



# TOWN COUNCIL – AGENDA REQUEST FORM

THIS FORM WILL BECOME PART OF THE BACKGROUND INFORMATION USED BY THE COUNCIL AND PUBLIC

Please submit Agenda Request Form, **including back up information, 8 days prior** to the requested meeting date. **Public Hearing requests must be submitted 20 days prior to the requested meeting date to meet publication deadlines** (exceptions may be authorized by the Town Manager, Chairman/Vice Chair).

## MEETING INFORMATION

Date Submitted: 9/26/18 Date of Meeting: 11/15/18  
Submitted by: Kyle Fox Time Required: 45 Minutes  
Department: Public Works Background Info. Supplied: Yes  No   
Speakers: Kyle Fox, Public Works Director; Sarita Croce Assistant Director of Public Works/Wastewater

## CATEGORY OF BUSINESS (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Appointment:  Recognition/Resignation/Retirement:   
*Public Hearing:*  Old Business:   
New Business:  Consent Agenda:   
Nonpublic:  Other:

## TITLE OF ITEM

Wastewater Infrastructure Upgrade - Phase III

## DESCRIPTION OF ITEM

The Merrimack Wastewater Facility has been in operation since 1970. Much of the equipment currently in operation is original to the facility. The Department of Public Works will present the draft proposal of the third phase of upgrades to the facility to allow the Division to maintain its ability to treat the sewer waste stream in a cost effective manner while meeting the requirements of the Environmental Protection Agency (EPA). A powerpoint presentation will be given.

## REFERENCE (IF KNOWN)

RSA: Warrant Article:  
Charter Article: Town Meeting:  
Other: N/A: X

## EQUIPMENT REQUIRED (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Projector:  Grant Requirements:   
Easel:  Joint Meeting:   
Special Seating:  Other:   
Laptop:  None:

## CONTACT INFORMATION

Name: Kyle Fox Address: 6 Baboosic Lake Road, Merrimack, NH 03054  
Phone Number: (603) 424-5137 Email Address: kfox@merrimacknh.gov

# SECTION 1

## EXECUTIVE SUMMARY

This Preliminary Design Report (PDR) is intended to define the scope of work and basis of design for the Wastewater Treatment Facility (WWTF) Phase III and Thornton's Ferry and Souhegan Pump Stations Upgrades. Town staff were key participants in the preliminary design effort and were instrumental in providing insight and critical information necessary to ensure this project meets the wastewater treatment needs of the Town. This executive summary is intended to be a concise summary of the entire document to assist the Merrimack Town Council and residents in understanding the project, and as such, significant detail has been excluded. For additional information on the any of the topics discussed in this summary, refer to the remaining sections of the report and the appendices.

### 1.1 BACKGROUND

The Town of Merrimack, New Hampshire owns, operates, maintains and performs capital upgrades on nine remote wastewater pump stations and a 5 million gallon per day (MGD) wastewater treatment facility (WWTF). These facilities convey and treat flow from a variety of commercial, residential and industrial sources. The two largest remote pump stations – Thornton's Ferry Pump Station and Souhegan Pump Station – and the WWTF were brought online in 1970.

Additionally, the Town also owns, operates, maintains and performs capital upgrades on a Compost Facility located on the WWTF property, including a Compost Amendment Storage Building. This facility converts dewatered biosolids from the Merrimack WWTF, as well as several WWTFs from surrounding communities, into a high-quality compost that is marketed to local and regional residential and commercial users. The Compost Facility and Compost Amendment Storage Facility were brought online in 1994.

There have been a number of upgrades to the WWTF since 1970; however, these upgrades targeted select equipment systems and much of the remaining equipment is approaching 50 years old. Further, even some of the equipment systems that have been upgraded within the past 50 years are well beyond their useful life. While select components at Thornton's Ferry Pump Station and

Souhegan Pump Station have been replaced, there has never been a comprehensive upgrade at either station and most of this equipment is also approaching 50 years old. Select components of the Compost Facility were upgraded as part of the 2015 Phase II Upgrade, but several of the systems are still original to the facility.

The Town completed an evaluation of upgrade needs at the Compost Facility in 2007 and at the WWTF, Thornton's Ferry Pump Station and Souhegan Pump Station in 2011. Both evaluations recommended significant upgrades at all facilities. The WWTF and pump station evaluation grouped the recommended upgrades into a Phase II Upgrade and a Phase III Upgrade. Wright-Pierce assisted the Town with the completion of the Phase II Upgrade, along with upgrades to the Compost Facility, in 2015. However, due to financial constraints at the time, upgrades of certain equipment systems recommended for the Phase II Upgrade and for the Compost Facility Upgrade were delayed until Phase III. With few exceptions, the scope of work for this project is based on the recommendations of the 2007 and 2011 facility evaluations and the Phase II WWTF and Compost Facility Upgrade preliminary design report. The scope items of this project that are not one of the recommendations were included to address needs or code deficiencies that came to light after the evaluations were completed. Other significant upgrades in the past 20 years that occurred before or concurrently with the above-mentioned evaluations as follows: Chlorination Upgrade (1999), Electrical Service Upgrade (1999), WWTF Improvements and Odor Control Facilities (2000), Phase I WWTF Upgrade (2007), the Dewatering Upgrade (2010).

## 1.2 PROJECT GOALS

The three main goals for this project are as follows:

- Replacing equipment that is well beyond its useful and recommended life: Most of the equipment systems to be upgraded are over 30 years old and many are approaching 50 years old, as noted above. Typical useful life for process equipment and most building systems varies from 15 to 30 years, depending on the operating environment. As equipment reaches and surpasses the end of its useful life, reliability decreases and maintenance requirements increase. Efficiency also decreases as equipment wears, which translates to increased electrical usage. Additionally, in many cases, it can be very difficult to locate replacement parts for old equipment, which further exacerbates the issue of

equipment reliability. Replacement of equipment systems that are beyond their useful life is essential for the WWTF to continue to effectively and efficiently meet permitted discharge limits and to avoid costly fines.

- Addressing safety concerns: While there is always a certain potential for risk of injury working in and around wastewater treatment processes, steps can be taken to reduce the risk of operator injuries. Select upgrades have been included to address ongoing safety concerns related to accessibility of process spaces for equipment maintenance and structure cleaning.
- Addressing code-related deficiencies: Building and electrical codes have changed significantly since these equipment systems and buildings were originally constructed. Significant upgrades, such as the ones included in this project, require that existing spaces be upgraded to meet current codes. There are a number of equipment system and building modifications throughout the plant that fall into this category; however, the largest is related to providing American's with Disabilities Act (ADA)-approved access to the Headworks Building (the office spaces, laboratory, restrooms, conference room, etc. at the WWTF are located on the upper floor of this building).

