LYON & GERRISH TOWNSHIP PROPOSED HIGGINS LAKE PUBLIC SEWER SYSTEM

May 26, 2021

Fleis & VandenBrink

AGENDA

- History & Project Need
- Proposed Collection & Treatment Facility
- Next Steps

HISTORY & PROJECT NEED

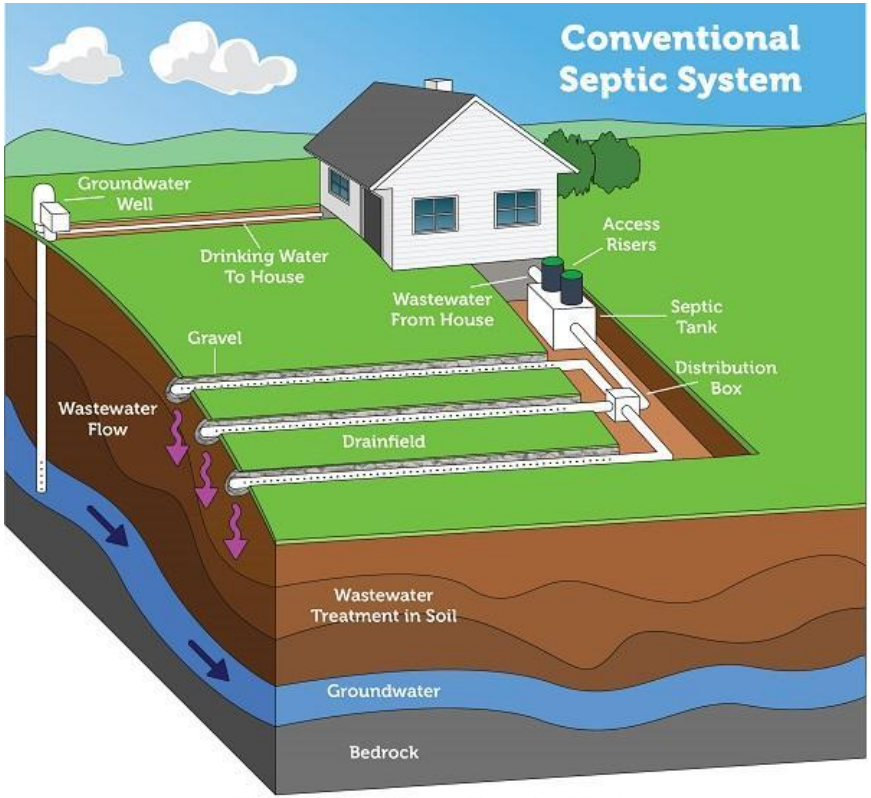
PROJECT HISTORY

General Milestone	Est. Completion
Public Joint Meeting with Lyon/Gerrish	October 2018
SEARCH Grant Application	Winter 2019
SEARCH Grant Award	Spring 2019
Development of Feasibility Study	May - October 2019
Public Information Meeting	October 2019
USDA Acceptance of Feasibility Study	Spring of 2020
Townships determine to form sewer Authority	January 2021
Formation of Sewer Authority	Spring 2021

IDENTIFYING THE PROBLEM

Typical Septic System and connecting conditions

- High (shallow) water table
- Soil type – generally sandy, highly permeable
- Dense Development
- Proximity to lake



Please note: Septic systems vary. Diagram is not to scale.

PRIOR LAKE STUDIES

Timeline of notable lake studies

- Maintaining the High Water Quality of Higgins Lake; (Bosserman, 1969)
- US EPA Natural Eutrophication Survey – Higgins Lake #195; (US EPA, 1975)
- A Water Quality Study of Higgins Lake, Michigan; (UofM, 1984)
- Effects of Residential Development on the Water Quality of Higgins Lake, Michigan 1995-99 (USGS, 2001)
- Changes in nearshore water quality from 1995 to 2014 and associated linkages to septic systems in Higgins Lake, MI; (MSU, Martin, Kendall, Hyndman, 2014)
- Algae and Water Chemistry Sampling Project; (UofM BS, Lowe, Kociolek, 2016)
- Higgins Lake Water Analysis (Raven Analytical - Roscommon High School Students, 2018, 2019)
- Three Prior sewer feasibility studies

