

SALINE WASTEWATER TREATMENT PLANT

SITING STUDY

Tetra Tech Project Number: 200-12789-20001
January 2020

PRESENTED TO

City of Saline
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USE OF DATA

This report is intended to be a planning-level document. Additional data are required before implementing recommendations in this document.

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WASTEWATER TREATMENT PLANT
SITING STUDY**

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City of Saline, MI
100 N. Harris Street
Saline, MI 48176

ACKNOWLEDGEMENTS

Tetra Tech appreciates the valuable contributions of the following individuals to this project:

Todd Campbell City Manager

Steve Wyzgoski Utilities Superintendent

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EXECUTIVE SUMMARY

Project Overview

The City of Saline owns and operates a wastewater treatment plant on Monroe Street near the southern border of the city. The WWTP dates to at least 1963 and perhaps even older. The recently completed asset management plan places a value of \$43 million on the facility and identifies \$32 million of improvements needed to sustain the plant over the next 20 years. Of this \$32 million, approximately \$11.7 million will be needed to sustain the existing WWTP without any growth. This \$11.7 million corresponds to a sewer rate increase of \$43/quarter for a typical single-family home so there is a significant financial impact to wastewater customers for the City to simply remain at its current size and sustain the existing WWTP.

The City of Saline is a desirable place to live. The current economy is strong and there is interest in developing new homes within and adjacent to Saline. Saline has established Urban Development Areas (UDA) with both Saline Township and Lodi Township to annex these properties into Saline as they develop. New development has the potential to significantly increase wastewater flows.

With the existing WWTP aging and the development pressures, the Saline City Council has elected to complete this study to identify a plan for future wastewater treatment. This study looks at both improving the existing WWTP site as well as siting a new wastewater treatment plant. Three locations for new WWTPs were identified in the townships surrounding the City of Saline. This study also evaluated providing wastewater treatment at the Ypsilanti Community Utilities Authority (YCUA) WWTP. This study is a high-level evaluation to screen alternatives and chart a course for next steps. These next steps may involve further evaluation of sites and further discussions with regional treatment providers.

Flow Projection

The current WWTP has a permitted capacity of 1.81 MGD. The current average daily flow to the WWTP is 1.5 MGD, which is approximately 83% of the design capacity. With projected development within the City and the UDA, the flows to the WWTP are expected to increase. EGLE typically requires that a WWTP expansion evaluation be performed when current facility flows exceed 85% of the design capacity as is currently happening at the Saline WWTP. The projected development within in the service area and UDA was reviewed to develop projected flows for the WWTP in the next 20 years. These projected flows were used to evaluate the WWTP improvement alternatives. The following table is the projected flow increase expected in the 20-year planning period. The flows will exceed the original WWTP Basis of Design capacity.

Table ES-1 - Projected WWTP Flows

	Average Day (MGD)	Max Month (MGD)	Max Day (MGD)	Peak Hour (MGD)
Current Plant Flows	1.50	1.60	3.93	6.0
Projected Flows from Development within Current Service Area	0.28	0.34	0.70	0.84
Projected Flows from UDA	1.2	1.44	3.0	3.6
Total Projected Flows	2.98	3.38	7.63	10.44

Based on a projected average daily flow projection of 3.0 MGD, the proposed WWTP alternatives are recommended to be sized for 4.0 MGD average daily flow capacity to provide additional capacity for redevelopment and provide operational flexibility. To meet this design capacity, substantial improvements will be needed to the existing WWTP processes and infrastructure.

Capacity Analysis

A capacity analysis of the WWTP was previously performed. This previous analysis was reviewed and updated for the present report. The analysis used throughout this report were taken from numerous sources to provide a conservative overall standard for determining improvement sizes and costs. These sources include the 2014 edition of *Great Lakes Upper Mississippi River Board Recommended Standards for Wastewater Facilities*, also known as the *Ten States Standards*. These standards are supplemented with the WWTP industry design best practices including *Water Environment Federation (WEF) Manual of Practice (MOP) 8*, and the Fourth Edition of Metcalf and Eddy's "Wastewater Engineering Treatment and Reuse." The latter provides detailed design information for the Rotating Biological Contactors.

As indicated in Table ES-2 below, the majority of the existing process have capacity to treat average conditions at the WWTP. Theoretically, some existing processes do not meet the maximum day conditions when operating at firm capacity (largest unit out of service). However, the City is consistently meeting its permit limits.

Also indicated in the table is whether the existing unit processes have firm capacity to meet the projected 20-year flows. The table shows that the majority of the WWTP cannot accommodate the peak flow from the future population.

Table ES-2: Saline WWTP Unit Process Capacity

Process	Current Firm Capacity	2019 Ave Day (1.5 MGD)	2019 Max Day (3.93 MGD)	2040 Ave Day (3.0 MGD)	2040 Max Day (7.63 MGD)
Influent Raw Sewage Pumping	12.3 MGD	Yes	Yes	Yes	Yes
Grit Removal	7.5 MGD	Yes	Yes	Yes	No
Primary Clarifier Tanks	2.9 MGD	Yes	No	No	No
Rotating Biological Contactor (RBC)	<i>2.2 MGD</i>	Yes	No	No	No
Secondary Clarifier	3.4 MGD	Yes	No	Yes	No
Tertiary Filters	5.0 MGD	Yes	Yes	Yes	No
Ultraviolet Disinfection	4.5 MGD	Yes	Yes	Yes	No
Digester	<i>1.47 MGD</i>	No	No	No	No
Sludge Storage	<i>1.0 MGD</i>	No	No	No	No

Note: Flow capacities indicated in italics are based on average day flows

The recent Asset Management Plan assessment performed at the WWTP also indicated that many of these process components were in need of replacement due to condition or treatment performance.

Alternative Development and Evaluation

The objective of this evaluation is to evaluate long-term alternatives for cost effective and efficient treatment of the City's wastewater flows. The evaluation of alternatives was conducted on both economic and noneconomic (such as land use plan and constructability) factors. Economic evaluations were performed on the basis of both capital cost and life-cycle costs (i.e. capital cost and operating cost including rehabilitation). Life-cycle costs are expressed as a present worth cost to account for the time value of money.

Four primary alternatives were identified and evaluated with the first three having options designated by letters (e.g. 1A, 2A, etc.). The four alternatives are:

1. Expand at Existing WWTP Site – An evaluation of expanding at both the existing site east of Monroe (Alternative 1A) and expanding to the vacant parcel west of Monroe (Alternative 1B) was conducted.
2. Construct a New WWTP – An evaluation of constructing a new WWTP outside the city limits was conducted. Three separate sites were evaluated including the transmission requirements to deliver wastewater to each site. Alternative 2A is a site west of the current city limits in Lodi Township, Alternative 2B is a site south of the city in either Saline Township or York Township, and Alternative 2C is southeast of the city in York Township.
3. Regional Treatment at YCUA – An evaluation of pumping wastewater to the YCUA WWTP was conducted. Three different discharge locations within Pittsfield Township were evaluated and designated as Alternatives 3A, 3B, and 3C.

4. Combined YCUA Treatment and Existing WWTP – An evaluation was conducted consisting of pumping a portion of the city's wastewater to YCUA thereby allowing the existing WWTP to be used.

A summary of the results is presented in Table ES-3.

Table ES-3 - Economic Evaluation of Alternatives

Alternative Worth Cost	Capital Cost ³	Present Worth Cost	Single-Family Home Quarterly Rate Impact
1. Existing WWTP Site ¹	\$76,003,000	\$82,508,000	\$283
2A. New WWTP (West)	\$94,376,000	\$92,700,000	\$353
2B. New WWTP (South)	\$89,747,000	\$89,792,000	\$334
2C. New WWTP (East)	\$95,910,000	\$92,658,000	\$357
3. Regional Treatment at YCUA ²	\$86,560,000	\$103,134,000	\$389
4. Combined YCUA and Existing WWTP	\$176,400,000	\$135,124,000	\$685

¹This alternative considered two different options for expanding the existing WWTP and the lowest life-cycle cost option is used in this table

²This alternative considered three different discharge locations and the least expensive in terms of both capital cost and lowest life cycle cost is used in this table

³Capital costs in this table also include costs to sustain existing infrastructure

The economic evaluation suggests that Alternative 1 (Expanding at existing WWTP site either east or west of Monroe Street) has the lowest capital and present worth costs. Alternative 2B (constructing a new WWTP to the south) is the next lowest in terms of present worth cost. Alternatives 1 and 2B have present worth costs within 10% of each other which is relatively close for a conceptual analysis. The Saline City Council may wish to also consider noneconomic factors such as the WWTP's proximity to residents in making a decision between these two alternatives.

Furthermore, there are some unknowns in connecting to YCUA that could reduce costs and make Alternative 3 more cost effective. For instance, if Pittsfield Township shared in the cost of the sewer work more than the 50% assumed in this report, this alternative would be more cost effective.

Table ES-3 also shows the approximate impact on quarterly sewer bill for a typical single-family home including both debt service and operating cost changes. This calculation uses the existing customer base so the quarterly rate impact will decrease as connection fees are collected and additional users are added to the system.

Recommended Next Steps

We recommend the City of Saline further explore the feasibility of Alternatives 1, Alternative 2B and 3 (in this order) as there are additional details to be determined beyond the screening level evaluation conducted in this study. The present worth costs are similar and noneconomic factors, such as community acceptance or land availability, may drive the selection of an alternative. Working with adjacent authorities (Pittsfield Township and YCUA) requires detailed discussions regarding cost sharing proposals. Specific answers to be sought are listed below:

Further Consideration of Expanding Existing WWTP (Alternative 1):

- This alternative has the lowest capital cost (by approximately \$14 million) and present worth cost. Would the residents adjacent to the existing WWTP be satisfied with keeping the WWTP at this location?
- Would expansion on the current parcel be satisfactory as it requires new processes be constructed closer to residents or should expanding west of Monroe be further considered?
- If expanding west of Monroe is desired, further research and consideration into the environmental responsibility for occupying the site needs to be conducted.

Further Evaluation for New WWTP to South (Alternative 2B):

- Alternative 2B contains properties within both Saline and York Township. The properties within Saline Township would be preferred based on proximity to the existing sewer system and elevation above the Saline River floodplain. Are their properties potentially for sale in the area within Saline Township?
- How does Saline Township feel about locating a WWTP in that location and granting variances to current land use plans to construct a WWTP?

Further Evaluation for Treatment at YCUA (Alternative 3) :

- Does YCUA have conveyance capacity to accept Saline's flow?
- What operating fees will Pittsfield Township charge to share trunk sewer capacity?
- What cost sharing will Pittsfield Township request for the shared trunk sewer?

Meetings will need to be held with Saline Township, YCUA and Pittsfield Township to further evaluate these questions. Saline should plan on \$30,000 of professional fees (engineering and legal) to support these discussions. YCUA may pass along fees associated with their capacity analysis which cannot be quantified at this time.

The City should also consider conducting a detailed study on managing the biosolids for any of the alternatives discussed in this report including remaining at the current site. Biosolid management is a point of concern for most wastewater utilities as the typical methods of disposing of biosolids is impacted by emerging restrictions due to the PFAs and other concerns. Furthermore, the City's existing WWTP has limited sludge storage volume and more frequent disposal may be required. This study would further refine costs for the alternatives in this report and assist the City with managing biosolids in the interim. We suggest the City budget \$50,000 for this study.

We also recommend the City initiate discussions with its financial advisors regarding financing the future project. There may be financing approaches such as special assessment districts that allow for much of the cost of the future construction to be borne by developable properties.

Schedule

Tetra Tech feels a design and construction schedule will look similarly for all alternatives. A nominal schedule would include one year for survey, design, permitting and construction bidding. Construction will take approximately two years for each alternative. Thus, a project will take approximately three years to implement.

The City will likely seek Michigan State Revolving Fund (SRF) loan to finance the improvements. The loan is administered by Michigan's Department of Environment, Great Lakes, and Energy (EGLE). This loan requires a detailed application (project plan) to be completed by July 1 prior to the state's next fiscal year. EGLE requests a notice of intent to be filed by April 1 in the year of the project plan's submittal. This study was initiated in October 2019 and completed in early 2020. Thus, the next opportunity to apply for this loan is with a Notice of Intent in April 2020 for Fiscal Year 2021. However, based on further dialog needed to select an alternative, an SRF project plan submitted in July 2021 for Fiscal Year 2022 is more likely. This would place the earliest construction completion in calendar year 2024.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AMP	Asset Management Plan
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
DPW	Saline's Department of Public Works
ENR	Engineering News Record
EGLE	Michigan Department of Environment, Great Lakes, and Energy. Formerly the MDEQ.
EQ	Equalization (Storage) Tank
MDEQ	Michigan Department of Environmental Quality. Now referred to as EGLE.
MGD/mgd	Million Gallons per Day
mg/L	Milligrams per liter
NPDES	National Pollutant Discharge Elimination System. The federal program that grants EGLE authority to regulate wastewater treatment plant discharges.
MOR	WWTP monthly operating report
N	Nitrogen
O&M	Operations and Maintenance
PFAs	Per- and polyfluoroalkyl substances
pH	A chemical scale to define how acidic or basic a water-based solution is
UDA	Urban Development Area
REU	Residential Equivalent Unit (equivalent to an average single family home)
RBC	Rotating Biological Contactors. The biological (secondary) treatment process at the City's existing wastewater treatment plant.
SRF	State Revolving Fund. Michigan's low interest loan program for wastewater projects.
TDS	Total Dissolved Solids
TRC	Total Residual Chlorine
UV	Ultraviolet. In this report, UV refers to ultraviolet disinfection of the wastewater effluent.
WEF	Water Environment Federation
WWTP	Wastewater Treatment Plant
YCUA	Ypsilanti Community Utilities Authority

