

Lincoln Woods WWTP Evaluation – Phase 1

Planning Board/SLPAC Review Meeting

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Presentation Overview

Project Scope – Phase 1
WWTP Assessment
Existing WWTP Recommendations
WWTP Performance
Capacity Analysis
Schedule
Next Steps - Phase 2

Project Scope – Phase 1



WWTP Assessment & Background

- Collect and review operations and maintenance data
- Collect and review manuals, drawings, and other project related data
- Site visit and condition assessment



WWTP Performance

- Review permit compliance and historical DMR data
- Evaluate remaining useful life of processes and equipment
- Compare current WWTP flows and loads to design data



Capacity

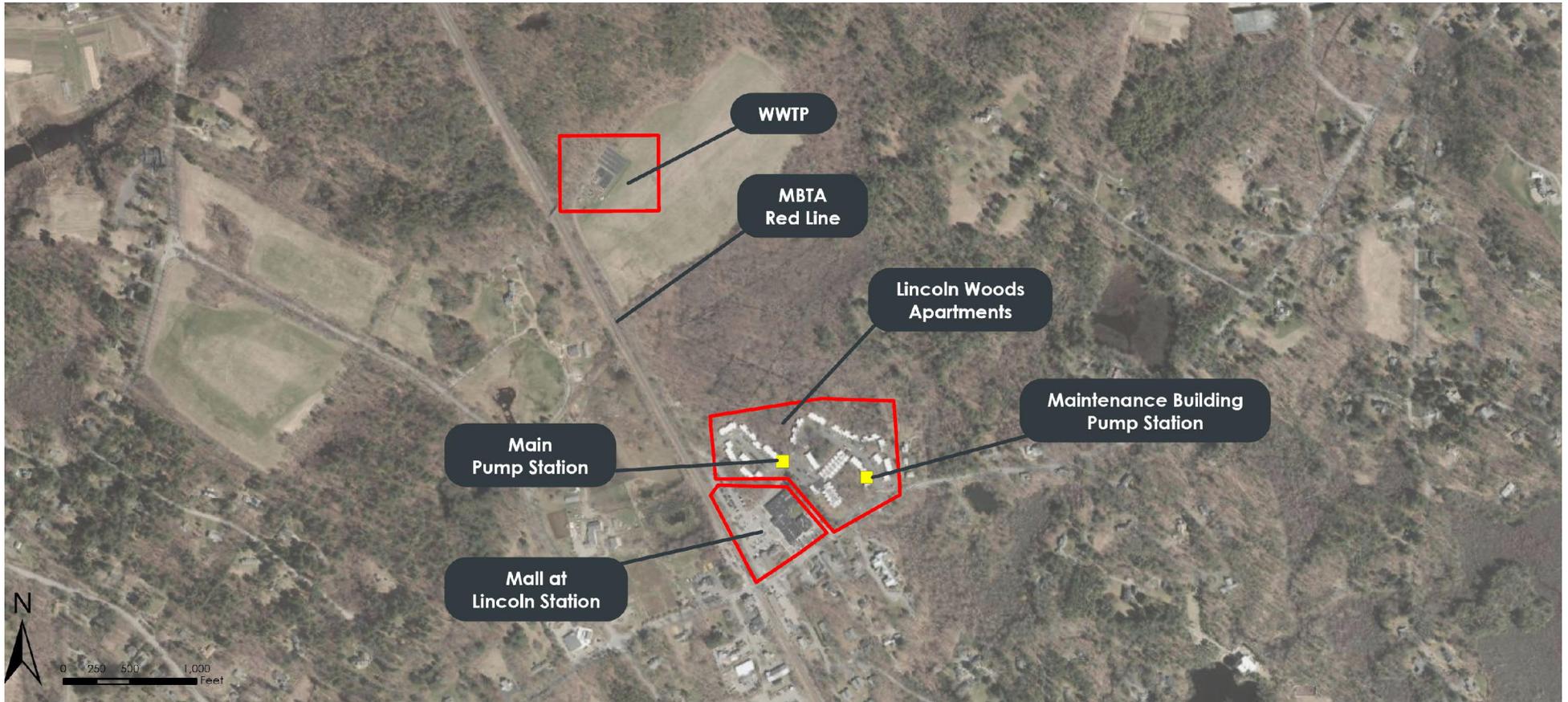
- Evaluate current WWTP capacity
- Evaluate additional available capacity
- Evaluate potential expansion alternatives