COMMON FINDINGS OF PRIOR STUDIES

Documentation that lake is impacted by septic systems

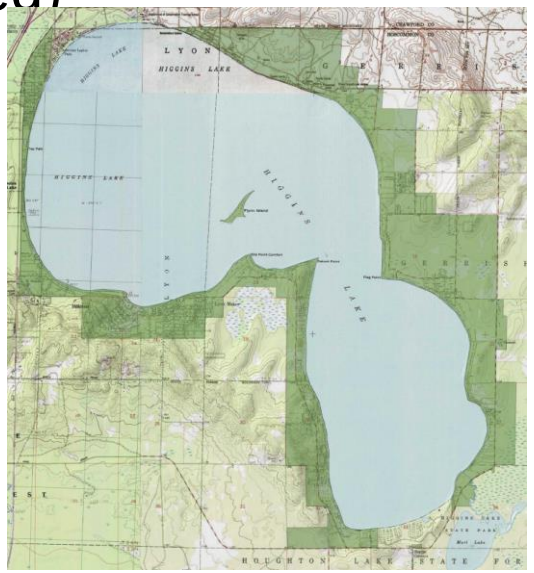
- Continually increasing nitrogen and phosphorus levels in Higgins Lake
- Changes in Trophic State Index indicators (Total P, blue-green algae, anoxic conditions, etc.)
- Septic drain field seepage is likely the largest controllable source of phosphorus loading in Higgins Lake

CAMP CURNALIA – CASE STUDY

- Camp Curnalia wastewater collection and treatment constructed in 2009
- The 2014 MSU study analyzed pre- and post-construction sampling with USGS/MSU sampling locations
- Results show:
  - Significant reduction in Total Phosphorus
  - Nitrate and Nitrite levels dropped below detection levels
  - Boron levels exhibited significant declines
  - Specific conductivity measurements were lowest at the Camp area of the lake

STUDY AREA

- How was the Study Area identified:
  - Potential areas influencing water quality
  - Health and safety
- Areas that will benefit from community sewer due to:
  - Isolation distances, lot size/density
  - Poor soils (clay, excessively drained)
  - Depth to groundwater
  - Lot density



PROPOSED SEWER COLLECTION SYSTEM

ALTERNATIVES EXPLORED

- Approached alternatives analysis without preconceived ideas – looked at all possibilities
- USDA Engineer reviewing the feasibility study requires alternatives that are modest in cost and scope
- Collection System
    - Gravity Sewer with Low Pressure component
    - Complete Low-Pressure System
        - Grinder System
        - Septic Tank Effluent Pumping Chamber (STEP)

GRAVITY VS. LOW PRESSURE

Gravity Sewer

- Minimal maintenance
- Higher risk of inflow & infiltration
- Dewatering costs are high and can be unpredictable
- Open trenching is disruptive & requires more restoration
- Terrain around Higgins Lake Requires a significant number of large pump stations
- Higher risk of odor
- Higher capital cost

Low pressure Sewer

- Each property has its own onsite pump system
- Directional drilling minimizes disruption to property
- Less susceptible to inflow & infiltration
- Pumping can allow more consistent flushing of sewers