### 1.3 PROPOSED PROJECT

Table 1-1 provides a summarized list of the major components of the project and indicates which goals apply to each component. Additionally, the first column differentiates which equipment is original to the facility and has never been upgraded.

**TABLE 1-1: PROPOSED SCOPE OF PROJECT**

Project Component	Project Goals			
	Original to Facility	Beyond Useful Life	Health & Safety	Code-Related Deficiencies
Construction of New Influent Screenings Facility <sup>(1)</sup>	✓	✓	✓	✓
Comprehensive Upgrade of Main Pump Station <sup>(2,3)</sup>	✓	✓	✓	✓
Replacement of One Primary Clarifier Mechanism <sup>(2,4)</sup>	✓	✓		
Replacement of Three Secondary Clarifier Mechanisms and Addition of Algae Brush System	✓	✓	✓	
Modifications to Sludge Storage Tanks		✓	✓	
Modifications to Headworks Building				
New Emergency Generator and Electrical Upgrades	✓	✓	✓	
Laboratory, Restroom/Locker Room, Conference Room and Office Spaces Renovation	✓	✓		✓
Sludge Handling and Tank Drainage Piping/Valve Manifold, One Primary Sludge Pump <sup>(5)</sup> and One Tank Drain Pump Replacement	✓	✓	✓	
Roof Replacement and Miscellaneous Structural Repairs	✓	✓		✓
Modifications to Chlorination Building <sup>(2)</sup>				
Electrical Upgrades	✓	✓		✓
Secondary Sludge Pumps and Piping/Valve Manifold Replacement		✓		
Upgrade of Compost Facility Ventilation System <sup>(2)</sup>	✓	✓	✓	
Replacement of Amendment Storage Facility <sup>(2)</sup>	✓	✓	✓	
Comprehensive Upgrade of Thornton's Ferry Pump Station	✓	✓	✓	✓
Comprehensive Upgrade of Souhegan Pump Station	✓	✓	✓	✓
Other Miscellaneous Upgrades Throughout the WWTF		✓		✓

Notes:

1. The WWTF currently has a grinder in the Main Pump Station to reduce the size of solids in the raw wastewater, especially rags/wipes. The grinder is frequently overwhelmed with the volume of solids, which causes the equipment to break down. Additionally, the rags/wipes that pass through the grinder cause clogging of downstream equipment and accumulate in tanks, which require additional time-intensive repairs and cleaning.
2. This project component was delayed from the 2015 Phase II Upgrade to the 2018 Phase III Upgrade due to financial constraints.
3. The Main Pump Station is located at the head end of the WWTF and is considered part of the WWTF. It conveys all influent flow to the first treatment process.
4. One new primary clarifier was constructed under the 2007 Phase I Upgrade and one original clarifier was replaced under the 2015 Phase II Upgrade.
5. Due to financial constraints of previous projects, the Town replaced the other primary sludge pumps as part of the capital improvements plan.

#### **1.4 PROJECT COST ESTIMATE, SCHEDULE, AND FUNDING**

Due to the size of the project, the Town evaluated the cost and schedule to complete all of the work in a single phase and in two separate phases. If the Town chooses to complete the work in two phases (Phase III and a Phase IV), the scope summarized in Table 1-1 will be divided as indicated below. The three pump stations have been prioritized due to the increased potential for failure with equipment that is approaching 50 years old and the greater environmental impacts associated with a failure at these locations. The new screenings facility has been prioritized as it will reduce repair and maintenance requirements associated with rags/non-flushable wipes passing through the existing grinder to the rest of the WWTF.

- Phase III:
  - Final design for Phase III and Phase IV
  - Construction of New Influent Screenings Facility
  - Comprehensive Upgrade of Main Pump Station
  - Comprehensive Upgrade of Thornton's Ferry Pump Station
  - Comprehensive Upgrade of Souhegan Pump Station
- Phase IV:
  - Replacement of One Primary Clarifier Mechanism
  - Replacement of Three Secondary Clarifier Mechanisms and Addition of Algae Brush System
  - Modifications to Sludge Storage Tanks
  - Modifications to Headworks Building

- New Emergency Generator and Electrical Upgrades
- Laboratory, Restroom/Locker Room, Conference Room and Office Spaces Renovation
- Sludge Handling and Tank Drainage Piping/Valve Manifold, One Primary Sludge Pump and One Tank Drain Pump Replacement
- Roof Replacement and Miscellaneous Structural Repairs
- Modifications to Chlorination Building
  - Electrical Upgrades
  - Secondary Sludge Pumps and Piping/Valve Manifold Replacement
- Upgrade of Compost Facility Ventilation System
- Replacement of Amendment Storage Facility
- Other Miscellaneous Upgrades Throughout the WWTF

The total project cost estimates and the proposed schedules for both the single-phase and two-phase approaches are summarized in Table 1-2. The total estimated project costs include construction, construction contingency, technical services, materials testing, interim financing, and legal and administrative fees. An inflation factor has also been included with each project estimate based on the anticipated construction schedule. Additionally, with the two-phase project approach, a final design allowance for both phases has been included under the Phase III estimate as the Town intends to complete both designs in 2019 to be prepared should one of the systems to be upgraded under Phase IV fail suddenly. A reduced technical services allowance has been included in the Phase IV project estimate to update the design documents before bidding according to the schedule shown below.

The two-phase approach costs \$2,480,000 million more than the single-phase approach due to additional technical services (i.e. updating the Phase IV design documents and assisting with two bids), contractor's mobilization/demobilization, as well as inflation associated with two separate projects and with an extended construction schedule.

**TABLE 1-2: TOTAL PROJECT COST ESTIMATE AND PROPOSED PROJECT SCHEDULE**

	Single-Phase Approach	Two-Phase Approach <sup>(2)</sup>	
	Phase III	Phase III	Phase IV
Total Project Cost <sup>(1)</sup>	\$22,620,000	\$13,100,000	\$12,000,000
Proposed Schedule			
Warrant Vote	April 2019	April 2019	April 2022
Begin Design	August 2019	August 2019	May 2022
Bidding	August 2020	August 2020	August 2022
Begin Construction	September 2020	September 2020	September 2022
Complete Construction	September 2022	March 2022	September 2024

Notes:

1. The cost estimates are based on an ENR Construction Cost Index of 11068 (June 2018).
2. The total time for construction of the upgrades under the two-phase approach is greater than that for the single-phase approach due to added time for multiple contractor's mobilization/demobilization; for fabrication and delivery of significant pieces of custom-built equipment such as pumps, influent screens, clarifier mechanisms, the generator, etc.; and for sequencing replacement of equipment while the treatment processes are maintained.