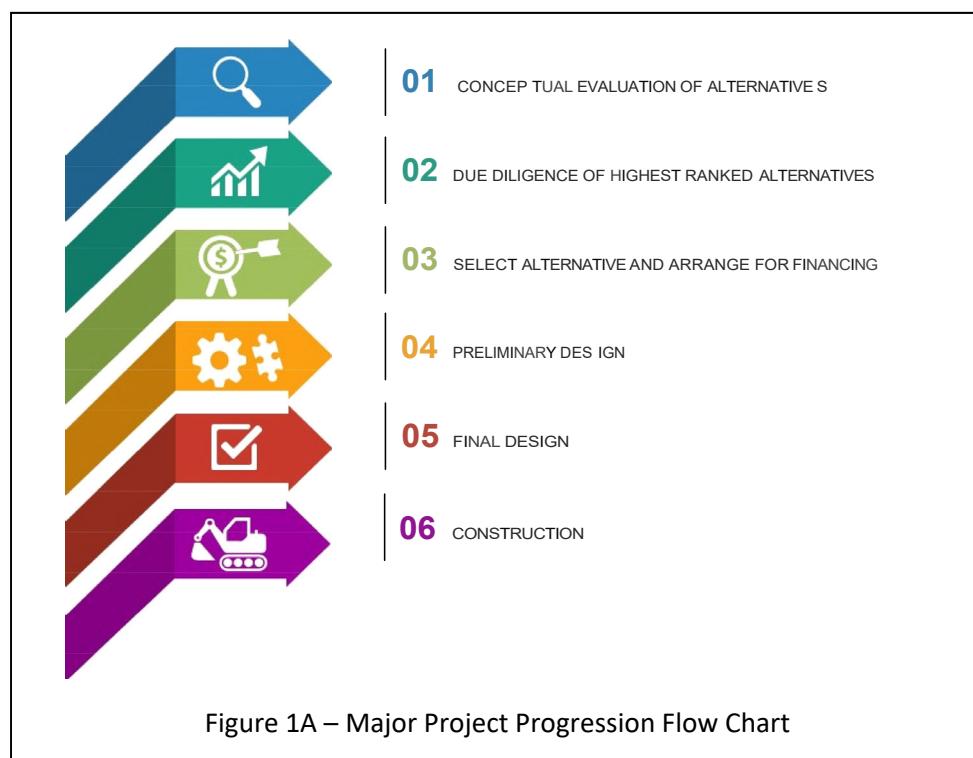
1.0 INTRODUCTION

The City of Saline is at an important crossroads regarding wastewater treatment. The City's existing wastewater treatment plant dates to at least 1963 and probably earlier. The treatment process consists of four general steps; preliminary treatment, primary treatment, secondary treatment and disinfection. The plant provides biological treatment using rotating biological contactors (RBCs) which date to the mid-1980s. The WWTP has a current average daily permitted treatment capacity of 1.81 MGD and a peak hydraulic capacity of 5.0 MGD. Collected biosolids are digested and stored for agricultural land application. The site is small with limited room to expand. Perhaps most importantly, residential construction has occurred around the site and residents are vocal regarding noise and odors that periodically occur at the facility.

Saline is a highly desirable place to live and is facing growth pressures. Not only is there growth pressure within the existing service area, but the City has discussed expanding its limits with both Saline and Lodi Township. These discussions have resulted in Urban Development Areas (UDA) that call for Saline to expand when new development occurs in these planned areas.

This study is being conducted to evaluate the City's options for wastewater treatment. This is a high-level evaluation to screen alternatives and chart a course for next steps. These next steps may involve further evaluation of sites and further discussions with regional treatment providers.

Implementing a major capital project involves numerous phases of analysis with each subsequent phase consisting of increased level of detail and analysis. This way, resources are only spent on alternatives that show merit for implementation. A typical process for evaluating and implementing a major capital project is depicted in Figure 1A. This siting study can be considered as Step 01 on the flowchart.



The approach undertaken to develop the evaluation and recommendations for the WWTP within this report include the following steps:

- Review historical flows and pollutant loadings
- Develop projections for future flows and pollutant loadings
- Review treatment standards and potential regulatory changes
- Review the WWTP AMP and unit process capacity analysis
- Assess the capacity of the WWTP to meet future flow and load projection
- Develop alternative for future treatment capacity
- Evaluate capital and operational cost of the alternatives
- Document work and present recommendations

The following major alternatives were identified for the wastewater treatment for Saline:

1. Existing WWTP Site – Maximize the utility of providing wastewater treatment at the existing site located along Monroe Street
2. New WWTP Sites – Evaluate new locations for WWTP, primarily around the perimeter of the existing City limits
3. Regional Treatment – Evaluate Saline joining a regional treatment provider such as the Ypsilanti Community Utilities Authority's (YCUA) wastewater treatment plant located over twelve miles east of the Saline WWTP near the intersection of Rawsonville Road and I-94. There has been some discussion about Saline becoming a regional treatment provider but due to the lack of sewered areas adjacent to Saline, this alternative is not considered likely.
4. Combined Regional Treatment and Existing WWTP - Also identified was evaluating the combination of two or more of the above options such as utilizing the City's existing treatment plant and sending the surplus to YCUA.

Several past studies helped guide the analysis in this report. In 2015, Tetra Tech completed a capacity evaluation of the existing Saline WWTP as part of the Andelina Farms development's request to connect to the WWTP. This study identified several capacity concerns and capacity expansion ideas at the existing WWTP site.

In 2019, Tetra Tech finalized the City's Wastewater Asset Management Plan. This plan identified a 20-year Capital Improvement Plan (CIP) for the WWTP. This plan assisted in identifying the rehabilitation needs for the WWTP.

This study evaluates and discusses the above alternatives in more detail.

2.0 BASIS OF EVALUATION

2.1 SERVICE AREAS

The City of Saline provides wastewater service primarily to customers within the City Limits. A drawing of the existing service area and remaining undeveloped areas is included in Appendix A.

The City of Saline, Lodi Township, and Saline Township have planned for providing sewer service to portions of each Township through Urban Development Areas (UDA). The location of these UDA are shown in Figure 1B. The proposed UDAs are approximately 2,000 acres in size which will significantly enlarge the size of Saline. Thus, there will be a major impact of this growth on wastewater flows.

2.2 WWTP FLOW AND LOADING RATES

Reliable flow and pollutant load projections are critical elements for assessing the WWTP capacity and future expansion/upgrade alternatives. Historical facility data was used to determine current flows and loadings.

For the projected WWTP flows the City's current undeveloped property with the existing service area and the projected development with the UDA was reviewed. These projected flows are used to evaluated the alternatives.

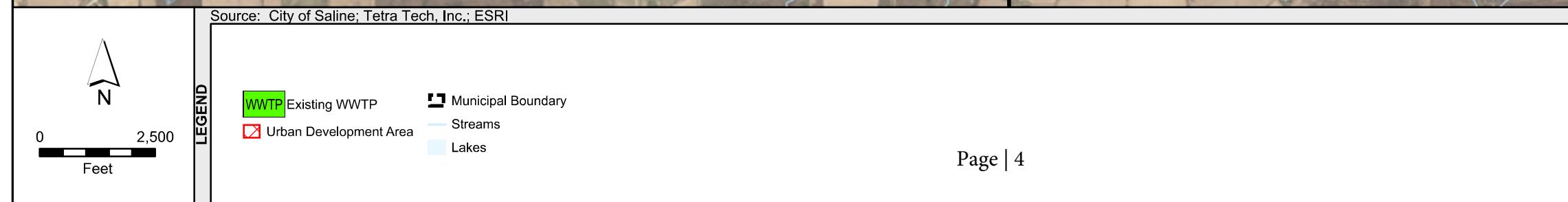
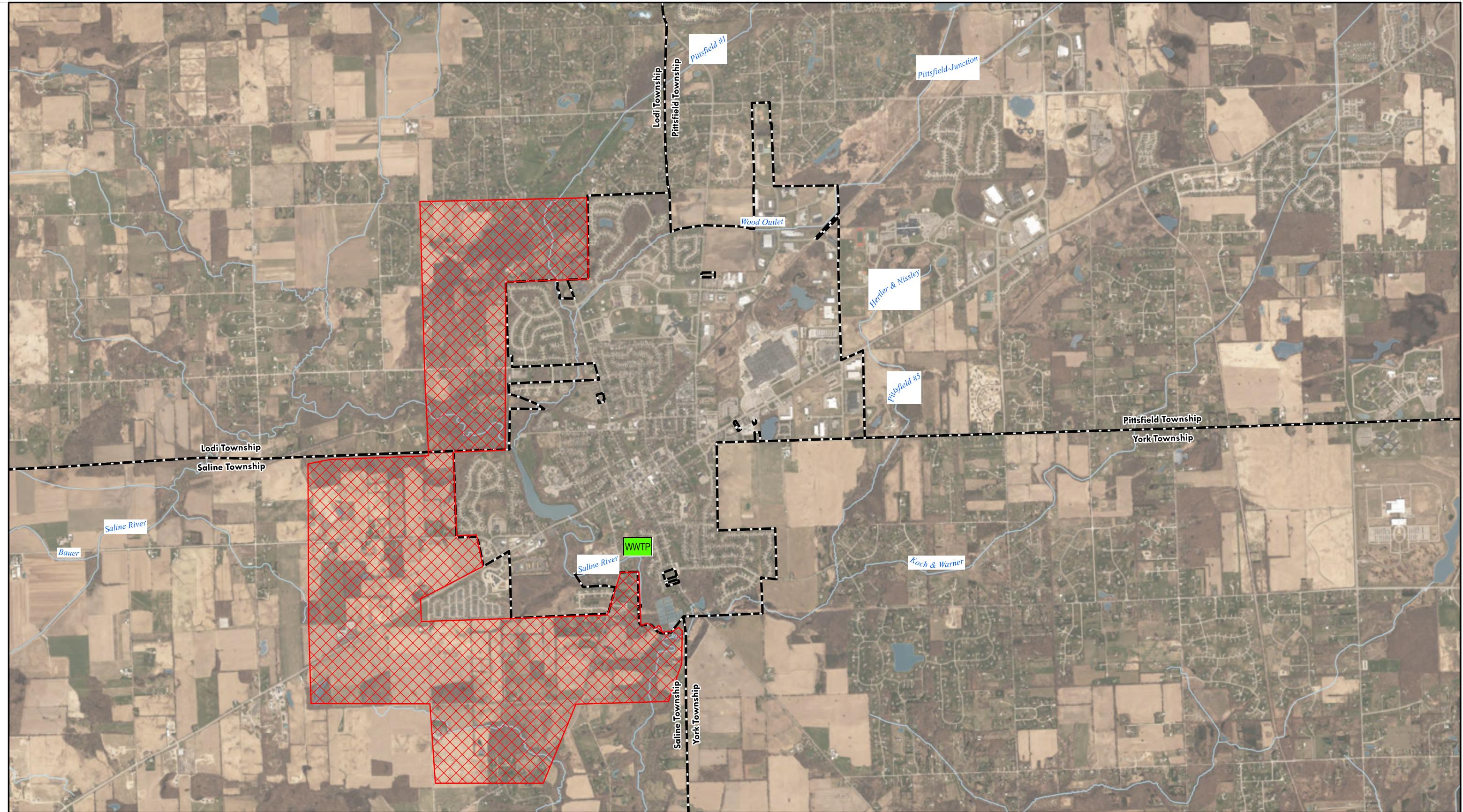
2.2.1 Existing WWTP Flow and Loading Rates

The WWTP Monthly Operating Report (MOR) data was reviewed from previous years to identify the WWTP current daily average, maximum daily and peak hourly flow rates recorded. This provides a baseline condition for the WWTP.

A summary of the plant flows from 2010 through 2019 is present in Table 2-1.

Table 2-1 – 2010 – 2019 Saline WWTP Recorded Daily Flows

	Average Day (MGD)	Max Day (MGD)
2010	1.21	3.93
2011	1.50	7.43
2012	1.21	3.02
2013	1.26	3.97
2014	1.32	3.32
2015	1.34	3.74
2016	1.19	2.90
2017	1.25	3.59
2018	1.40	4.84
2019	1.50	5.97
Average	1.31	3.93



The WWTP's current average flow is 83% of the original design capacity of 1.81 MGD. EGLE typically requires that a plant expansion evaluation be performed when a facility reaches 85% of design conditions.

The monthly operating reports were reviewed to evaluate monthly changes in plant flow. A summary of the existing flows observed during this time period is shown in Table 2-2.

Table 2-2 – 2010 – 2019 Saline WWTP Recorded Daily Flows

	Total (MGD)	Max (MGD)	Min. (MGD)	Avg. (MGD)
Jan	39.3	3.02	0.467	1.27
Feb	38.3	4.84	0.87	1.36
Mar	48.5	3.85	1.06	1.56
Apr	46.1	5.71	0.91	1.48
May	44.9	5.98	0.88	1.45
June	40.4	3.93	0.79	1.35
July	35.5	5.86	0.65	1.15
Aug	36.0	1.83	0.70	1.16
Sept	34.0	1.90	0.70	1.14
Oct	37.3	2.26	0.74	1.20
Nov	39.0	7.43	0.81	1.30
Dec	39.0	2.53	0.82	1.26
	Total	Max	Min	Avg
2010-19	39.85	7.43	0.467	1.31

A summary of the current influent wastewater characteristics is presented in Table 2-3. The conditions are based on MOR data

Table 2-3 - Current WWTP Loading Conditions

Parameter	2019 MOR Influent Loading	Original Basis of Design Loading
Flow, MGD	1.5	1.81
Biochemical Oxygen Demand (BOD), mg/L (lbs/day)	198 (2,366)	200 (4,220)
Total Suspended Solids (TSS), mg/L (lbs/day)	195 (2,333)	250 (5,275)
Total Phosphorus, mg/L (lbs/day)	4.2 (5.7)	10 (211)
Ammonia-Nitrogen, mg/L (lbs/day)		15 (316)

Note: Values in parentheses are expressed as lbs/day.

2.2.2 Future WWTP Flow Rates

To develop the future flows to the WWTP the projected development with the service area and UDA was reviewed with City staff. The development considered the type of development and density to project REU/acre. Based on future development the of REU's were projected for the service area and are presented in Table 2-4.