Recommendations

- Near-term, short-term, and long-term facility improvements
- Estimated costs associated with all suggested improvements
- Additional considerations for the facility

Project Location



Process Evaluation

Equipment	Condition	Comments	Age vs. Typical Life
Maintenance Building/Main Pump Stations	Fair	Maintenance Building PS has construction & code-related problems	Wet Wells: 46 of 60 Years Pumps/Motors: 12 of 20 Years
Flow Equalization Tank	Fair	Cracked Concrete around Hatch Protective Coatings could be applied to interior walls	19 of 60 Years
FET Pumps	Fair/Good	One pump replaced in 2018	3 of 20 Years & 12 of 20 Years
Comminutor	Poor	Needs cutter replacement/Runs but doesn't work well	12 of 20 Years
Process Tank	Good	Clarifier mechanisms need replacement	Aeration Diffusers: 6 of 30 Years Blowers: 12 of 20 Years Clarifier: 46 of 20 Years
Denitrification Filter	Good/Fair	Blower needs replacement and new enclosure	Sand: 19 of 30 Years Structure: 19 of 60 Years Blower: 19 of 15-20 Years
Effluent Clear Well	Good	Hatch needs replacement, One effluent pump replaced recently	Structure: 19 of 60 Years Pumps: 19 of 20 Years & 0 of 20 years

Process Evaluation - Continued

Equipment	Condition	Comments	Age vs. Typical Life
UV Disinfection	Good	Requires regular maintenance	14 of 15-20 Years
Dosing Siphon Chamber	Good	None	46 of 60 Years
Effluent Sand Filter Beds	Fair	Needs monthly raking of sand	New Layer of Sand: 8-10 Years
Chemical Storage and Feed Systems	Fair	Need to remove original pumps and add redundant small pump	5 of 5-10 Years
Instrumentation	Fair	Requires regular maintenance and calibration Currently running instruments to failure, not recommended	5 to 10 Years
Electrical	Good	All components in good condition	Generator: 2 of 30 Years Switchgear: 2 of 20 Years Solar Field: 5 of 30 Years
HVAC	Poor	Cooling is an issue in summer Two electrical heaters show signs of corrosion	Ventilation Fans: 19 of 10-15 Years Unit Heaters: 19 of 15 Years
Building	Poor	Complete renovation/replacement is needed	N/A

Existing WWTP Recommendations

0-5
Years

Near-Term

- Remote Pump Stations:
 - Replace pumps
 - Install ventilation & odor control systems
- WWTP:
 - Replace: comminutor, clarifier mechanisms, denitrification blower, denite pumps, UV system
 - Remove/replace methanol pumps
 - Replace building
- Estimated Cost: \$380,300

5-15
Years

Short-Term

- Replace one FET grinder pump, process blowers & denitrification filter sand
- Add sand in filter beds
- Estimated Cost: \$121,000

20-30
Years

Long-Term

- Replace pump stations
- Replace second FET grinder pump, process tank, effluent dosing pump, electrical equipment
- Evaluate sand filter beds
- Estimated Cost: \$2,125,800

30+
Years

Additional

- Concrete structure replacement throughout WWTP site
- Estimated Cost: \$695,600