The Town intends to finance the project(s) through the New Hampshire Department of Environmental Services (NHDES) Clean Water State Revolving Fund (CWSRF) program. The loan will be paid through the following means:

- NHDES is offering the Town of Merrimack 5% in principal forgiveness for this project
- The loan for the Sewer Manhole Rehabilitation Project will be retired in 2021 and the \$56,900 budgeted payment on this loan will be transferred to the new loan.
- The loan for the Dewatering Upgrade will be retired in 2022 and the \$267,900 budgeted payment on this loan will be transferred to the new loan.
- At \$242/year, the sewer user fee in Merrimack is the 5<sup>th</sup> lowest in the state. Over the next eight years, Public Works is proposing four 9% increases in the sewer user fee spaced out every two years. Even with these proposed increases (and assuming the sewer user fees in the rest of the state remain the same, which they will not), Merrimack will still have the 13<sup>th</sup> lowest rates in the state.





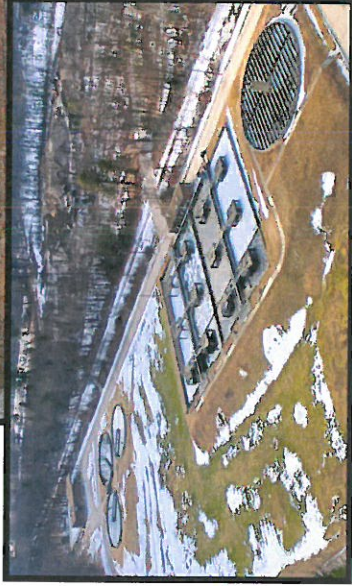
# WWTF Phase III and Pump Stations Upgrade

*Presented by:*

Kyle Fox – Director, Public Works Department

Sarita Croce – Assistant Director, Public Works Department/Wastewater

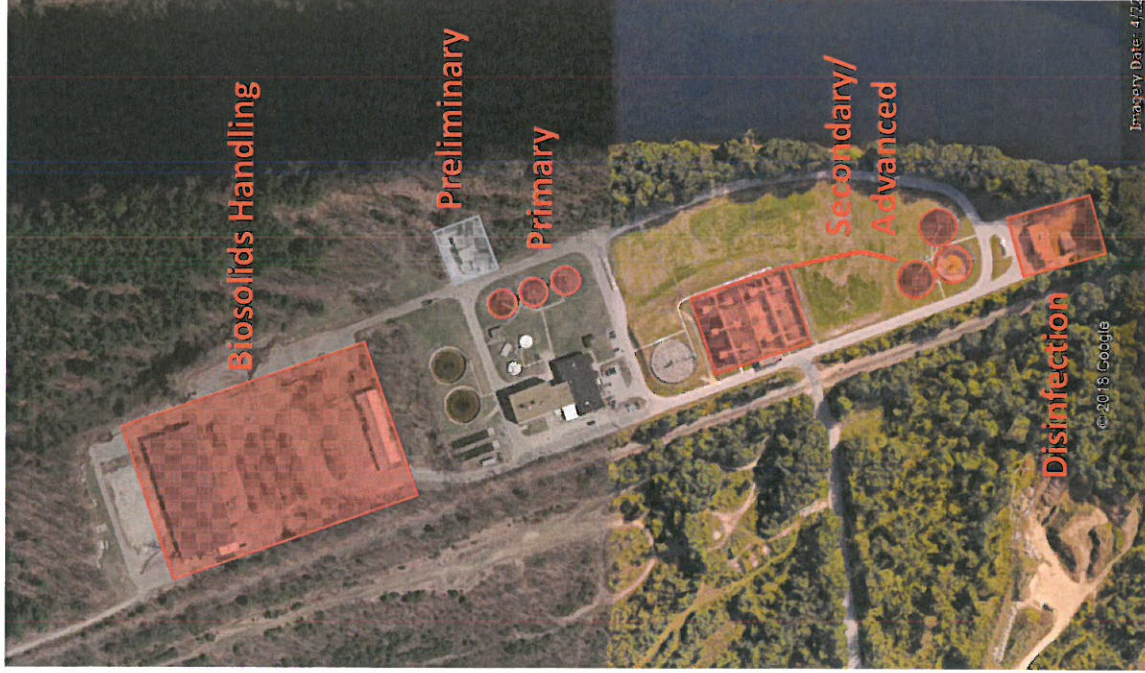
# Presentation Overview



- ✓ WWTF Overview
- ✓ History of Upgrades
- ✓ Goals
- ✓ Project Scope
- ✓ Total Project Cost
- ✓ Funding
- ✓ Questions & Discussion