Table 2-4 - Projected Development

	Estimated REU's
Estimated Current Connections	6,700
Projected Development within Current Service Area	800
Projected Flows from UDA	4,900
Total Projected Flows	12,400

Future WWTP flows will consist of flows from the existing customers, growth within the service area, and growth from the UDA. Table 2-5 outlines what the projected flows for a future, more developed condition may be. New connections were added within both the City service area and the UDA. The UDA area encompasses approximately 2,000 acres although some portion projects as being undevelopable due to floodplain/wetland concerns. The projected flows from the existing service area current service area includes a 0.1 mgd increase from existing sewer users not attached to a specific parcel.

A detailed table of these calculations is included in Appendix A. In general, new development was added at a rate of 225 gal/day/REU. Peak hour flows were assumed to be approximately 3 times the average daily flows.

Table 2-5 - Projected WWTP Flows

	Average Day (MGD)	Max Month (MGD)	Max Day (MGD)	Peak Hour (MGD)
Current Plant Flows	1.50	1.80	3.93	6.0
Projected Flows from Development within Current Service Area	0.28	0.34	0.70	0.84
Projected Flows from UDA	1.2	1.44	3.0	3.6
Total Projected Flows	2.98	3.38	7.63	10.44

It would be prudent to design new treatment processes to have slightly more capacity than the projected flows in Table 2-5. This buffer would allow for redevelopment to occur at slightly higher usage. It would also provide the 15% margin that the EGLE requests a community maintain before enforcing an expansion of the treatment facility. Therefore, the basis of design flows for the evaluation are listed in Table 2-6. Alternatives for treatment by regional provider uses an average flow of 3 mgd which is a number rounded from average flows in Table 2-5.

Table 2-6 - WWTP Basis of Design Projected Flows

	Average Day (MGD)	Max Month (MGD)	Max Day (MGD)	Peak Hour (MGD)
Current Plant Flows	1.5	1.8	3.9	6.0
Total Projected Flows	2.98	3.38	7.63	10.44
Basis of Design Projected Flows	4.0	5.0	10.0	12.0

2.3 TREATMENT PERFORMANCE

2.3.1 Current Permit

Treatment requirements for the Saline WWTP are contained in National Pollutant Discharge Elimination System (NPDES) Permit No. MI0024023 issued by the Michigan Department of Environmental Quality (MDEQ), since renamed Michigan Department of Environment, Great Lakes and Energy (EGLE).

The NPDES limits are based on assessment of the water receiving body, Saline River, and modeling that has been done of the river system. The model takes into account the impact of the discharges within the watershed including WWTP upstream and downstream. CBOD₅, Ammonia-N and dissolved oxygen (DO) limits are developed with the aid of a computer model that applies the Streeter-Phelps formula to calculate the dissolved oxygen sag curve for a free flowing stream. EGLE runs the model during each permit renewal cycle to simulate the dissolved oxygen concentration in the river downstream of the discharge and identify the lowest levels. These values are compared to state standards of 6.0 milligrams per liter (mg/L) as a daily average and 5.0 mg/L as a daily minimum. If the standards are met, the permitted limits for CBOD₅, Ammonia-N and DO are recommended to remain the same. If the standards are not met, lower limits may be recommended.

The EGLE model includes oxygen depletion that occurs due to CBOD₅ and Ammonia-N degradation, as well as diurnal oxygen fluctuations due to plant/algae photosynthesis and respiration. The model also accounts for oxygen addition into the water via stream reaeration, using the generally accepted O'Conner-Dobbins correlation to stream velocity and depth.

The Saline WWTP permit limits are summarized in Table 2-7.

Table 2-7 - NPDES Permit Discharge Limits

Effluent Characteristic	Dates in Effect	Daily Minimum	Daily Maximum	30-Day Average	7-Day Average
CBOD ₅	May – Sept.	--	3.9	4 mg/L	--
	Oct. – Nov.	--	7.7	16 mg/L	--
	Dec. – Apr.	--		25 mg/L	40 mg/L
TSS	May – Sept.	--		20 mg/L	30 mg/L
	Oct. – April	--		30 mg/L	45 mg/L
Ammonia-N	May – Sept.	--		0.5 mg/L	--
	Oct. – Nov.	--		3.1 mg/L	--
	Dec. – Mar.	--		13 mg/L	--
	April	--		14 mg/L	--
Total Phosphorus	All Year	--		1.0 mg/L	--
TRC	All Year	--	10 mg/L	--	--
Total Mercury	All Year		24 mg/L	5 mg/L	
TDS	All Year	--	--	--	--
Total Selenium	All Year	--	--	--	--
Total Vanadium	All Year	--	--	--	--
Acute Toxicity	All Year		2.0 mg/L		
Chronic Toxicity	All Year		7.1 mg/L	1.4 TU	
Available Cyanide	All Year	--	--	7.4 mg/L	--
Total Boron	All Year	--	--	--	--
Chloride	All Year	--	--	--	--
Sulfate	All Year	--	0.038 mg/L	--	--
CBOD Removal	Dec. – April	--		85% (min.)	--
TSS Removal	Dec. – April	--	(report)	85% (min.)	--
Dissolved Oxygen	May – Sept.	7.0 mg/L	(report)	--	--
	Oct. – Nov.	6.0 mg/L	(report)	--	--
	Dec. – Apr.	3.0 mg/L	1.0 TU	--	--
Fecal Coliforms	All Year	--		200/100 mL	400/100 mL
pH	All Year	6.5 std. units		--	--

During the review of other NPDES permits in the Saline River watershed, there have been two new private developments that were issued NPDES permits in 2019. Both of these permits received similar limits with the advanced wastewater treatment limit of 4 mg/L for CBOD₅ in effect from May through November and a lower Total Phosphorus limit of 0.5 mg/L. EGLE has expressed concerns about the Total Phosphorus concentration in the Saline River, although the River is not included in the 303(d) list and is not planned to have a Total Maximum Daily Loading limit for Total Phosphorus. A lower Total Phosphorus limit is anticipated to be included in the reissued NPDES permit for the Saline WWTP. In addition, some communities discharging to the Detroit River and Lake Erie have recently had the Total Phosphorus limits tightened in an effort to control algae blooms in Lake Erie. The Saline River

discharges to the River Raisin which enters Lake Erie. It is possible that EGLE may further restrict Total Phosphorus discharges to the River Raisin and the Saline River. Permit limits will be discussed in more detail within the alternative evaluation as permit limits may vary between alternatives.

2.3.2 Treatment Planning Criteria

The design standards used throughout this report were taken from numerous sources to provide a conservative overall standard for design. These sources include the *Great Lakes Upper Mississippi River Board Recommended Standards for Wastewater Facilities*, also known as the *Ten States Standards*. These standards are supplemented with the WWTP industry design best practices including *Water Environment Federation (WEF) Manual of Practice (MOP) 8*, and the Fourth Edition of Metcalf and Eddy's "Wastewater Engineering Treatment and Reuse." The latter provides detailed design information for the Rotating Biological Contactors.

2.4 ECONOMIC EVALUATION

The economic evaluation of alternatives follows EGLE guidelines for the preparation of revolving fund loan project plans including evaluating costs over a 20-year planning period. A capital cost was prepared for each alternative. In addition to the capital cost, a 20-year present worth cost (also referred to as a life-cycle cost analysis) was prepared to consider the capital costs, the annual costs (such as O&M) and the difference in useful lives between components of each alternative.

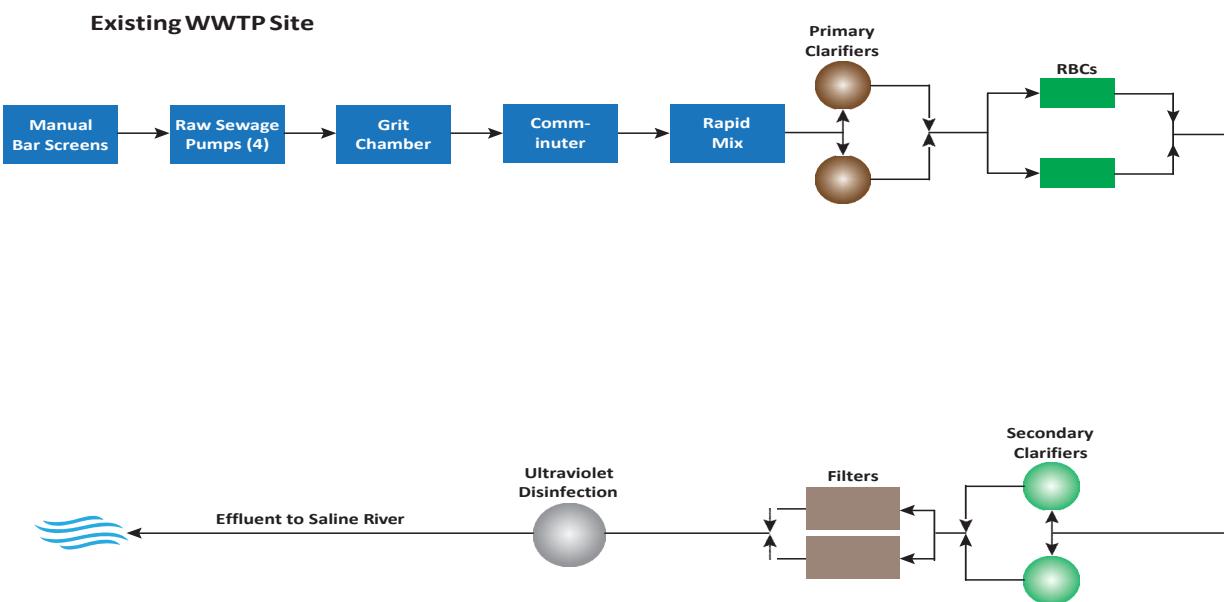
Useful life differences were factored by assigning a salvage value of each alternative at year 20. Future costs were discounted at EGLE's current 2% discount rate. Future operating costs were increased 3.5% annually from present conditions to account for projected growth. Opinions of cost for each alternative are contained in Appendix B. Additional detail of capital cost opinions and life-cycle cost calculations are contained in Appendix C.

3.0 EXISTING WWTP SITE

The City of Saline's wastewater treatment plant is located east of Monroe Street near the southern edge of the city limits. The city's sewer system conveys wastewater largely from north to south with three main trunk sewers. These trunk sewers are named the Westbelt, Centralbelt, and Eastbelt Trunk Sewers. Recent capacity analyses showed that each trunk sewer had some portions that had capacity limitations. New development within the UDA will require significant sewer projects to deliver the wastewater to the existing plant.

The location of the existing plant is both a strength and weakness. The existing collection system has been designed and constructed to deliver wastewater to the treatment plant. Thus, maintaining the plant at its current site will not require sewer work to deliver wastewater to a new site. However, residential development has occurred around the existing site and the owners of many of these properties do not like being so close to the WWTP (primarily noise and odor concerns). The existing WWTP site is, of course, zoned for use as a wastewater treatment facility.

The existing treatment system is summarized in the below flow diagram. The plant consists influent pumps, grit removal, primary treatment, secondary treatment (RBCs followed by final clarifiers), and tertiary treatment (disk filters). Disinfection is provided by ultraviolet radiation.



NOTE: The sludge disposal process includes digestion, storage, and land application (not shown).

FIGURE 2 – Existing WWTP Flow Schematic

3.1 UNIT PROCESS CAPACITY ANALYSIS

A capacity analysis of the WWTP was previously performed in 2015 to evaluate additional flows from the Andelina Farms proposed development in Saline Township. This analysis was used to determine which treatment processes.

As indicated in Table 3-1 below, the majority of the existing process have capacity to treat average conditions at the WWTP. Theoretically, some existing processes do not meet the maximum day conditions when operating at firm capacity (largest unit out of service). However, the City is consistently meeting its permit limits when processes are functioning as intended.

Also indicated in the table is whether the existing unit processes have firm capacity to meet the projected 20-year flows. The table shows that the majority of the WWTP cannot accommodate the peak flow from the future population confirming that population growth will necessitate construction of new treatment processes at the current site or a new site.

Table 3-1: Saline WWTP Unit Process Capacity Evaluation

Process	Current Firm Capacity	2019 Ave Day (1.5 MGD)	2019 Max Day (3.93 MGD)	2040 Ave Day (3.0 MGD)	2040 Max Day (7.63 MGD)
Influent Raw Sewage Pumping	12.3 MGD	Yes	Yes	Yes	Yes
Grit Removal	7.5 MGD	Yes	Yes	Yes	No
Primary Clarifier Tanks	2.9 MGD	Yes	No	No	No
Rotating Biological Contactor (RBC)	2.2 MGD	Yes	No	No	No
Secondary Clarifier	3.4 MGD	Yes	No	Yes	No
Tertiary Filters	5.0 MGD	Yes	Yes	Yes	No
Ultraviolet Disinfection	4.5 MGD	Yes	Yes	Yes	No
Digester	1.47 MGD	No	No	No	No
Sludge Storage	1.0 MGD	No	No	No	No

Note: Flows indicated in italics are based on Average Day Capacity

3.2 CONDITION ASSESSMENT

The 2019 Asset Management Plan assessment performed at the WWTP also indicated that significant work at the WWTP is in need of rehabilitation or replacement due to condition and treatment performance. The plan identified \$31.8 million in capital improvements for the WWTP over the next 20 years and the plan is presented in Table 3-2.