LOW PRESSURE SEWER SYSTEM

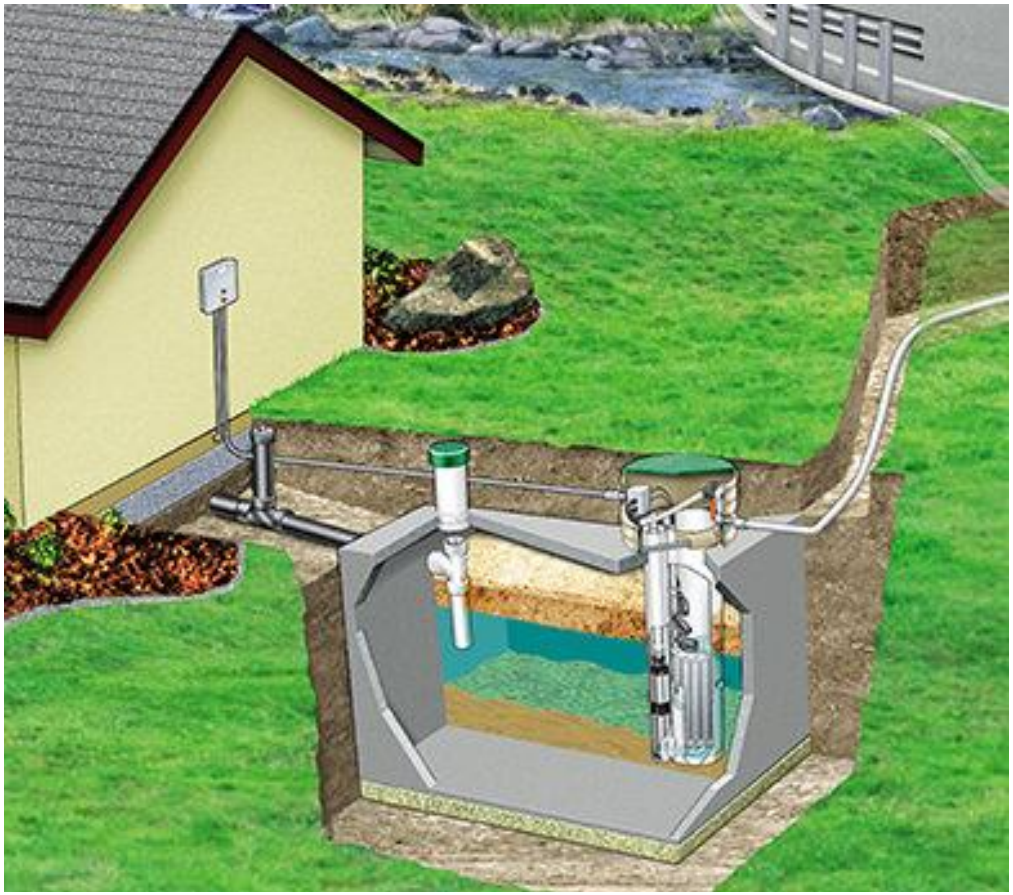
LOW PRESSURE CONSTRUCTION

Maximize this

Minimize this

SEPTIC TANK EFFLUENT PUMPING (STEP) SYSTEM

Onsite STEP System



STEP VS. GRINDER SYSTEMS

Septic Tank Effluent Pumping System

- Solids pumped by the Sewer Authority, discharged at the WWTF
- High head/low flow pumps reduce the number of booster stations
- Less impact by seasonal use
- High efficiency, low horsepower pumps
- Longer life pumps
- Lower operations and maintenance cost
- Greater storage volume during power outages

Grinder Systems

- Pumps convey both solids and liquid
- Larger less efficient pumps
- Higher electrical load requirements
- Shorter pump life
- More susceptible to seasonal usage and corrosive gas
- Higher annual operations and maintenance cost
- Grease and solids buildup with seasonal usage in sewers and pump chambers

PROPOSED SEWER SYSTEM

- Responsibility & Maintenance:
  - Property Owner:
    - Pipe from house to tank,
    - Electric cost for pumping, Est. at < $2.00/month
  - Utility:
    - Tank, pump, pump controls and all downstream piping
    - Utility will periodically pump tanks, operate, maintain & replace system
- Life of System:
  - 75 -100 years for most infrastructure
  - 15+ years on pumps and misc. components (built into the annual operation of system)