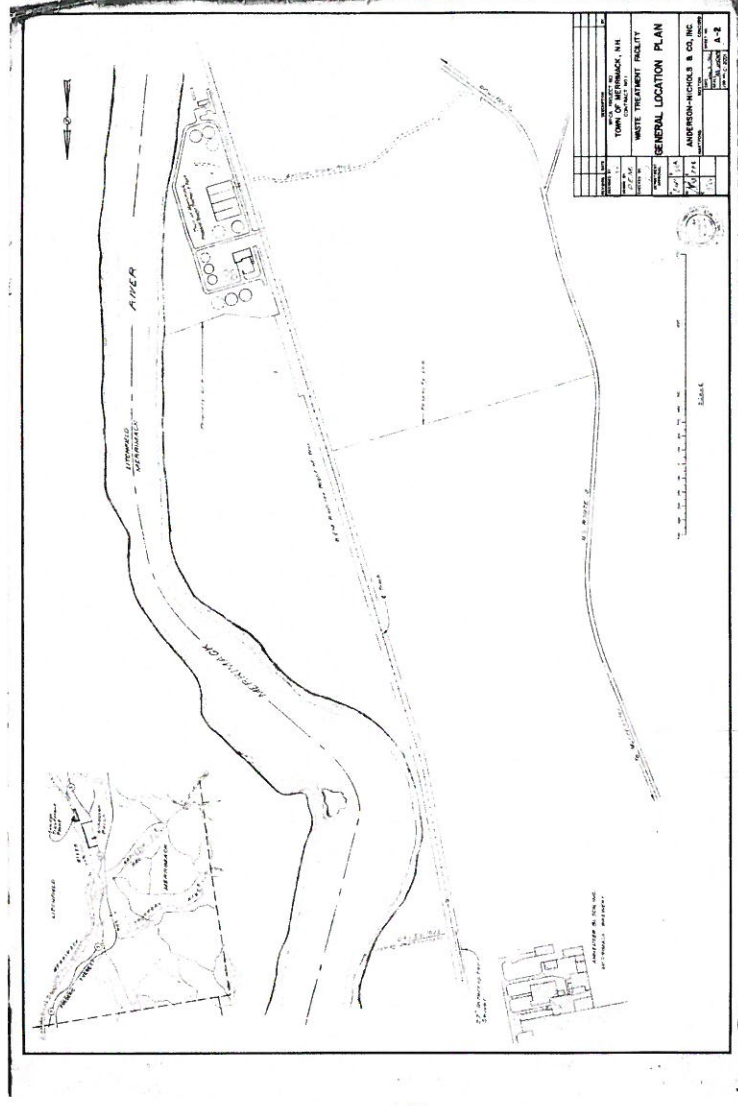
# WWTF Overview: Treatment

- Preliminary
  - Removes debris, sticks, floatables, grit which cause problems with equipment
- Primary
  - Removes >50% of particulate materials
- Secondary
  - Removes >90% of organic materials
  - Removes some nutrients
- Advanced
  - Removes substantial nutrients
- Disinfection
  - Kills bacteria
- Biosolids handling

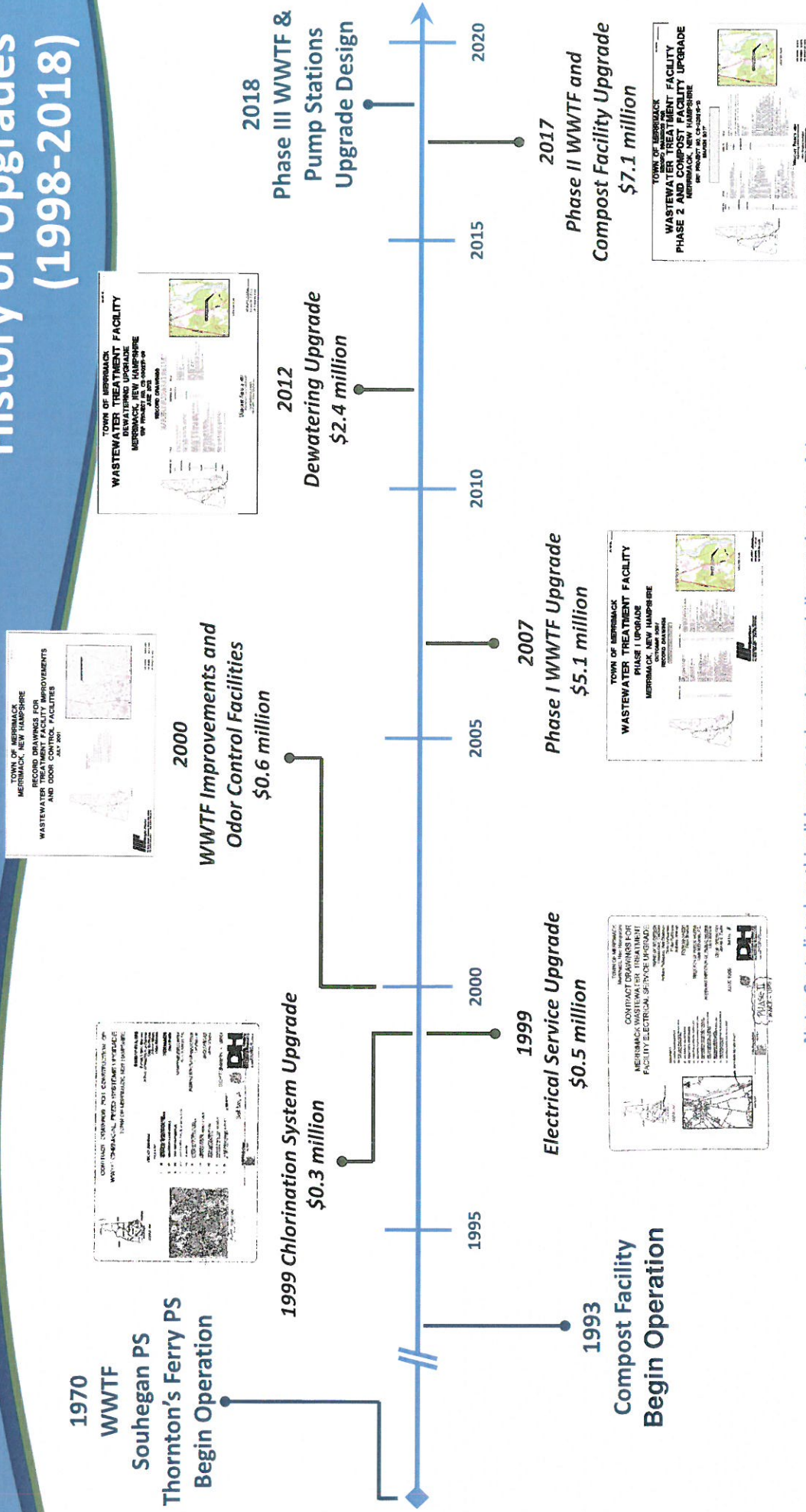


# WWTF Overview: Facility

- *Original* WWTF cost \$5 million in May 1970
- Equivalent to \$40 million in today's dollars
- Several major facilities/ systems constructed later



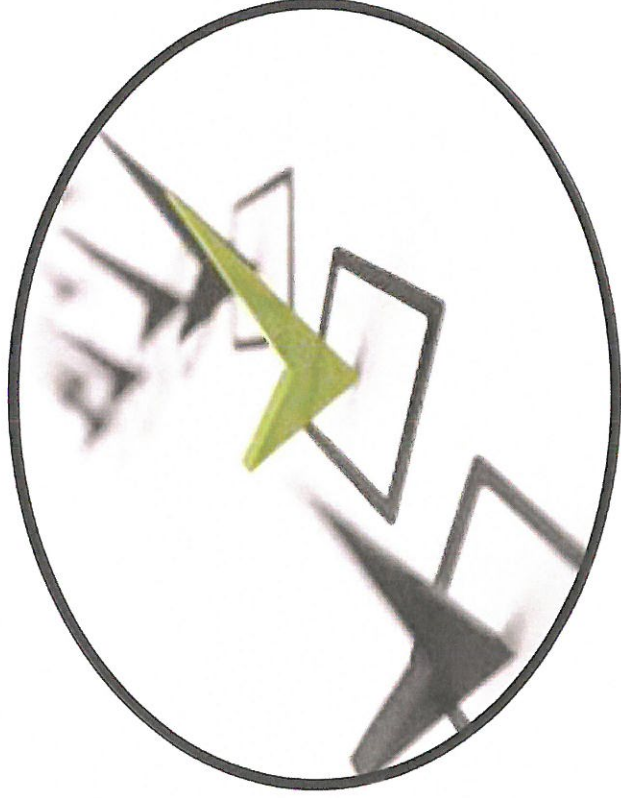
# History of Upgrades (1998-2018)



Note: Costs listed on this slide are total project cost dollars at the time of the upgrade.