Table 3-2 – Planned WWTP Capital Improvement Projects

Project Number	Description	Project Year	Project Cost
WWTP – 1	RBC Motor Control Center Replacement and Transfer Switch Replacement	2020	\$275,000.00
WWTP – 2	Raw Sewage Pump Replacement	2022	\$1,400,000.00
WWTP – 3	Digester No. 3 Cover Replacement	2026	\$600,000.00
WWTP – 4	Sludge Storage Tank Expansion	2026	\$2,050,000.00
WWTP – 5	Primary Clarifier Mechanism Replacement	2028	\$520,000.00
WWTP – 6	Primary Clarifier Expansion – 60 ft. Dia.	2028	\$1,600,000.00
WWTP – 7	Secondary Clarifier Mechanism Replacement	2030	\$580,000.00
WWTP – 8	Secondary Clarifier Expansion – 60 ft. Dia.	2030	\$2,120,000.00
WWTP – 9	RBC Media and Cover Replacement	2032	\$5,710,000.00
WWTP – 10	UV Module Upgrade	2034	\$790,000.00
WWTP – 11	Generator Replacement	2036	\$530,000.00
WWTP – 12	4.1 MG Equalization Basin	2038	\$14,310,000.00
WWTP – 13	RBC Gear Box (annual 2020-2026)		\$790,000.00
WWTP – 14	Roof Replacement (annual 2020-30)		\$460,000.00
WWTP – 15	Building Door Replacement (annual 2020-30)		\$70,000.00
	6-year	Subtotal	\$2,670,150.00
	Remaining	Subtotal	\$29,134,850.00
		Total	\$31,805,000.00

Note: Projects in bold are within City's 6-year CIP period

Of this \$31.8 million, approximately \$11.7 million is associated with rehabilitating the existing infrastructure and is independent of growth. Debt service for this \$11.7 million would require a rate increase of approximately \$43/quarter for the average single-family home.

4.0 IDENTIFICATION AND EVALUATION OF ALTERNATIVES

4.1 PURPOSE

The evaluation of treatment unit performance and capacity analysis for the existing treatment system indicates that based on projected growth and anticipated regulatory changes, treatment process expansion throughout the WWTP will be required in the 20-year planning window. In this section, WWTP treatment alternatives will be identified and evaluated. The evaluation includes factors such as site layout, process technology, construction cost, operational cost, construction sequencing, and capacity.

4.2 ALTERNATIVE DEVELOPMENT

Tetra Tech and city staff developed multiple improvement alternative approaches for the existing or new WWTP. The alternatives were reviewed based on the following considerations: utilizing existing WWTP processes and structures, treatment capacity, treatment technology, operation and maintenance costs, site layout, coordination with existing processes, long-term function of the systems, expandability, and construction cost. The alternatives were reviewed with city staff to receive input and make modifications. Construction and O&M costs were developed for the alternatives to provide life-cycle cost evaluations expressed in terms of present worth costs.

The proposed WWTP improvements were developed to meet the following objectives:

- Improvements sized for 4.0 MGD average day capacity (WWTP improvements) and 3.0 MGD (regional treatment alternatives)
- The improvements will address replacement or rehabilitation of the existing WWTP aging assets that have exceeded their expected life.
- The improvements will limit impact on the WWTP operations and treatment capacity during construction
- The improvements will minimize the requirement for additional pumping between processes by effective utilization of site topography.
- The improvements shall be developed to minimize the impact on adjacent neighbors and city residents.

The following process modifications were identified to be included as part of the improvements.

- Installation of fine mechanical bar screens before the influent pump will reduce wear and accumulation of debris in downstream processes. For example, limit the accumulation of rags and paper material in the digester tanks and reduce labor from hand-cleaning a screen.
- New secondary treatment capacity was assumed to be activated sludge technology as that is more forgiving to changes in plant loading and less labor intensive than other technologies.
- Biosolid processing (for new processes) was assumed to be a solids dewatering system and disposal of the material in a landfill. This would replace the existing digestion system and sludge holding tanks at the existing WWTP in the new WWTP site alternatives. The cost to construct new digester systems and the volume of sludge storage tanks necessary for land application to meet the projected flows was not cost effective when compared to landfill disposal. However, there is an unknown future of both land application (agricultural land disposal) and landfill disposal in the state given emphasis on controlling PFAs. A detailed

biosolids analysis would typically be an initial step in preliminary design. The city may wish to consider developing a biosolids management plan ahead of preliminary design to not only accelerate a future preliminary design phase but to also assist in managing biosolids in the interim period as the current plant has challenges regarding sludge storage volume and timeliness of removal.

The WWTP alternatives were developed based on the treatment capacity in Table 4-1. The regional treatment alternatives were evaluated in terms of a 3 mgd average flow and a 12 mgd peak flow.

Table 4-1 - WWTP Alternative Flow Capacity

	Average Day (MGD)	Max Month (MGD)	Max Day (MGD)	Peak Hour (MGD)
WWTP Alternative Capacity	4.0	5.0	10.0	12.0

Table 4-2 indicates the treatment process components and capacities identified for the alternatives.

Table 4-2 - WWTP Processes and Future Capacity

Proposed Unit Process Improvements	Firm Capacity	2040 Design Ave Day (4.0 MGD)	2040 Design Peak Hr (12.0 MGD)
Raw Sewage Influent Pumps - 4 pumps @ 2,800 gpm	12.1 MGD	Yes	Yes
Screen Unit - Two units with 1/4-inch bar spacing – 12 MGD/ea	12.0 MGD	Yes	Yes
Grit Removal Tanks - 2- 12 MGD Vortex Grit Tanks	12.0 MGD	Yes	Yes
Primary Clarifier Tanks 3 Tanks – 130' x 35' x 10' Ave Loading – 1,000 gpd/sf Peak Loading – 2,000 gpd/sf	9.1 MGD 13.7 MGD	Yes	Yes
Aeration Tank - Three Tanks 150'x 35' x18' - Primary Effluent – 116 mg/L - 15 lbs BOD/day/1000cft	4.0 MGD (Ave Day)	Yes	Yes
Final Clarifiers - Four 70' Dia Tanks - Peak Loading – 1,200 gpd/sft	13.9 MGD	Yes	Yes
Tertiary Filtration - Cloth Media Sand Filter - 3 Filters	12.0 MGD	Yes	Yes
Ultraviolet Disinfection - 3 units at 6 MGD each	12.0 MGD	Yes	Yes

Equalization storage of 1.5 mg was provided in all alternatives. This storage will assist in controlling peak flows and provide several hours of response time should a downstream process need to be repaired.

The following alternatives for wastewater treatment improvements were identified:

1. Existing WWTP Site (two options for expanding at the existing site)
2. New WWTP Site (three potential options for locations were evaluated)
3. Regional Treatment at YCUA (three potential options for discharge locations)
4. Combined Regional Treatment at YCUA and Existing WWTP

The following is a summary of the alternatives developed and evaluated with the City staff. Each alternative is discussed within its own section and opinions of cost presented. Opinions of cost are presented in terms of both capital costs and life-cycle costs expressed as present worth. These costs are detailed further in Appendices B and C. Cost opinions are presented with costs for both the wastewater treatment and the cost for sewer/pumping costs to transmit the wastewater from the existing sewer system to a new location.

Also within each section is a discussion of noneconomic factors which may be considered when evaluating each alternative.

4.3 EXPAND EXISTING WWTP (ALTERNATIVE 1)

This alternative assumes that treatment capacity at the existing WWTP will be expanded. This alternative was developed to include an evaluation for completing all the expansion work at the existing site and a second evaluation where land west of Monroe Street was obtained and an expansion of the facility was constructed there along with modifications to some of the existing processes on the current WWTP site.

4.3.1 Expand at Existing Site (Alternative 1A)

This alternative consists of utilizing the existing WWTP site location and expanding the WWTP capacity by changes to treatment technology and construction of the new tanks and installation of new equipment. Specifics of this alternative include:

- Construction of new influent pump station adjacent to existing pump station on WWTP site with $\frac{1}{4}$ -inch mechanical bar screens and connect to existing forcemain to the grit building.
- Construct additional grit removal tank.
- Construct two new primary clarifier tanks in the location of the previously abandoned trickling filters. The existing primary clarifier tank mechanism will be replaced.
- The existing rotating biological contactors would be replaced with activated sludge treatment system including aeration tanks with fine bubble diffuser, blowers to supply air to the system and pumps to return settled sludge from the final clarifiers back to the influent of the aeration tanks.
- Construct two new final clarifier tanks and replace the mechanism in the two existing tanks.
- Expand the existing tertiary filters and UV disinfection systems with new equipment.

- For this alternative, the city would continue the current biosolids handling approach to utilize digestion of biosolids with land application for disposal as the city has a functional digester. Additional biosolids storage capacity would be constructed. To increase digester capacity, a biosolids thickening system would be installed to thicken the biosolids before they are pumped to the digester. This would increase the digester retention time and also reduce the biosolids storage volume requirement.

This alternative addresses most of the improvements identified within the 2019 Asset Management Plan. Thus, there would be few future rehabilitation projects for the legacy equipment but at a lower investment than shown in Table 3-2. Figure 3 includes a process schematic of how the plant layout may occur followed by Figure 4 which shows a site plan with improvements identified.