WWTP Performance - Flows and Loads

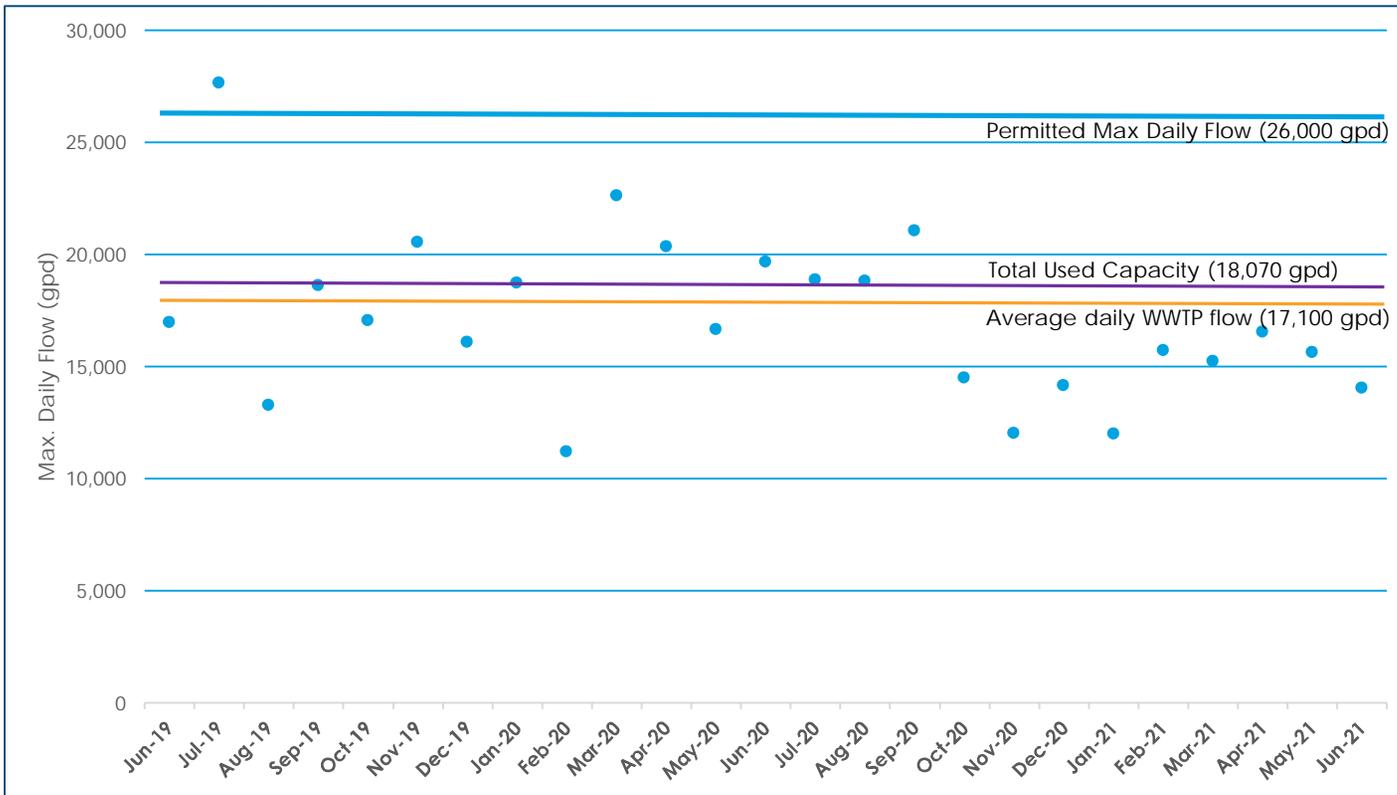
WWTP Flows and Loads - January 2018 to June 2021

Parameter	Flow (gpd)	BOD (mg/L)		TSS (mg/L)		Ammonia (mg/L)	Nitrate (mg/L)	TN (mg/L)
		Inf	Eff	Inf	Eff	Inf	Eff	Eff
Permit Limit	26,000 gpd		30 mg/L		30 mg/L		10 mg/L	10 mg/L
5 th Percentile Daily	4,500	-	-	-	-	-	-	-
Minimum Month	4,830	164	0.2	22	2.0	15	0.6	1.8
Maximum Month	19,440	2,400	123	7,780	101	72	19.6	23.0
95 th Percentile Daily	15,790	-	-	-	-	-	-	-
Annual Average	9,960	399	26	387	9	1.9	2.7	9.3

- Very few flow violations
- Annual average flow less than half of permitted capacity
- BOD, TSS, and Nitrogen violations, due to mechanical failures
- Process can perform well and is not currently overloaded or over capacity