## Goals

- Goal #1: Replacing equipment that is **original to the facility** and/or well beyond its useful and recommended life
- Goal #2: Addressing safety concerns
- Goal #3: Addressing code-related deficiencies



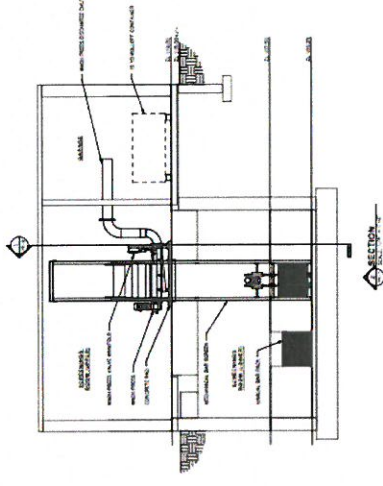
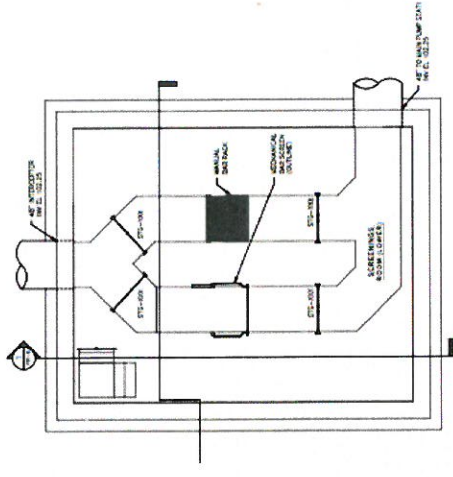
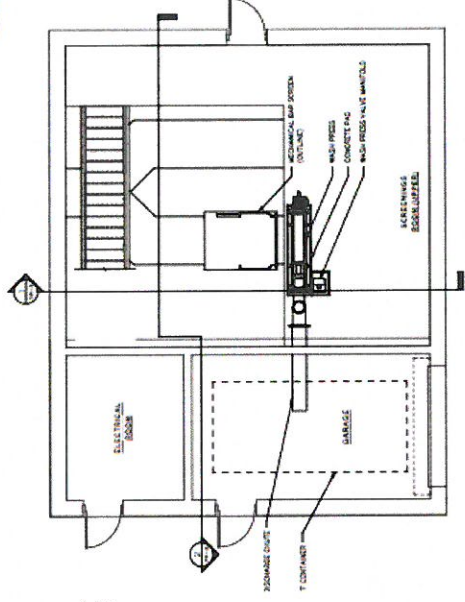
## Goals

Replacement of equipment systems that are beyond their useful life is essential for the WWTF to continue to effectively and efficiently provide a service to the sewer rate payers and comply with permit requirements identified by the Clean

Water Act

# Project Scope: New Influent Screenings Facility

- Needed to address issues with discharge of “flushable” wipes and other debris discharged to the sewer system
- Replaces grinder in Main Pump Station



Goal #1: Age of Facility

Goal #2: Safety

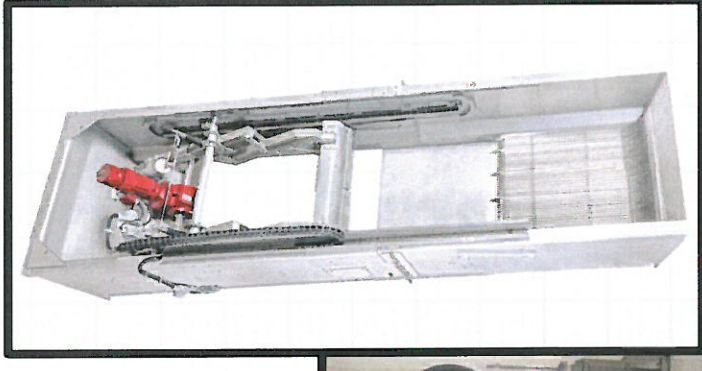
Goal #3: Code Concern



# Project Scope:

## New Influent Screenings Facility

- New 40-ft x 32-ft building
- New automated climber style mechanical screen and wash press
- Garage for washed/dewatered screenings roll-off container



Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

## Project Scope: Main Pump Station

- Comprehensive upgrade to pumps and building, controls, and electrical systems
- Estimated Electrical Savings: \$10,000/year (43% reduction)

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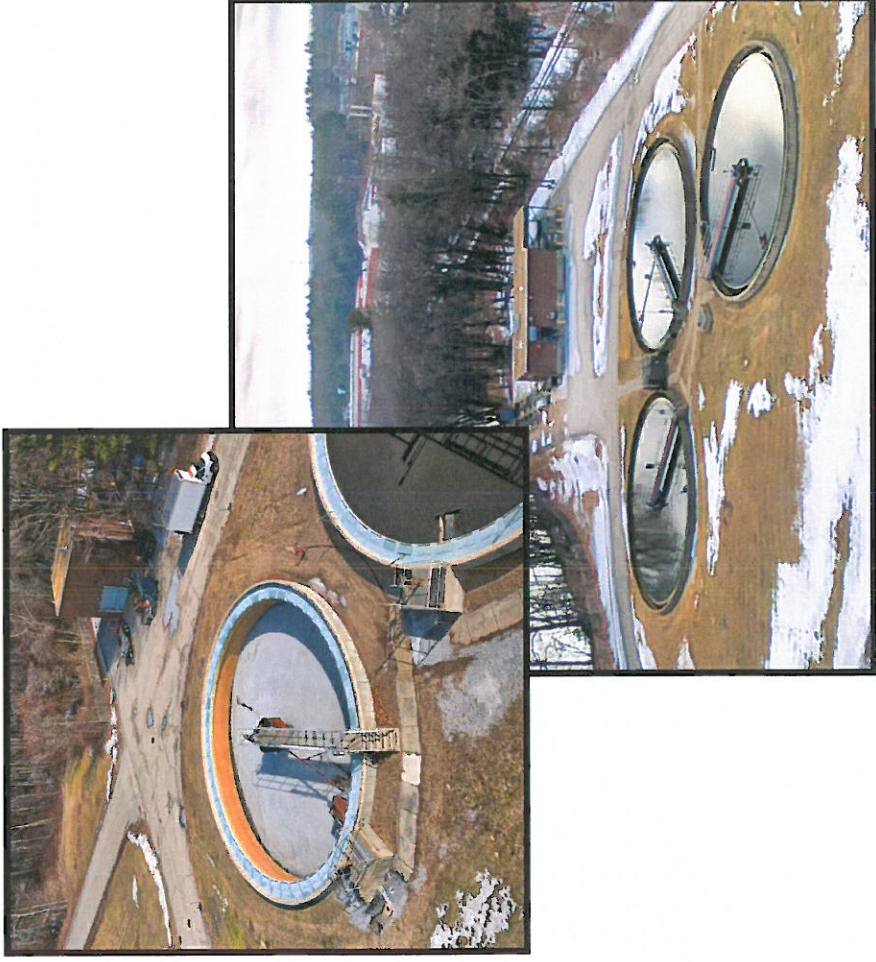


Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

## Project Scope: Clarifiers



- Replace 1 of 3 primary clarifier mechanisms
- Replace 3 of 3 secondary clarifier mechanisms
- New algae removal system for launders in secondary clarifier

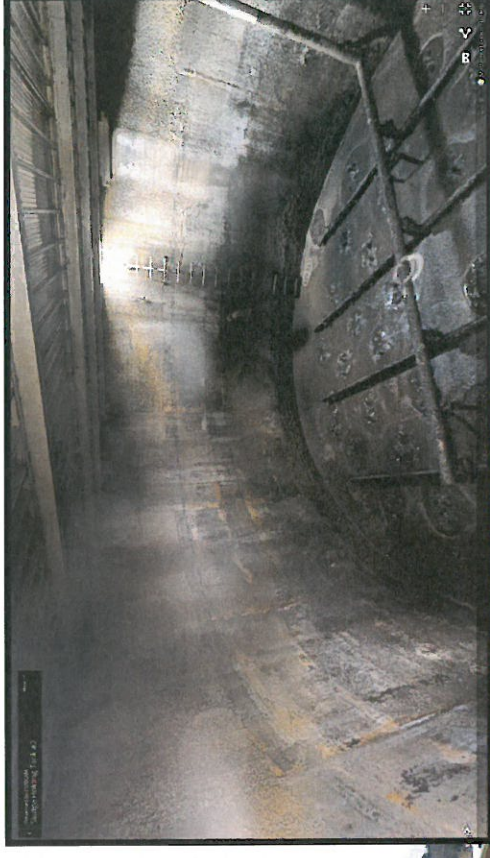
Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

## Project Scope: Sludge Holding Tanks

- Structural modifications to address safety concerns
- Replace sludge mixing system to simplify cleaning and maintenance



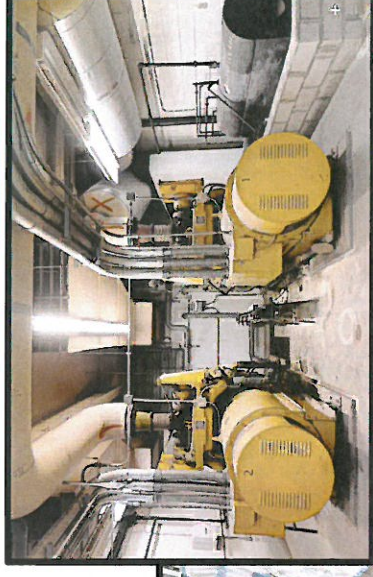
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Goal #1: Age of Facility     Goal #2: Safety     Goal #3: Code Concern

# Project Scope: Headworks Building

- New emergency power system
- New roofing system
- Modify/expand laboratory space
- ADA compliance upgrades
- Miscellaneous building system upgrades

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Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

Slide 13

## Project Scope: Souhegan and Thornton's Ferry Pump Stations



- Comprehensive Upgrades
  - Pumps and grinders
  - Forcemain replacement
  - Building systems
  - HVAC systems
  - Electrical and control systems
- Estimated Electrical Savings:  
**\$3,000/year (33% reduction)**

Souhegan: <https://my.matterport.com/show/?m=yfvaQXy1mNt>

Thornton's Ferry: <https://my.matterport.com/show/?m=wQeBDMs1XAc>

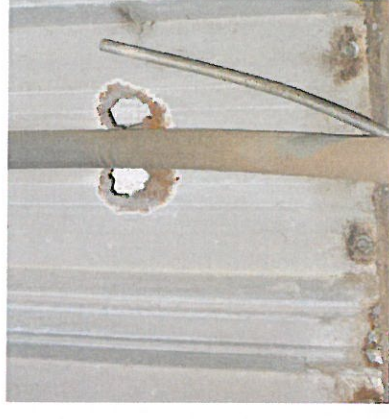
Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

## Project Scope: Compost Facility

- Replace six exhaust fans that transfer contaminated air from composting area to the biofilter
- Replace select exterior wall panels
- Replace select ductwork not replaced under Phase II



Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern

## Project Scope: Amendment Storage Building



Replace Amendment  
Storage Building with  
prefabricated metal  
building and concrete  
base slab