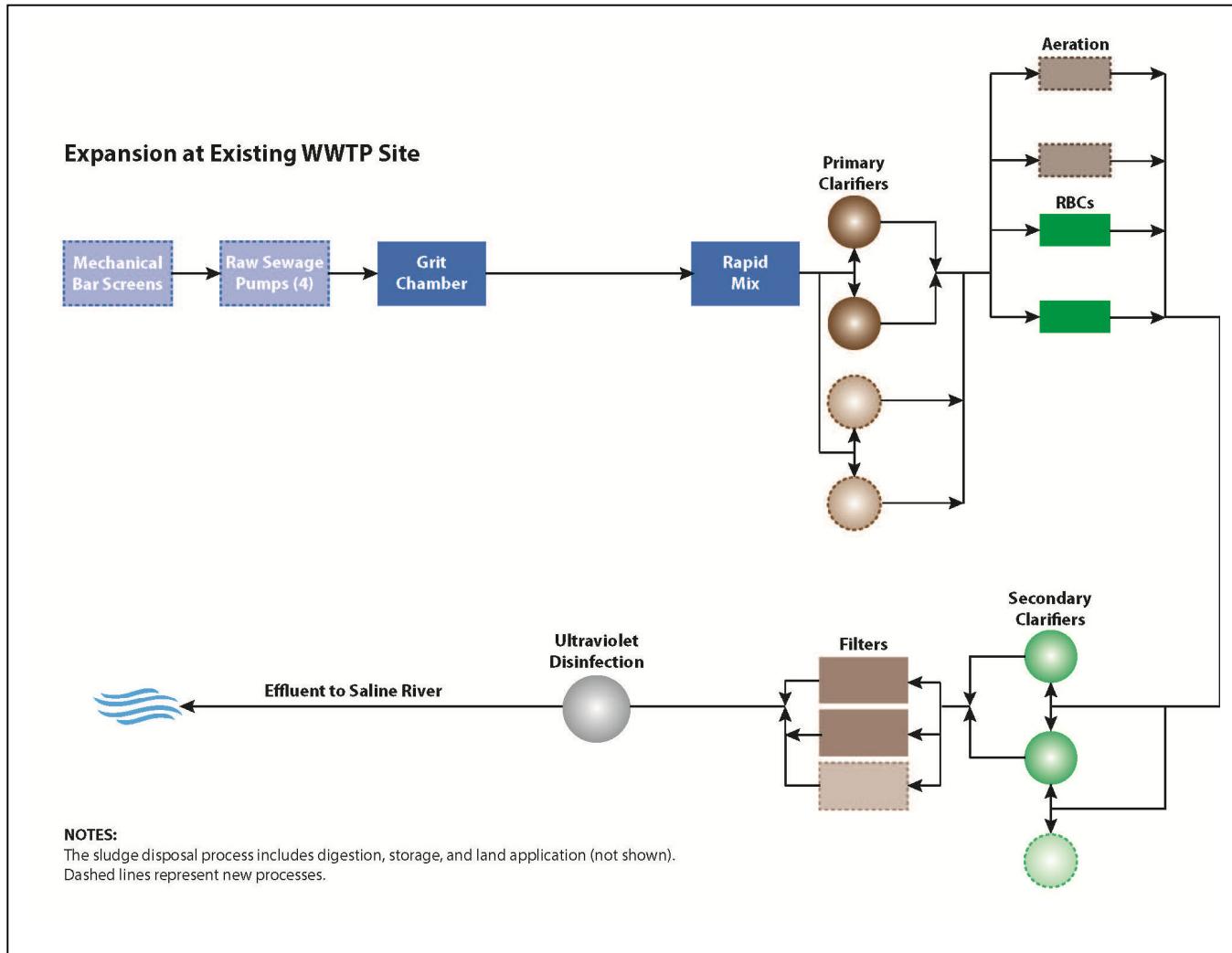


Figure 3 – WWTP Process Flow Diagram for Expansion at Existing WWTP Site

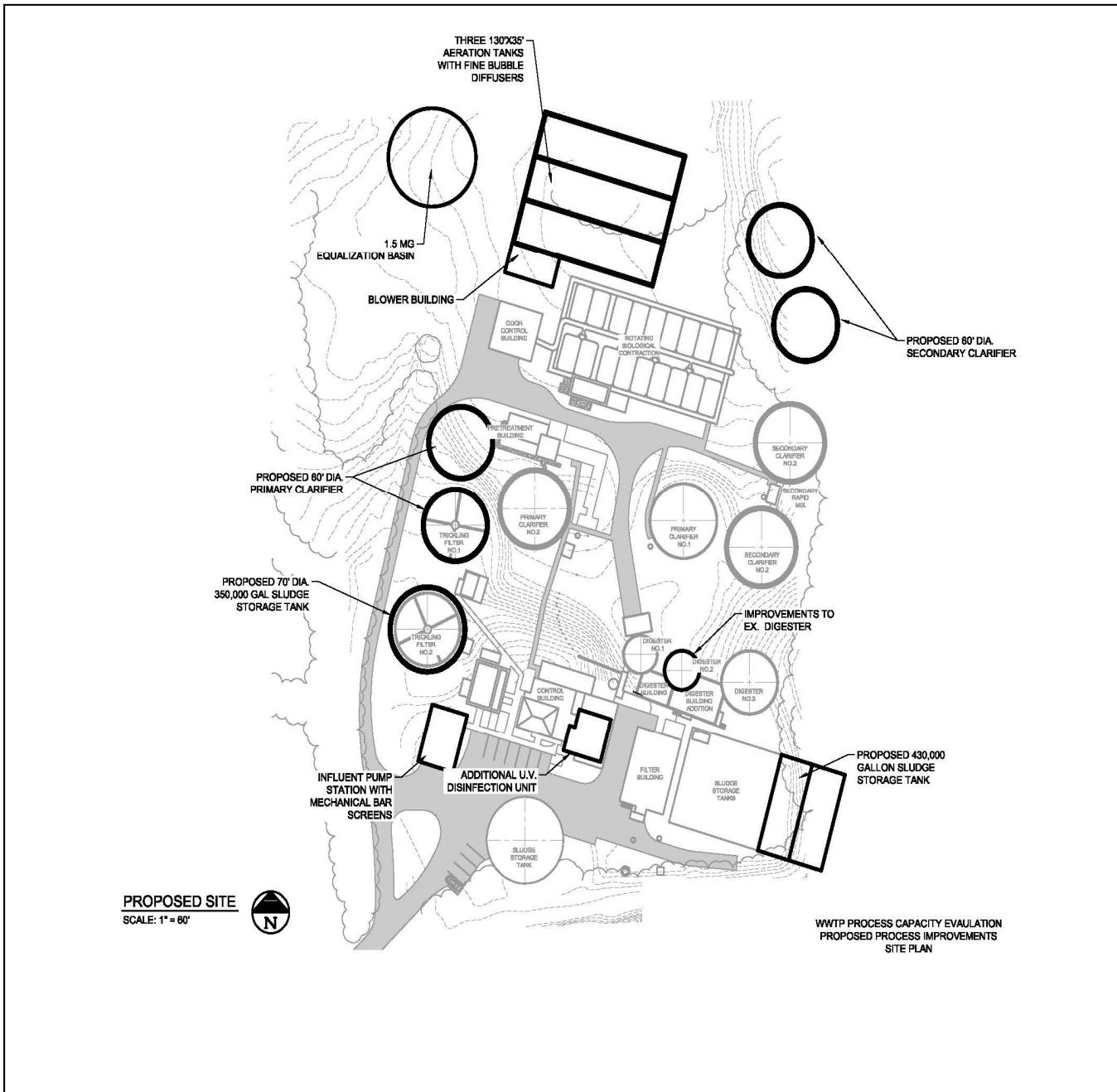


Figure 4 – Expansion at Existing Location Site Plan

Advantages/Disadvantages for Alternative 1A:

- Advantages for this alternative includes:
 - Uses existing infrastructure value
 - Do not need to locate a new site
 - No conveyance improvements needed as the present WWTP site is used
 - Located above 100-year floodplain
 - Proven electrical supply and road system
- Disadvantages for this alternative includes:
 - Residents near existing WWTP do not want facility to remain there
 - New process construction would move treatment processes even closer to residents
 - Located upwind of Saline (odor concern)
 - The system would still be utilizing a large portion of the existing aged infrastructure and would need to be rehabilitated.
 - Continues to use an aged treatment plant
 - Unknown regulatory future of digestion and land application of biosolids
 - This alternative is the most challenging and risky in terms of sequencing construction as it requires all processes to remain in operation during construction
 - Construction traffic and noise will impact adjacent residents

Table 4-3 - Alternative 1A - Capital and Life-cycle Costs

Component	Capital Cost ¹	Present Worth Cost
WWTP Expansion	\$75,674,000	
Transmission	\$0	
TOTAL	\$75,674,000	\$85,265,000

¹Capital cost includes costs to sustain WWTP as determined in Saline's Asset Management Plan

4.3.2 Expand Across Monroe Street (Alternative 1B)

As the existing WWTP site is small and located close to residences, this alternative assumes that new treatment processes will be constructed on vacant property west of Monroe Street. Specifics of this alternative include:

- Construction of new influent pump station adjacent to existing pump station on WWTP site with ¼-inch mechanical bar screens and connect to existing force main to the grit building.
- Construct additional grit removal tank.
- Convert the two existing secondary clarifier to primary clarifiers. Install covers on the tanks for odor control. The existing primary clarifier tank mechanism will be replaced.
- Flow from the primary clarifier tanks will be conveyed to the west side of Monroe St.
- Construct activated sludge treatment system including aeration tanks with fine bubble diffuser, blowers to supply air to the system and pumps to return settled sludge from the final clarifiers back to the influent of the aeration tanks on the west side of Monroe. The blower building would also house chemical feed storage tanks and feed system.

- Construct four new final clarifier tanks.
- Construct new tertiary treatment and UV disinfection building to house cloth filter units and UV equipment.
- An effluent sewer will be constructed from the UV equipment to the existing outfall to the Saline River on the east side of the Monroe.
- The existing digester system would remain in operation.
- New biosolids dewatering building would be constructed to house dewatering equipment and dumpsters for the disposal of dewatered cake at a landfill.
- A new administrative and maintenance building would be constructed on the new portion of the WWTP site.

This alternative addresses most of the improvements identified within the 2019 Asset Management Plan. Thus, there would be few future rehabilitation projects for the legacy equipment. Figure 5 includes a process schematic and Figure 6 a layout of where the plant processes may be located.

One point of discussion for this alternative is that the City does not presently own the property west of Monroe Street. This property has groundwater contamination resulting from its prior ownership by Hoover/Johnson Controls and the property's use for metal plating. EGLE databases indicate that the site is contaminated with various metals and PFAs. Should the City further consider this site, evaluation of the financial impact of this contamination should be evaluated including whether to purchase or lease the land.

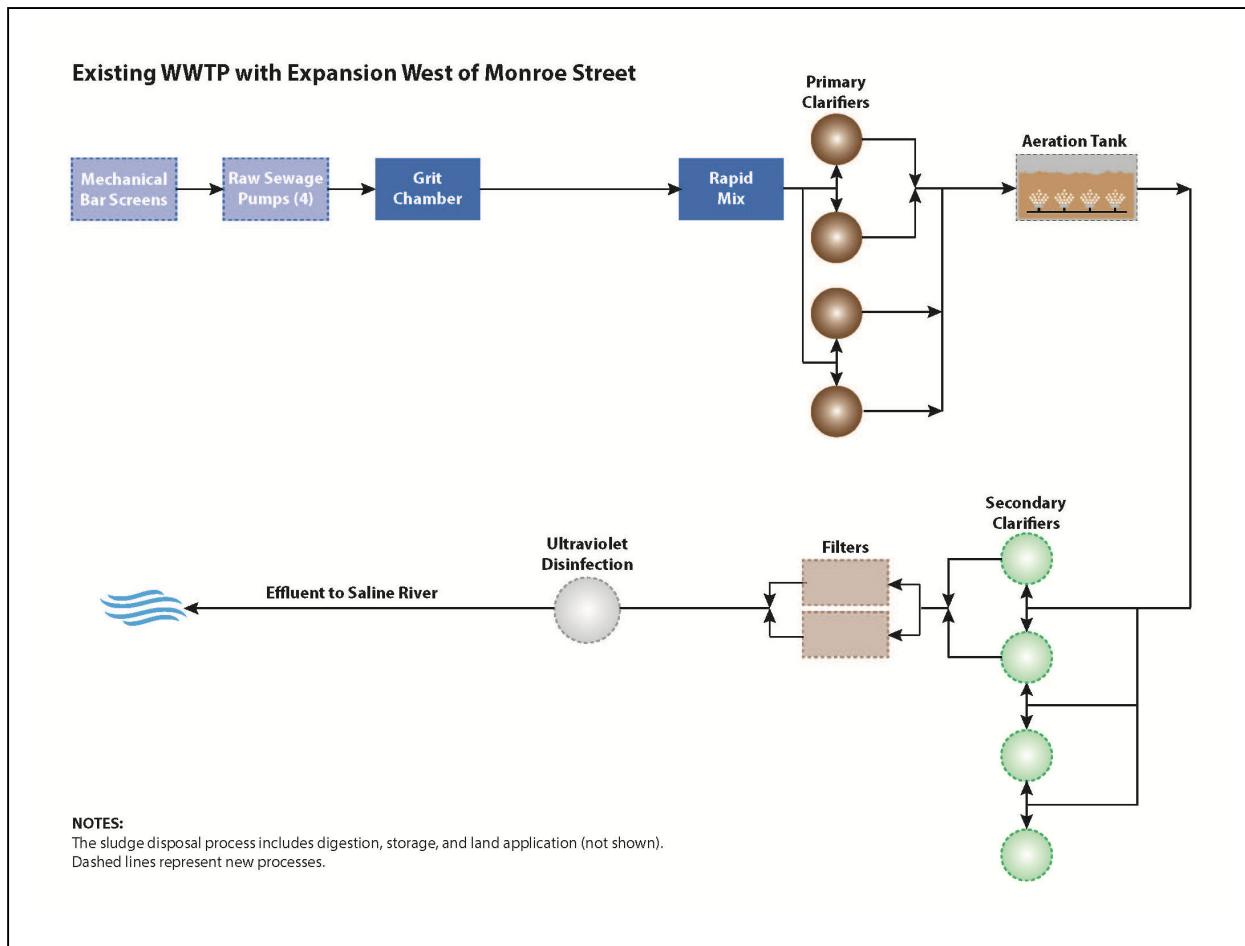


Figure 5 - Process Flow Schematic for Existing WWTP with Expansion West of Monroe Street

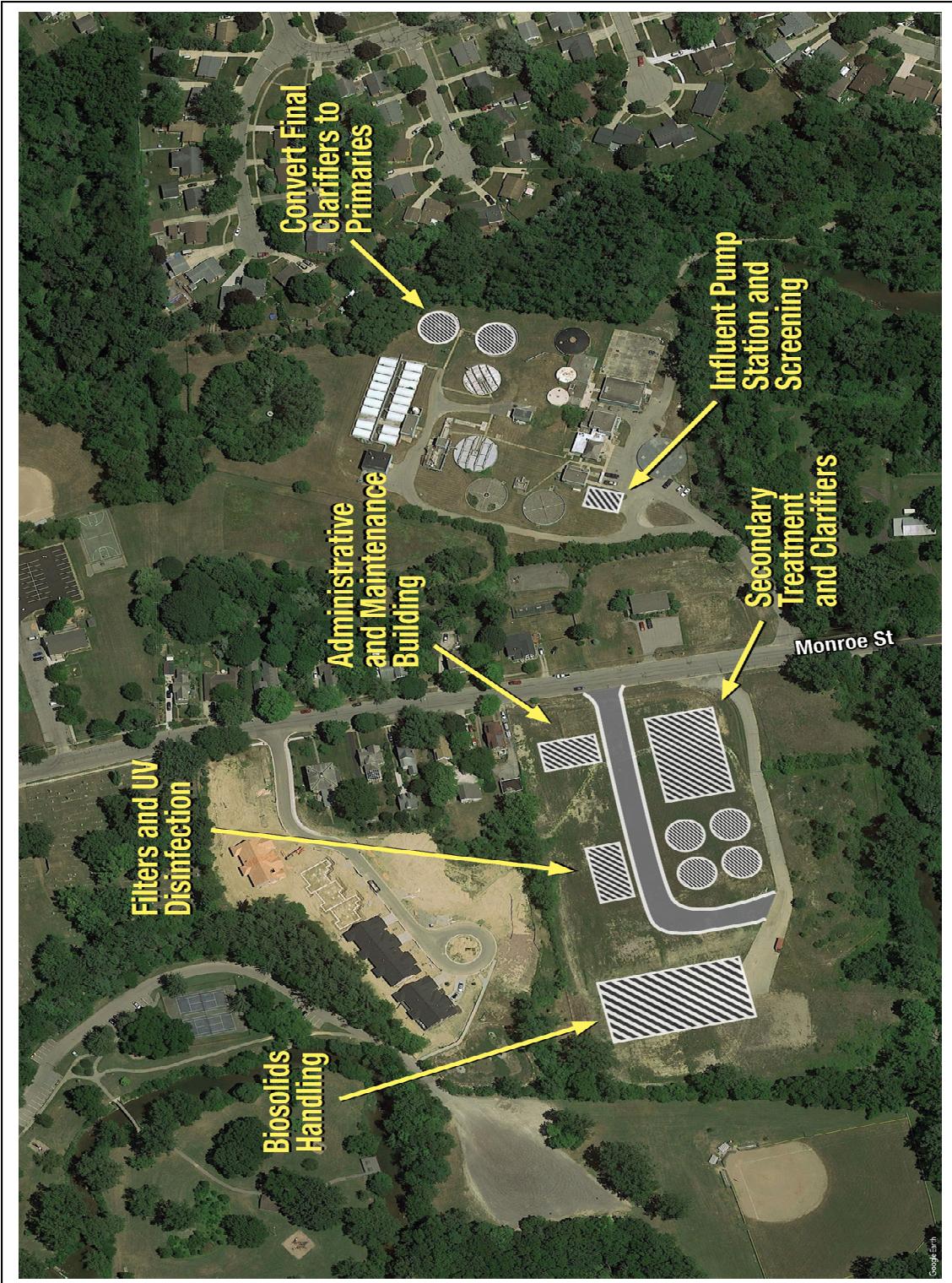


Figure 6 – Existing WWTP with Expansion Across Monroe Street Site Plan

Advantages/Disadvantages for Alternative 1B:

- Advantages for this alternative includes:
 - Uses existing infrastructure value (i.e. Odor Control Equipment)
 - Do not need to locate a new site
 - No conveyance improvements needed as the present WWTP site is used
 - Proven electrical supply and road system
- Disadvantages for this alternative includes:
 - Residents near existing WWTP do not want facility to remain there
 - Located upwind of Saline (odor concern)
 - New property west of Monroe is not presently zoned for industrial use
 - There are groundwater/soil contamination concerns on the property west of Monroe. The financial impacts of this in the future cannot be accurately quantified in this study
 - While most of site appears to be above floodplain, a more detailed survey will be needed to determine useable portion of parcel
 - Continues to use an aged WWTP
 - Roads south of WWTP are County Normal Routes with seasonal roads with weight restrictions
 - Some construction sequencing challenges and their risks will be present
 - Construction traffic and noise will impact adjacent residents

Table 4-4 - Alternative 1B - Capital and Life-cycle Costs

Component	Capital Cost ¹	Present Worth Cost
WWTP Expansion	\$76,003,000	
Transmission	\$0	
TOTAL	\$76,003,000	\$82,508,000

¹Capital cost includes costs of sustain WWTP as determined in Saline's Asset Management Plan

4.4 NEW WWTP SITES (ALTERNATIVE 2)

Constructing a new WWTP would likely involve the City purchasing land outside the City limit and developing a site through the community's site plan development process. This study performs a preliminary evaluation of regions (identified as study areas on figures) and discusses the advantages and disadvantages of each. A representative parcel is depicted in each figure for the purpose of calculating cost opinions but should not be considered to be a definitive parcel for construction. Selecting a specific parcel was not an objective of this study and is not advantageous for Saline to lock into a single parcel at this stage. By evaluating sites as a region, Saline will have flexibility to discuss the potential with government officials and multiple land owners without being committed to a single parcel. This will ensure the City has alternate approaches should a preferred parcel within a region be unavailable.