PROPOSED TREATMENT SYSTEM

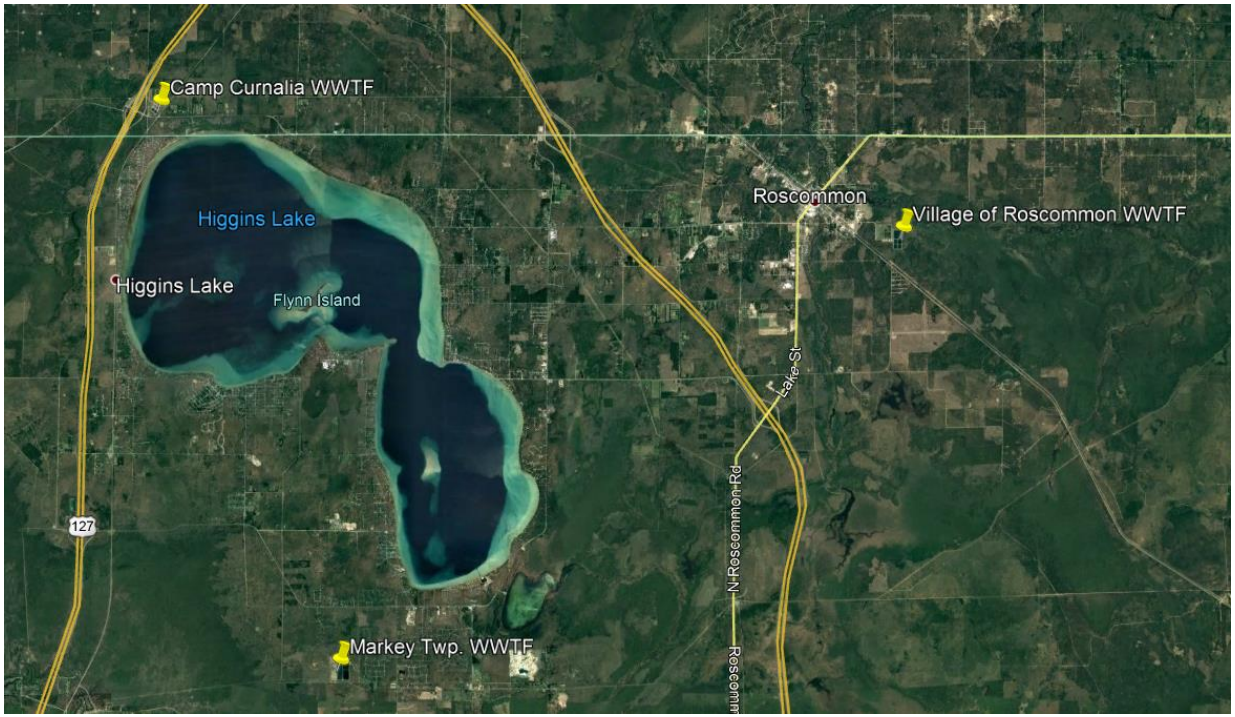
ALTERNATIVES EXPLORED

Wastewater Treatment Systems

- Regional WWTF
- Lagoon Treatment Facility
- Mechanical Treatment Plant

ALTERNATIVE 1: REGIONAL TREATMENT SYSTEM

- Collection system delivers flow to an existing regional WWTF.
  - Camp Curnalia
  - Markey Township
  - Village of Roscommon
- Significant expansion of existing facilities would be required.



Regional WWTF Locations

PROPOSED TREATMENT SYSTEM OVERVIEW

- Centralized WWTF, Designed to treat summertime flow rates
- Certified Operator in charge of treatment
- Effluent quality monitored for compliance by EGLE
- High quality effluent discharged to groundwater far away from the Lake

	Raw Wastewater	Drainfield Discharge	Municipal WWTP Treated Water
Nitrogen	60 ppm	60 ppm	<5 ppm
Phosphorus	10 ppm	8.1 ppm	<1 ppm

Source: EPA Onsite Wastewater Treatment System Manual, 2002 EPA/625/R-00/08
Crites and Tchobanoglous, Small and Decentralized Wastewater Management Systems, McGraw-Hill,1998.

ALTERNATIVE 2: LAGOON TREATMENT FACILITY

- Collection system delivers flow to large earthen basins.
- Large land area required.
- Potential for seasonal odors
- Higher capital costs vs Mechanical WWTF
- Lower operating costs vs Mechanical WWTF