Current WWTP Capacity - Existing Flows

Maximum Daily Flow Per Month, June 2019 – June 2021



- Consistently below permitted 26,000 gpd
- Average used capacity of 17,100 gpd at WWTP
- 470 gpd of “build-out” flow from unoccupied housing units, 500 gpd from restaurant COVID-19 closure in The Mall
- Total capacity of 18,070 gpd currently used
- Available Capacity 7,930 gpd (Permitted 26,000 gpd – 18,070 gpd)

Mall at Lincoln Station – Potential Commercial and Residential Expansion Scenarios*

- Permitted Flow – 26,000 gpd
- Average Flow from Mall - 1,795 gpd
- 500 gpd Flow added for Mall Restaurant = 2,295 gpd (COVID 19 Period Adjustment)
- Unused Available Capacity at WWTP is 7,930 gpd

Parameter	% Increase**			
	10%	25%	50%	100%
Commercial Flow (gpd)	230	570	1,150	2,295
Residential Flow (gpd)***	7,700	7,360	6,780	5,640
Number of Bedrooms****	70	66	61	51

*Based on current permitted flow capacity only

**% Increase over 2,295 gpd of Existing Commercial Flow

*** 7,930 Available Capacity minus Commercial Flow

**** Residential Flow Divided by MassDEP-required 110 gpd/bedroom

Existing WWTP Constraints Regarding Increasing Capacity

Process/Equipment	Existing Capacity	Deficiency	Recommendations	Magnitude of Change
Flow Equalization Tank	Volume – 10,000 gallons working, 16,600 gallons total Pumping – 108,000 gpd	Volume should be 50% of effluent permit flow Pumping OK	Increase working volume of existing tank to at least 13,000 gallons, an increase in volume would be required should disposal exceed 30,000 gpd	Increasing working volume – easy Increasing overall tank volume – easy to add height and modify piping or to add a new, larger tank
Comminutor	450,000 gpd	No flow deficiency	None	None
Biological Process - Aeration	Flow – 53,700 gallons available, treatment depends on BOD concentration BOD Treatment – 122 lbs/day	Flow limited by incoming wastewater strength / operation of FET	Better operation of FET	Up to 40,000 gpd, easy changes to operate FET better and add backup controls to the FET pumps
Biological Process - Clarifier	Unknown	Shallow depth of tank, lack of operating data	Collect operational data	Clarifier performance can be sub-optimal due to denitrification filter, operational data is easy to collect
Sludge Holding	7,600 gallons	None	None	None
Denitrification Filter	26,000 gpd	Cannot process more than 26,000 gpd	Increase size if more flow desired	Difficult and costly to replace filter. Likely easier to construct a new filter and abandon/demo old filter
Effluent Clear Well	6,800 gallons	Sized for existing denitrification filter	Increased volume if more flow desired	Easy to increase volume or construct new tank
UV Disinfection	40,000 gpd	None	Larger system if more flow desired	Easy to replace unit
Sand Beds – Effluent Disposal	10,500 sq. ft., 2.5 gpd/sq. ft.	Actual loading rate unknown, no reserve capacity	Percolation / Infiltration Testing Reserve area constructed Expand beds if more flow desired and testing determines beds are flow-limited	Testing easy to accomplish Room for reserve area difficult on existing site but can be done Increasing capacity difficult

Project Schedule

2021

TASKS	Planned Dates
PHASE I	
Kickoff meeting	July 13
Facility visit	Late July
Draft Report	August 31
Planning Board / SLPAC Meeting	October 5
PHASE 2	
Draft Report	November 30
Final Report	December 17
Planning Board / SLPAC Meeting	December 21

Next Steps - Phase 2

Expansion

- Future development flows and loads
- Capacity of pumping, treatment, disposal



Treatment Options

- Alternative technologies
- Effluent Disposal needs



Cost Estimate

- Capital costs
- O&M costs



Report

- Draft
- Review
- Final
- Meeting

Town involvement throughout project: Workshops, Meetings, Reviews

THANK YOU