4.4.1 Conceptual Treatment Process

Determining specific treatment processes is a step typically left for a preliminary design and not at a conceptual study. Table 4-2 listed process components assumed for a new WWTP site primarily for the purpose of assigning representative costs. Tetra Tech estimates that a new WWTP will require a site of approximately 10 to 15 acres. Cost opinions have been developed using 15 acres. A flow schematic depicting these processes is shown in Figure 7.

The biosolids handling approach for this alternative includes biosolids thickening and dewatering system with dewatered biosolids disposal at a landfill. This would replace the existing digestion system and sludge storage tanks for land application that is utilized currently because the cost to construct a new digester system is not cost effective when compared to landfill disposal. However, without the digestion component, the biosolids are not stabilized for odor and pathogens and this may limit the number of landfill location that will accept the dewatered cake. The solids handling facility will require odor control systems to contain odors from the material.

A detailed biosolids management plan should be developed to evaluate the alternatives for solids handling with the future selected alternative.

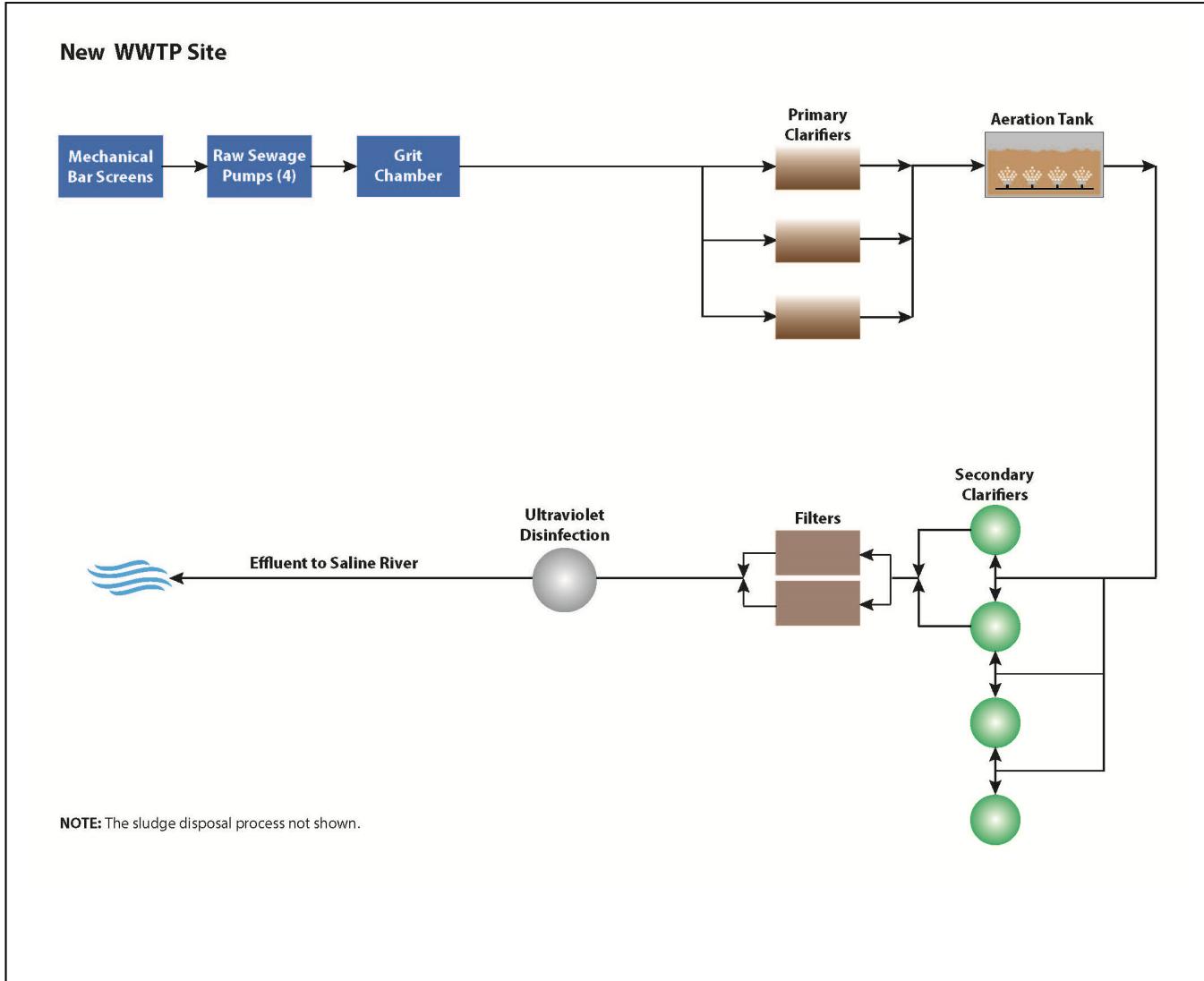


Figure 7 – Process Flow Schematic for New WWTP Sites

4.4.2 Discussion of Potential Sites

4.4.2.1 West (Alternative 2A)

This alternative involves locating a new WWTP along the Saline River, south of Saline Waterworks Road in Lodi Township. A WWTP in this location would require the existing WWTP site to be converted to a pump station and a new force main (approximately 24-inches in diameter) run to the WWTP site. This alternative is depicted in Figure 8.

Advantages/Disadvantages for Alternative 2A:

- Advantages for this alternative includes:
 - Located within the Lodi Township UDA. This should be advantageous to locate a treatment facility in an area planned for development.
 - Most of study area (north portion of area) appears to be on ground higher than 100-year floodplain
 - Site is located near a substation and dual power feeds. Dual feeds makes electrical service reliable and could eliminate the need for backup power
 - Existing WWTP would remain in service while new site is being constructed reducing risk of upsets during construction
- Disadvantages for this alternative includes:
 - Located at a higher elevation than the existing WWTP, requiring the wastewater to be pumped a long distance
 - Located upstream of Mill Pond. Often, EGLE will require a higher level of nutrient treatment for discharges upstream of impoundments
 - Located upwind of Saline (odor concern)
 - Lodi Township's land use plan calls for the area to be suburban residential and rural residential. Thus, variances to the plan will need to be obtained and a plant will be located near future residences.
 - Saline Waterworks Road is a Township road prohibited from through trucks

Table 4-5 - Alternative 2A - Capital and Life-cycle Costs

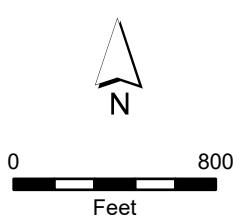
Component	Capital Cost	Present Worth Cost
WWTP	\$79,803,000	
Transmission	\$14,573,000	
TOTAL	\$94,376,000	\$92,700,000

4.4.2.2 South (Alternative 2B)

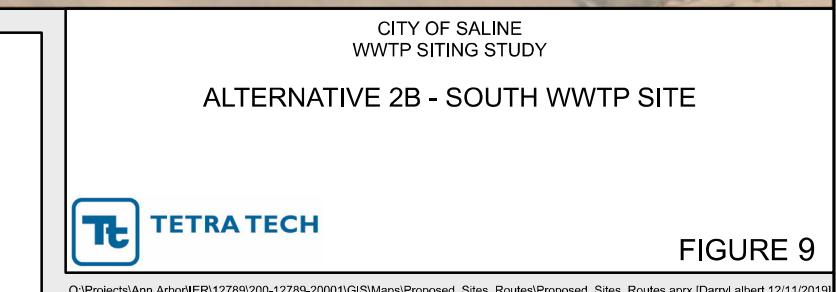
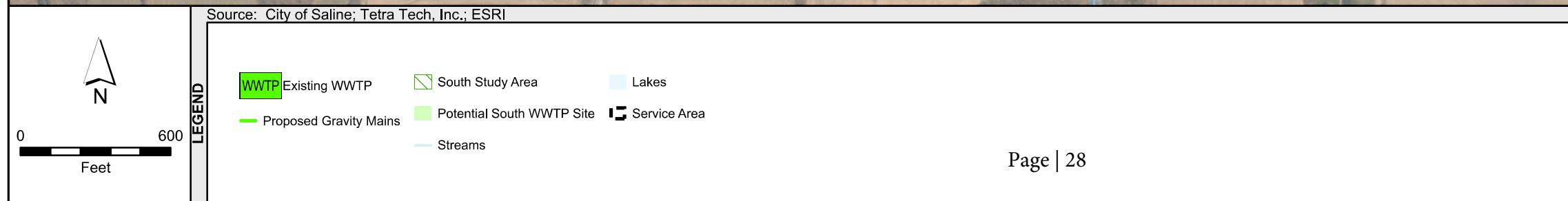
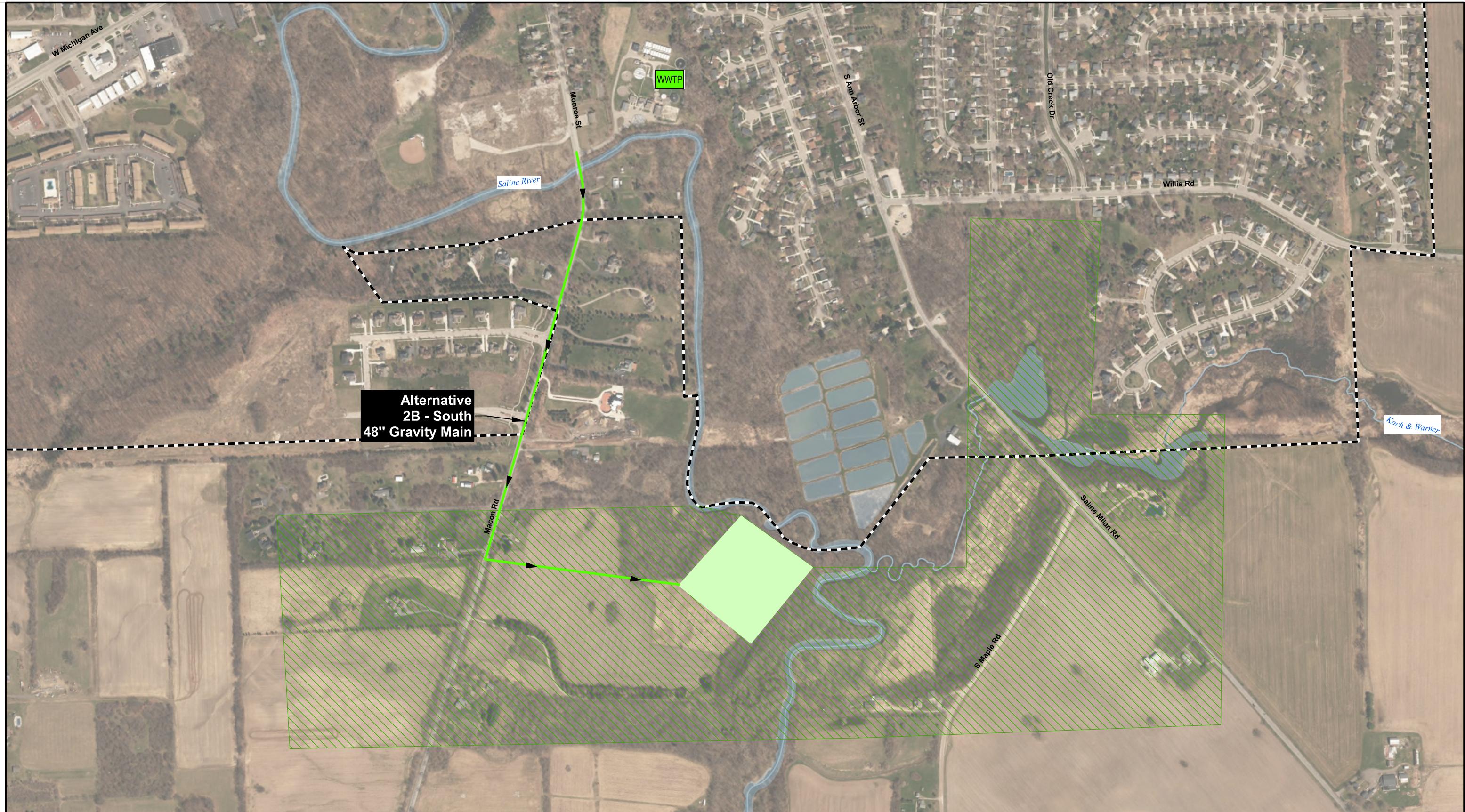
This alternative involves locating a new WWTP along the Saline River, adjacent to Saline-Milan Road in Saline or York Townships. A 48-inch gravity sewer is identified to convey wastewater from the existing WWTP location to the new site. This alternative is depicted in Figure 9.