Lagoon Treatment Overview

PROPOSED ALTERNATIVE: MECHANICAL TREATMENT FACILITY

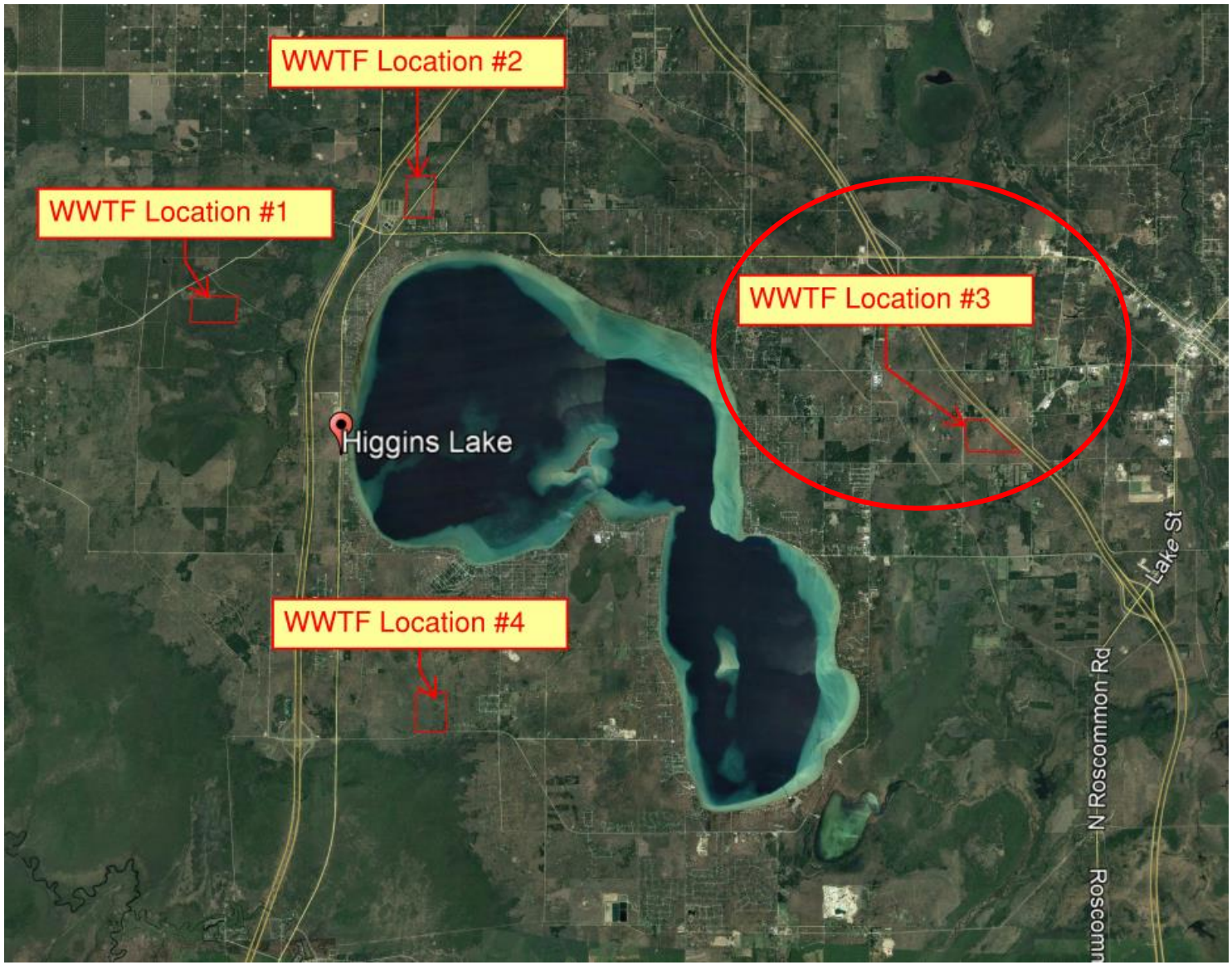
- Collection system delivers flow to concrete treatment and settling tanks
- Small treatment facility footprint
- Operational flexibility for seasonal flows
- Tanks can be covered to minimize odors

Oxidation Ditch

Mechanical Treatment Overview

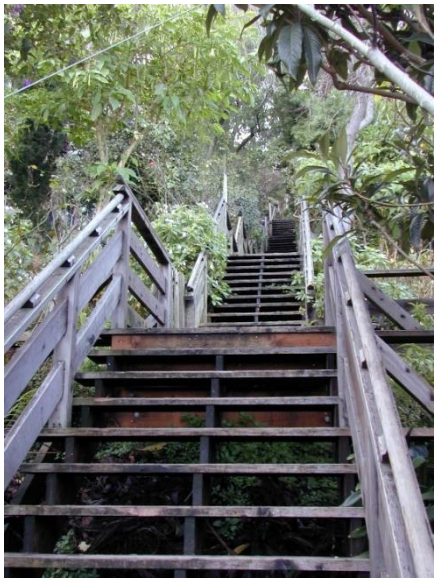
Rapid Infiltration Basin

POTENTIAL WWTF LOCATION



NEXT STEPS

General Milestone	Est. Completion
Prepare applications for funding	Spring-Summer 2021
Environmental & Historic Reviews	Spring-Summer 2021
Earmark Applications	Spring-Summer 2021
Begin Special Assessment Process	Spring-Summer 2021
USDA Application Submitted	Late Summer 2021
Receive funding commitments	Fall 2021
First Special Assessment Hearing	Fall 2021
Begin Design	Fall 2021
Advertise for bids	Fall 2022
Construction	Spring 2023 - Fall 2024



QUESTIONS