Goal #1: Age of Facility

Goal #2: Safety

Goal #3: Code Concern



### WWTF Phase III and Pump Stations Upgrade Total Project Cost

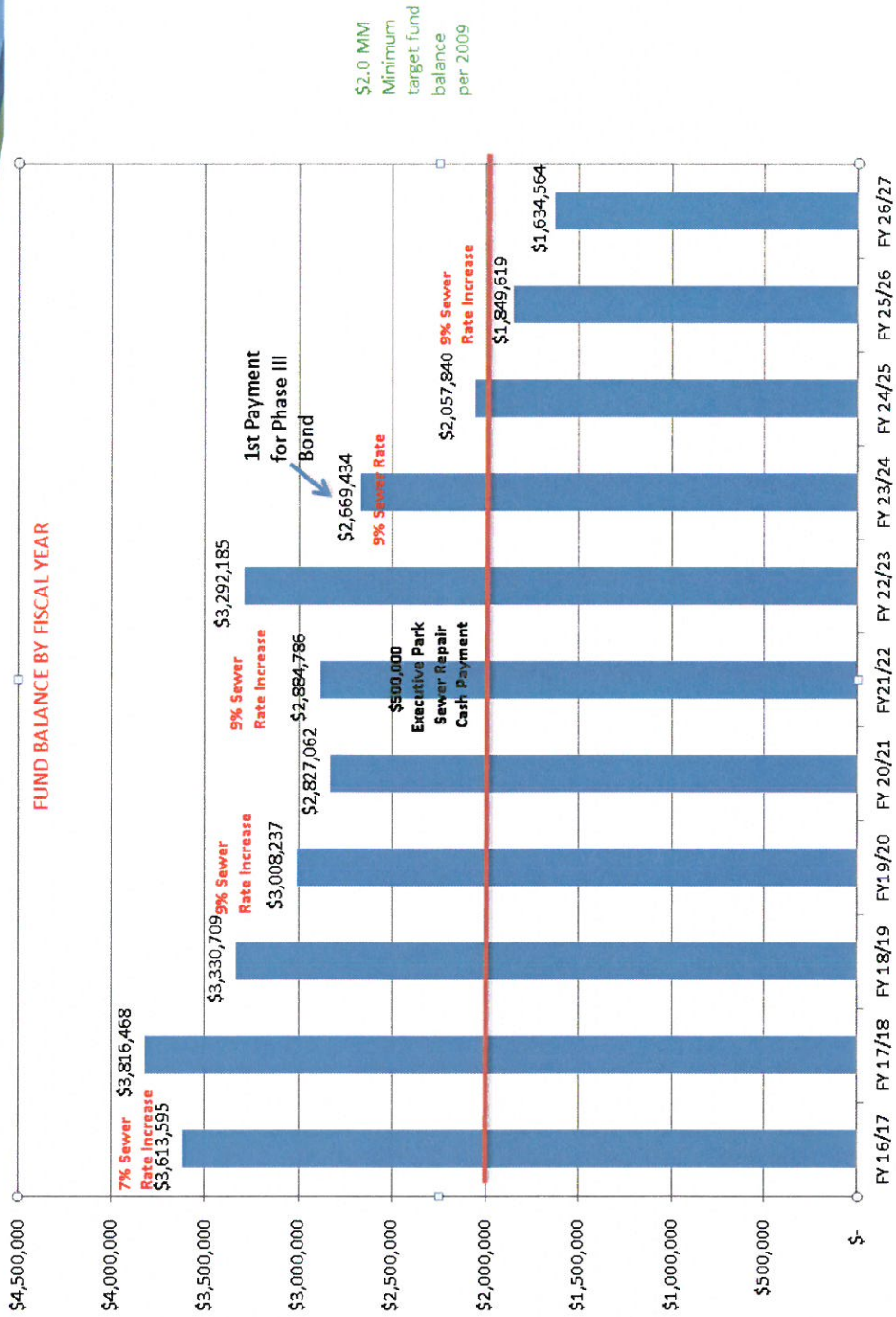
Influent Screenings Building (New Building)	\$2,810,000
Main Pump Station	\$2,610,000
Headworks Building	\$2,270,000
Primary Clarifiers	\$740,000
Primary Sludge Handling	\$260,000
Tank Drain Pumping	\$70,000
Sludge Holding Tanks	\$220,000
Secondary Clarifiers	\$1,010,000
Activated and Waste Sludge Handling	\$810,000
Instrumentation Upgrades	\$260,000
Chlorination Building and Misc. Upgrades	\$1,130,000
Compost Facility	\$1,520,000
Souhegan Pump Station	\$1,580,000
Thornton's Ferry Pump Station	\$1,760,000
Miscellaneous	\$90,000
Specials	\$390,000
<b>TOTAL CONSTRUCTION COST</b>	<b>\$17,530,000</b>
Design, Fees, and Contingencies	\$5,090,000
<b>TOTAL PROJECT COST</b>	<b>\$22,620,000</b>

	Phase III Total Project Cost	Phase IV Total Project Cost
Influent Screenings Building (New Building)	\$2,830,000	-
Main Pump Station	\$2,640,000	-
Headworks Building	-	\$2,530,000
Primary Clarifiers	-	\$820,000
Primary Sludge Handling	-	\$290,000
Tank Drain Pumping	-	\$70,000
Sludge Holding Tanks	-	\$240,000
Secondary Clarifiers	-	\$1,130,000
Activated and Waste Sludge Handling	-	\$900,000
Instrumentation Upgrades	\$200,000	\$290,000
Chlorination Building and Misc. Upgrades	-	\$1,260,000
Compost Facility	-	\$1,690,000
Souhegan Pump Station	\$1,590,000	-
Thornton's Ferry Pump Station	\$1,780,000	-
Miscellaneous	\$40,000	\$100,000
Specials	\$380,000	\$350,000
<b>TOTAL CONSTRUCTION COST</b>	<b>\$9,500,000</b>	<b>\$9,700,000</b>
Design, Fees, and Contingencies	\$3,600,000	\$2,300,000
<b>TOTAL PROJECT COST</b>	<b>\$13,100,000</b>	<b>\$12,000,000</b>
<b>Increase in Cost Compared to Single Project Approach: \$2,480,000</b>		