Source: City of Saline; Tetra Tech, Inc.; ESRI



LEGEND	■ Existing WWTP ■ North Study Area ■ Lakes — Proposed Force Mains ■ Service Area — Streams
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Advantages/Disadvantages for Alternative 2B:

- Advantages for this alternative includes:
 - Western portion of region is located within the Saline Township UDA. It should be advantageous to locate a treatment facility in an area planned for development.
 - Located at a lower elevation than the current WWTP making conveyance with a gravity sewer possible. The short distance away from the existing WWTP makes this the least costly alternative to convey wastewater.
 - Area west of Saline River appears to be ground higher than the 100-year floodplain elevation
 - Existing WWTP would remain in service while new site is being constructed reducing risk of upsets during construction
- Disadvantages for this alternative includes:
 - The Saline Township (west of Maple Road) master plan identifies this area for rural residential, suburban residential and open space (floodplain). Locating in a planned residential area will bring challenges. The portion east of Maple is within York Township and it is zoned Essential Agricultural. It would appear easier to locate a treatment plant within an area otherwise used as agricultural.
 - Macon Road is a County Normal Route with seasonal road with weight restrictions
 - Electrical service along Macon does not appear to be viable to support a WWTP. An extension of approximately 0.25 miles from a higher capacity area north may be needed.

Table 4-6 - Alternative 2B - Capital and Life-cycle Costs

Component	Capital Cost	Present Worth Cost
WWTP	\$79,803,000	
Transmission	\$9,944,000	
TOTAL	\$89,747,000	\$89,792,000

4.4.2.3 East (Alternative 2C)

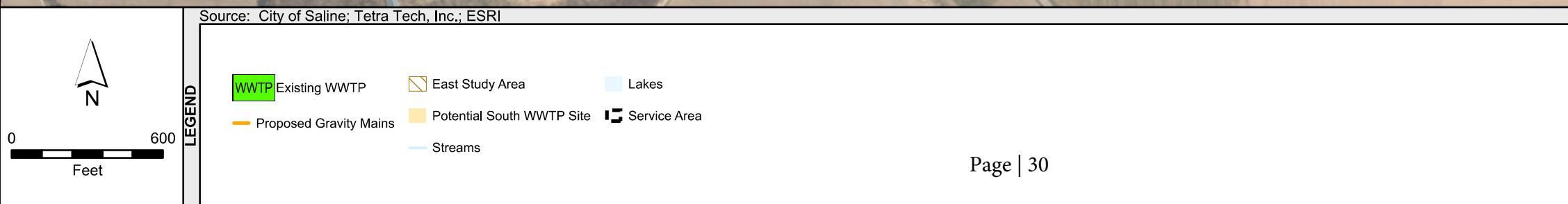
This alternative involves locating a new WWTP along the Koch & Warner Drain, adjacent to Willis Road in York Township. A 48-inch gravity sewer is proposed to convey wastewater to this new site. This alternative is depicted in Figure 10.

Advantages/Disadvantages for Alternative 2C:

- Advantages for this alternative includes:
 - Located at a lower elevation than the current WWTP making gravity sewer conveyance less expensive
 - Electrical service along Willis appears able to support a WWTP. A single feed may necessitate backup power



Source: City of Saline; Tetra Tech, Inc.; ESRI



CITY OF SALINE
WWTP SITING STUDY

ALTERNATIVE 2C - EAST WWTP SITE



FIGURE 10

- Disadvantages for this alternative includes:
 - Located farther from the existing WWTP than the South alternative making conveyance more expensive
 - The area south of the Drain is zoned Planned Unit Development. The area north of the Drain is mostly zoned Interim Agricultural. Areas both north and south of the Drain seem destined to have residential development in the future and pose the same obstacles to locating a new plant.
 - Portions of Willis Road are Township Roads restricted from through truck traffic
 - York Township flood hazards are not mapped and additional analysis regarding floodplain impacts would be needed as part of next evaluation steps
 - A discharge to the Koch Warner Drain may have more restrictive permit limits than a discharge to the Saline River

Table 4-7 - Alternative 2C - Capital and Life-cycle Costs

Component	Capital Cost	Present Worth Cost
WWTP	\$79,802,000	
Transmission	\$16,108,000	
TOTAL	\$95,910,000	\$92,658,000

4.5 REGIONAL APPROACH (ALTERNATIVE 3)

The regional approach primarily involves Saline contracting with the Ypsilanti Community Utilities Authority (YCUA) for wastewater treatment. YCUA already provides wastewater treatment for numerous communities in Washtenaw and Wayne Counties including Saline's eastern neighbor, Pittsfield Township. YCUA's wastewater treatment plant is located over 12 miles from Saline, northwest of the intersection of Rawsonville Road and I-94.

On October 22, 2019, representatives of YCUA met with Saline staff and Tetra Tech to discuss conceptual costs to connect to YCUA. Some key results of that discussion include:

- YCUA does not have an "up front" connection fee. Rather, Saline would be required to assume an annual portion of YCUA's debt service for the existing WWTP. This is based on a contract capacity (average flow basis) and YCUA may consider starting at a smaller capacity and increasing in the future should growth occur. YCUA estimates this annual cost would be \$303,000 annually for 3.0 mgd of capacity. This fee will vary annually as debt service changes. YCUA did not envision any significant changes in this rate in the near future.
- Saline would pay an annual O&M cost of \$1,395,000 based on 1.50 mgd of flow. This prorates to \$2,790,000 for 3.0 mgd of flow. This fee will increase with inflation and YCUA feels a typical increase is less than 2 or 3 percent.
- The nearest location where YCUA accepts wastewater is at the intersection of Michigan Avenue and Munger Road. Saline would be required to deliver wastewater to this location. YCUA felt that their receiving sewer was adequately sized to accept Saline's flow but would need to evaluate that in more detail if Saline was interested in further exploring treatment at YCUA.

Pittsfield Township is an existing customer of YCUA and has a major trunk sewer along US-12. Pittsfield is planning for a major rehabilitation and replacement of this sewer line in 2021 between Platt Road and Munger. Pittsfield would be interested in having Saline discharge to its sewer system and share in the cost of this replacement. Pittsfield is not yet able to share a cost sharing plan but is estimating the cost of its Phase I (east of Platt) at \$25 million. In discussions with Pittsfield's consultants, wastewater would need to be delivered along US-12 east of the railroad (approximately Warner Road) to get to a point where gravity sewer service could occur.

Alternatively, Saline could build its own conveyance through Pittsfield to the US-12 and Munger intersection, but Saline would be responsible for 100% of this cost.

By contracting for treatment with YCUA, Saline would decommission its existing WWTP. A pump station and screening facility would be constructed at or near the existing WWTP site. The analysis reflects a lower operations and maintenance cost for this pump station. The existing wastewater staff would be reduced in size but Saline would still need operators to troubleshoot the pump station and manage the screenings.

There are several conveyance routing options to deliver wastewater to this location and are further described below with their cost analyses. The alternatives assume a single pump station at the WWTP will be constructed. While the pumping distances discussed are manageable, during the next phase of evaluation, the City may wish to evaluate if costs could be reduced by constructing two pump stations with each having smaller energy requirements. The City should also consider connecting other pump stations along the route to the force main. However, doing so would require major electrical and pump upgrades and is likely not cost effective to do until a major pump station reconstruction is needed.

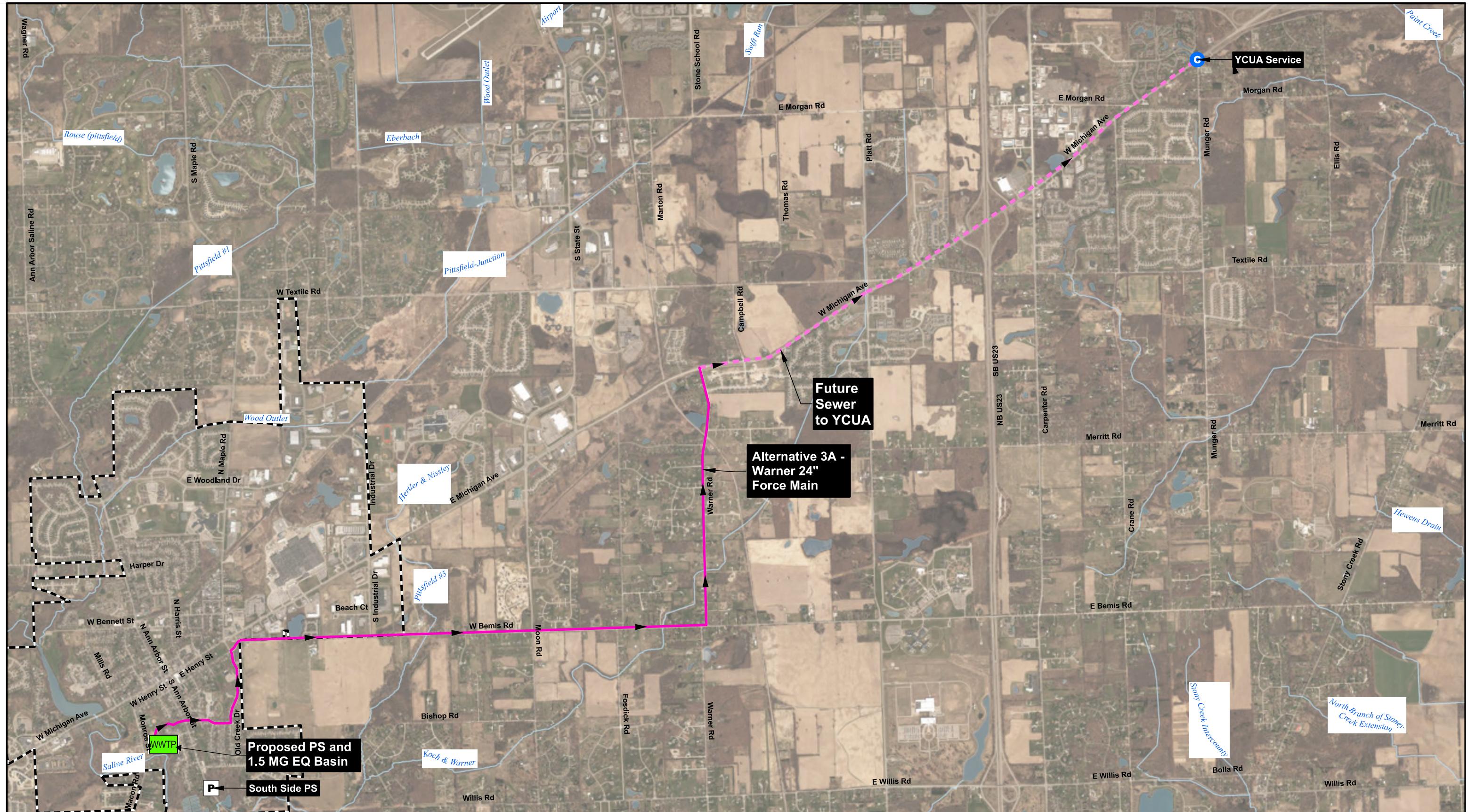
4.5.1 Pumped Discharge at Michigan Avenue and Warner (Alternative 3A)

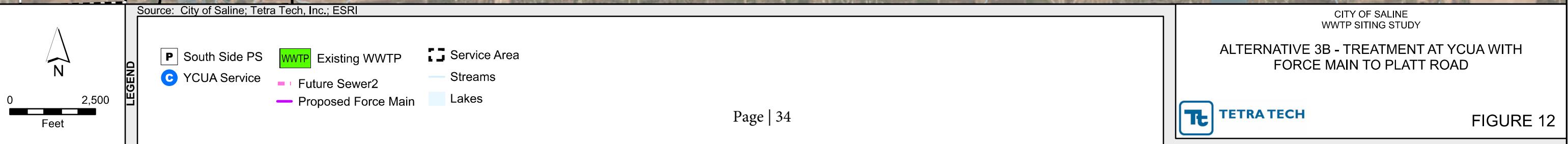
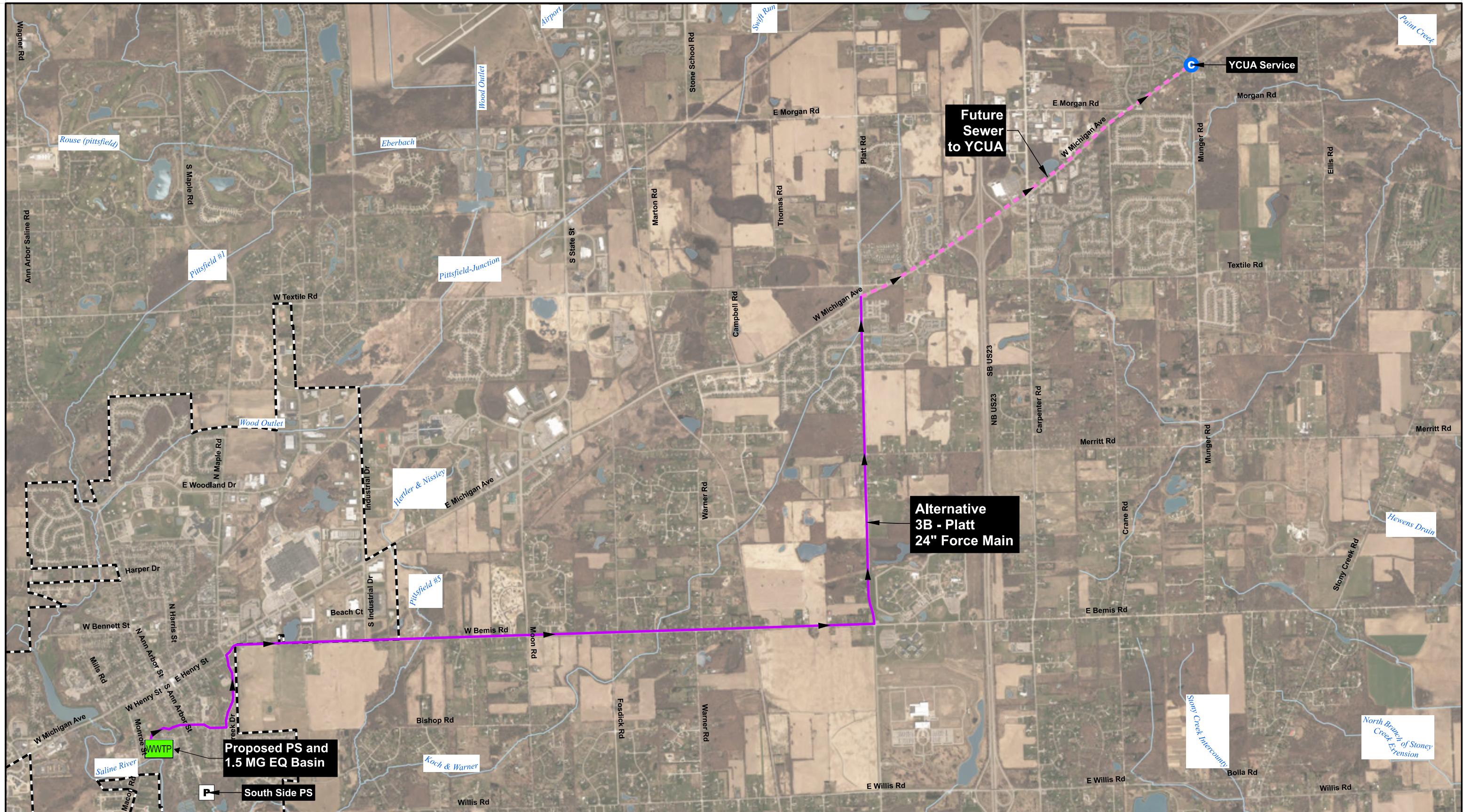
Figure 11 shows construction of a new force main to the intersection of Michigan Avenue and Warner Road. Pittsfield has a long-term plan to improve the sewer east of this location all the way to the YCUA connection and Saline could split the cost of this improvement with Pittsfield.

