is included in Appendix A.

Secondly, the EPA issued Newport an Administrative Consent Order dated March 6, 2009. A copy of this document is included in Appendix B. The Order requires Newport to:

- Prepare a Facilities Plan prior to January 31, 2010 which shall identify the process upgrades and process modifications necessary to meet the NPDES Permit limits;
- Submit an evaluation of extraneous flows and its effect on plant operations (Town of Newport to provide);
- Provide a schedule for implementation of these recommendations and to construct the Wastewater Treatment Facility upgrade necessary to achieve and maintain compliance with the phosphorus limits of the NPDES permit no later than October 31, 2012;
- Provide a detailed engineering report that recommends both long term and short term corrective measures and a schedule for corrective action to comply with Whole Effluent Toxicity (WET) limits in the NPDES permit.

This Facilities Plan will address the issues identified above.

As part of achieving these goals, this Plan includes an evaluation of the status and adequacy of the existing treatment plant equipment and structures, and identifies those areas at the plant that are in need of corrective action. This Plan also addresses the growth needs of the Town of Newport and whether sewage disposal is adequately met for the flows projected for a 20-year planning period. For the purpose of this Plan, the 20-year planning period begins in the year 2012, the expected date of treatment plant construction completion, and extends to the year 2032. This Plan will project population growth over this time period and will also consider what potential additional permit limits may be imposed.

The Town of Newport retained AECOM to perform this evaluation.

B. BACKGROUND

The Town of Newport operates a wastewater treatment plant that serves 1,597 users and an estimated population of 3,977. The total population of the Town is approximately 6,527. The wastewater treatment plant is currently operating under National Pollutant Discharge Elimination System (NPDES) Permit number NH0100200, under which limitations have been established on the amount and character of treated sanitary sewage that may be discharged to the Sugar River from this plant. This discharge permit became effective ~~April 1~~ July 1, 2007 and expires five years from that date.

C. PREVIOUS STUDIES

Pertinent engineering studies have been performed in the past and have addressed various wastewater and collection system needs for the Town of Newport. These reports have been utilized as applicable within this Facilities Plan. Relevant reports are listed below:

- Town of Newport Comprehensive Water System Study, Town of Newport, 2008.
- Development Program and Tax Increment Financing Plan, Bald Mountain Tax Increment Financing District, March 12, 2009.
- Sewer Use Ordinance, Town of Newport, June 16, 2008.
- Industrial Pre-Treatment Report, Town of Newport, July 1994.

D. FACILITIES PLAN ORGANIZATION

This Plan has been written and organized to educate and inform both the non-technical reader and the wastewater treatment operators and managers. The goal of this report is to describe current

operational conditions, discuss current and anticipated regulatory requirements, review feasible alternatives that will allow Newport to meet those requirements and result in overall operational improvements, and recommend solutions and processes that respond to Newport's financial, regulatory, social, and environmental concerns.

A brief description of the chapters contained herein is described below.

Chapter 1 provides background information relative to Newport's need to evaluate phosphorus removal alternatives at the wastewater treatment plant, describes the organization of the Plan, and provides a list of previous studies that provide data and information relative to this Plan.

Chapter 2 reviews existing conditions and performance at Newport's wastewater treatment plant. It also discusses breakdown of flows into its residential/commercial, industrial, septage, and infiltration/inflow components.

Chapter 3 reviews future conditions based on projected increased population and growth and the effect on future plant flows and loadings.

Chapter 4 introduces descriptions of feasible alternatives at Newport's WWTP that respond to current and anticipated NPDES permit requirements. It begins with a discussion of the kick-off workshop which culled the selection of feasible alternatives based on input from both AECOM's project team, the Public Works Department, and the operators of Newport's wastewater treatment system and focused efforts on piloting to those processes that fit the needs of the community. The entire workshop report is included in Appendix D.

Chapter 5 reviews the pilot testing completed, starting with the pilot protocol and moving through results. The pilot protocol and results are included in Appendix E.

Chapter 6 reviews the various alternatives and how they would impact Newport's wastewater treatment system. This Chapter incorporates the cost-effective treatment alternatives determined in Chapter 4 to be worth investigating, the results of the pilot testing covered in Chapter 5, and other secondary process corrective measures needed into an integrated treatment plan for phosphorus removal. Capital and annual operating cost estimates are presented for viable phosphorus removal alternatives reviewed. In addition, this chapter discusses possible future

permit limits and identifies additional improvements that should be incorporated into a long-term capital improvement plan.