## Project Breakdown Option

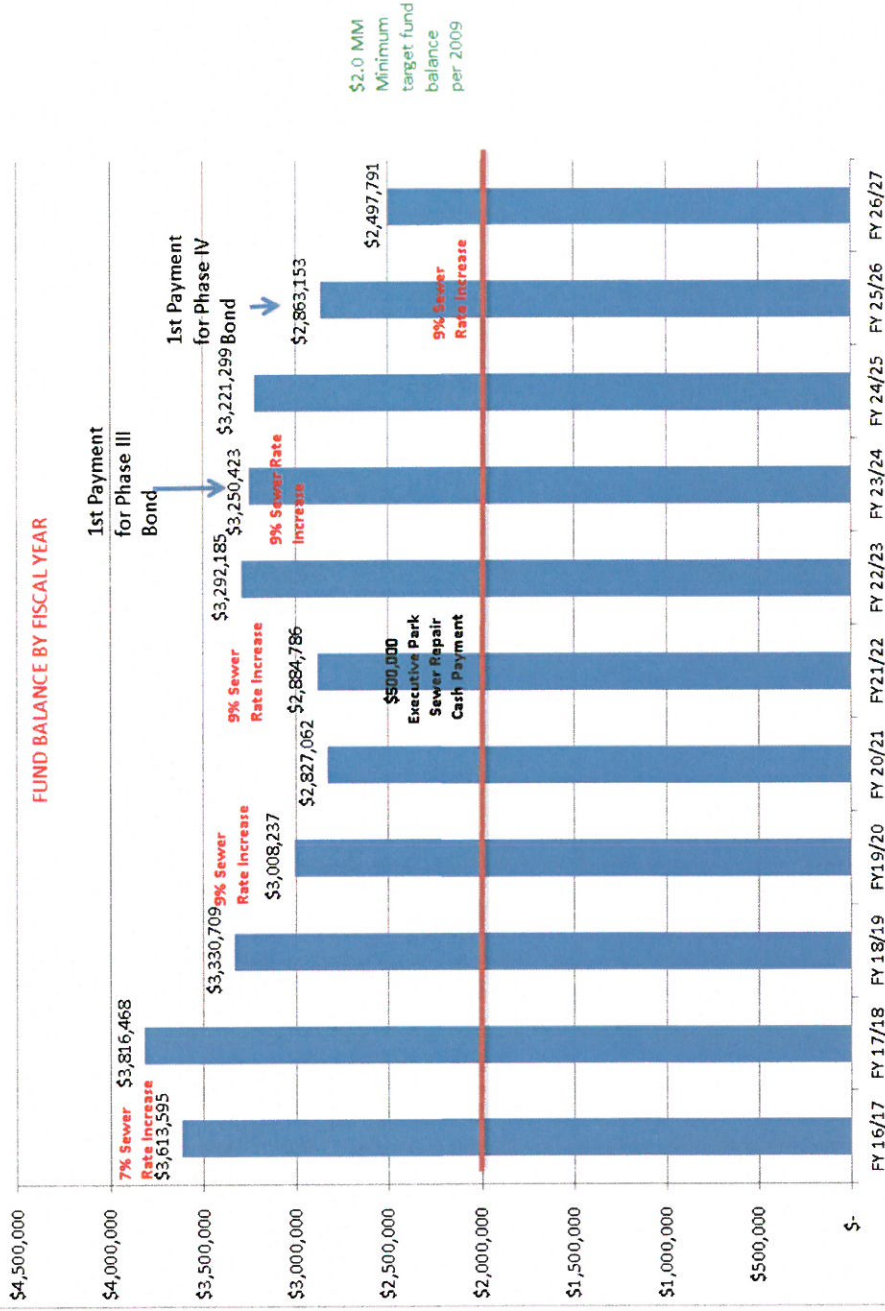
- Divide Project into Two Separate Phases:
  - Total project cost, Phase III: \$13,100,000
    - Souhegan Pump & Thornton's Ferry Pump Stations
    - Main Pump Station and New Screenings Building
    - Includes the design for the entire project
  - Total project cost, Phase IV: \$12,000,000
    - Headworks Building
    - Primary (1) & Secondary Clarifiers (3)
    - Sludge Handling Systems & Sludge Holding Tanks
    - Compost Facility & Amendment Storage Building
    - Instrumentation Upgrades
- Change in Cost Compared to Original Scope: \$2,480,000

# Fund Balance Future for \$22.6 Million Dollar Project



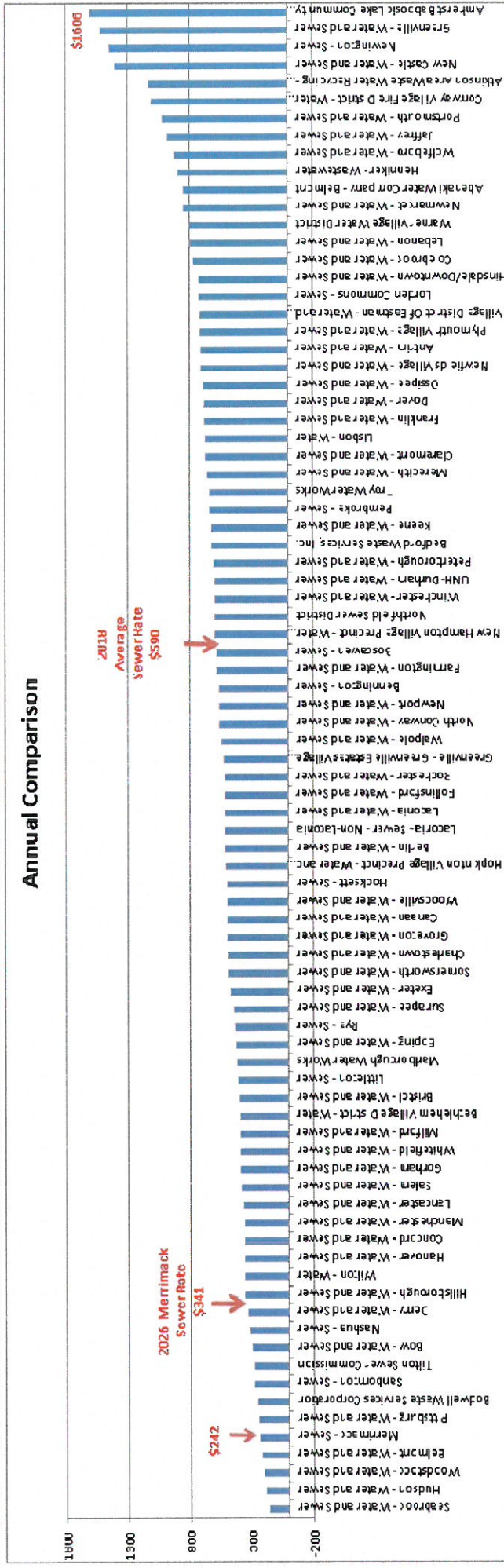
# Fund Balance Future for Phase III and Phase IV Projects

- Phase III: \$13,100,000
- Phase IV: \$12,000,000



# Funding: Rate Comparisons

- Merrimack currently ranks 5th lowest rate of all NH communities that charge a sewer rate (89 communities)
  - 2018 State Average: \$590
  - Merrimack 2018: \$242
  - Merrimack 2026: \$341
- Rate increases are planned for 2020, 2022, 2024 and 2026



# Funding: Rate Comparisons

## Annual Sewer User Rates<sup>1</sup> for Similarly Sized Communities (Population 17,000 - 33,000)

Utility - Rate Structure	Service Population	Annual User Fee (60,000 Gallons)
Merrimack - Sewer (2018)	22,000	\$242.00
Merrimack - Sewer (2027 <sup>2</sup> )	--	\$342.00
Derry - Water and Sewer	17,000	\$337.08
Salem - Water and Sewer	18,000	\$380.16
Rochester - Water and Sewer	25,000	\$522.96
Bedford Waste Services, Inc.	21,879	\$623.04
Keene - Water and Sewer	25,000	\$624.60
Dover - Water and Sewer	28,000	\$683.40
Lorden Commons - Sewer	24,844	\$722.04
Portsmouth - Water and Sewer	33,000	\$1,021.08

Notes:

1. Sewer user rates have been adjusted for easy comparison as many communities with combined water and sewer departments charge based on usage rather than on a flat annual rate.
2. Based on proposed rate increases.

## Funding: Financing

- NHDES is offering the Town of Merrimack 5% in principal forgiveness for this project
- The loan for the Sewer Manhole Rehabilitation Project will be retired in 2021
- The loan for the Dewatering Upgrade will be retired in 2022
- Additional \$325,000/year will be available to offset bond payment



# Questions & Discussion