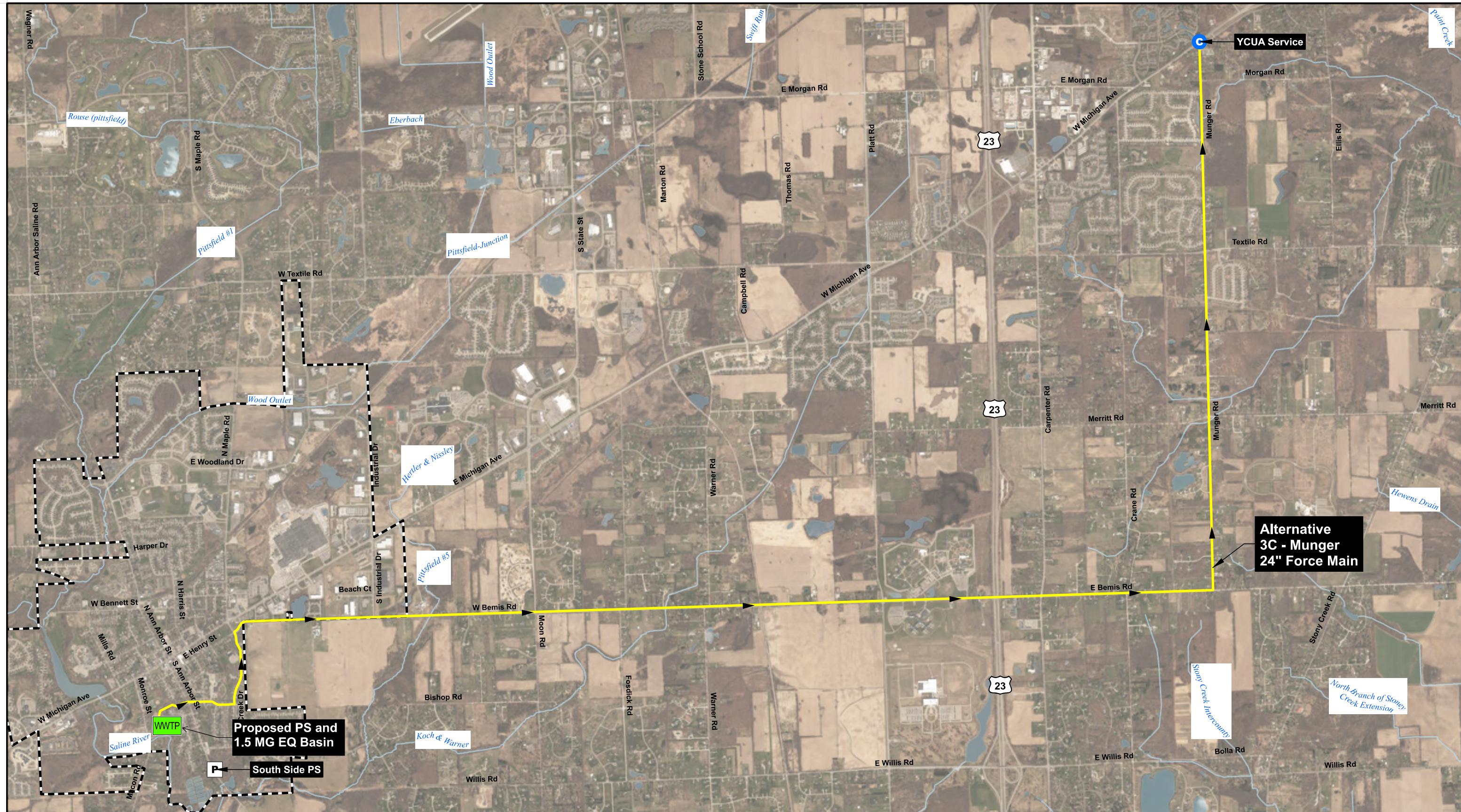
Pittsfield has only assigned a cost to the portion of this route east of Platt and has not yet proposed a cost for Saline to share. This analysis assumes Pittsfield will wish to split the cost at 50% and the per foot cost between Warner and Platt is the same as the per foot cost between Platt and Munger. This analysis also neglects any O&M costs charged by Pittsfield Township as these cannot be known until negotiation occurs.

Table 4-8 - Alternative 3A - Capital and Life-cycle Costs

Component	Capital Cost	Present Worth Cost
WWTP (Pump)	\$20,456,000	
Transmission	\$66,104,000	
TOTAL	\$86,560,000	\$103,134,000







Source: City of Saline; Tetra Tech, Inc.; ESRI



A scale bar showing distances from 0 to 2,500 feet. The bar is divided into four segments by vertical tick marks, with the first segment labeled '0' and the last segment labeled '2,500'. Below the bar, the word 'Feet' is written.

500

- The legend includes:
- South Side PS (Blue square)
- YCUA Service (Red circle)
- WWTP (Green square)
- Proposed Force Mains (Yellow line)
- Service Area (Black square)
- Streams (Light blue line)
- Lakes (Light blue area)

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ALTERNATIVE 3C - TREATMENT AT YCUA WITH FORCE MAIN TO MUNGER ROAD



FIGURE 13

4.5.2 Pumped Discharge at Michigan Avenue and Platt (Alternative 3B)

Figure 12 shows construction of a new force main to the intersection of Michigan Avenue and Platt. Pittsfield has a calendar year 2021 plan to improve the sewer east of this location all the way to the YCUA connection and Saline would split the cost of this improvement with Pittsfield. This analysis assumes Pittsfield will wish to split the cost at 50%. This analysis also neglects any O&M costs charged by Pittsfield Township as these cannot be known until negotiation occurs.

Table 4-9 - Alternative 3B - Capital and Life-cycle Costs

Component	Capital Cost	Present Worth Cost
WWTP (Pump)	\$20,456,000	
Transmission	\$73,354,000	
TOTAL	\$93,810,000	\$106,288,000

4.5.3 Pumped Discharge at Michigan Avenue and Munger (Alternative 3C)

Figure 13 shows construction of a new force main to the intersection of Michigan Avenue and Munger Road. With this conveyance alternative, Saline would not need to participate in cost sharing with Pittsfield.

Table 4-10 - Alternative 3C - Capital and Life-cycle Costs

Component	Capital Cost	Present Worth Cost
WWTP (Pump)	\$20,456,000	
Transmission	\$74,386,000	
TOTAL	\$94,842,000	\$106,475,000

Advantages/Disadvantages for Alternative 3:

- The advantages to joining YCUA would include the following:
 - No procurement of new land for wastewater treatment
 - Fewer facilities to operate and maintain. The residents surrounding the existing WWTP would not be inconvenienced by noise or odor.
 - Minimal “up front” costs charged by YCUA
 - The needed facilities could be constructed with minimal risk during construction
- The disadvantages would include the following:
 - Significant wastewater conveyance improvements will be needed
 - Saline would become a YCUA customer and lose some control over setting its wastewater costs and controlling discharges from industrial users
 - Higher annual costs than operating its own WWTP
 - There would be noise and traffic impacts around WWTP property to construct new pump station

4.6 COMBINED EVALUATION (REGIONAL TREATMENT AND SALINE TREATMENT – ALTERNATIVE 4)

The Saline City Council inquired about the potential to maintain their existing WWTP up to its capacity and contract with YCUA for treatment for flow rates above that capacity. The original concept was that the eastern portion of the City could be pumped to YCUA.

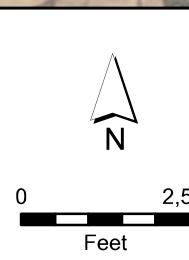
Upon reviewing the significant growth plans along the western edge of the existing City, the proposed UDA will consume a significant portion of the existing WWTP's capacity. Therefore, the flow to be diverted would need to occur very close to the existing WWTP to capture enough flow to allow the existing WWTP to function within its current capacity. For the purpose of this analysis, we have assumed that most of the UDA will be diverted to the City's exiting Westbelt sewer and this sewer will be diverted near Michigan Avenue and Monroe Street.

A pump station would be constructed and pumped through a force main installed along Michigan Avenue to YCUA. The pump station and force main will be smaller in size than previous alternatives. Figure 14 conceptually shows this alternative. The force main route is assumed to stay along US-12 and a higher cost to construct in this corridor is assumed. It may be possible to route the force main outside MDOT's right-of-way and reduce costs although the cost of maintaining both a WWTP and a YCUA connection will almost certainly be more costly than other alternatives.

This alternative also maintains the existing WWTP in its present configuration. Asset sustainment costs from the AMP have been included in the economic evaluation.

Advantages/Disadvantages

- The advantages to this combined treatment would include the following:
 - No procurement of new land for wastewater treatment
 - Minimal “up front” costs to YCUA
 - Utilizes the City’s existing WWTP asset
 - Construction would create negligible risks to existing WWTP operations
- The disadvantages would include the following:
 - Significant wastewater conveyance improvements will be needed
 - Saline would become a YCUA customer and lose some control over setting its wastewater costs and discharge limits from industrial customers
 - Procurement of land for pump station will be required. This may need to be located in a populated area.
 - The city will maintain both a WWTP and a major pump station
 - MDOT permitting for the force main will be challenging



CITY OF SALINE
WWTP SITING STUDY

ALTERNATE 4 - TREATMENT AT YCUA WITH
FORCE MAIN ALONG MICHIGAN AVE

TETRA TECH

FIGURE 14

O:\Projects\Ann Arbor\IER\12789\200-12789-20001\GIS\Maps\Proposed_Sites_Routes\Proposed_Sites_Routes.aprx [Darryl.albert 12/11/2019]

Table 4-11 - Alternative 4 - Capital and Life-cycle Costs

Component	Capital Cost ¹	Present Worth Cost
WWTP (Pump)	\$28,348,000	
Transmission	\$148,052,000	
TOTAL	\$176,400,000	\$135,124,000

¹Capital cost includes const to sustain WWTP as determined in Saline's Asset Management Plan

4.7 PERMITTING CONSIDERATIONS

A number of permits may be required as part of the construction and operation of the selected alternative. All alternatives would require the submittal of a Part 41 Construction permit to EGLE. A Joint Permit Application with the EGLE/Army Corps of Engineer may be required if construction will occur in wetlands, floodplains, or make changes to the stream (such as expanding or adding an outfall). The need for the Joint Permit Application cannot be adequately evaluated until an alternative and specific location are selected. This discussion will focus on NPDES permitting.

When developing NPDES Permit limits for the Saline River, EGLE currently evaluates five permittees, as summarized in Table 4-12.

Table 4-12 -NPDES Permits Near Saline

Facility	Design Flow (MGD)	Receiving Water	Comment
Saline WWTP	1.81	Saline River	Existing
River Ridge MHC/Condos-Saline	0.104	Unnamed Saline River Tributary	Existing
Saline Valley Farms WWTP	0.090	Saline River	Existing
Andelina Farms – Saline	0.078	Unnamed Saline River Tributary	Permitted Summer 2019, Not Discharging
Faust Acres	0.0386	Koch Warner Drain	Permitted Summer 2019, Not Discharging

The existing Saline WWTP is the largest discharger of the five. As noted previously, the re-issued NPDES Permit for the existing Saline WWTP (without expanded flows) is anticipated to receive a lower Total Phosphorus limit of 0.5 mg/L and be required to meet a monthly average CBOD₅ limit of 4 mg/L from May through November (as opposed to May through September currently).

A new NPDES Permit application would be required in order to apply for an expanded WWTP at the current site or a larger WWTP at a new site. As part of the application process, an antidegradation statement would be required. The antidegradation statement would require the City to demonstrate that the social and economic benefits from an expanded or new WWTP would be greater than the degradation of the receiving stream from the discharge. If the existing WWTP is retained with

additional flow sent to YCUA, an antidegradation statement and new NPDES Permit application would not be needed.

The proximity of the four other NPDES Permits could potentially result in the requirement to meet advanced wastewater treatment limits for more months of the year or a higher concentration of dissolved oxygen in the effluent, depending on the dissolved oxygen sag curve. The dissolved oxygen curve depends on the concentration and flow of the discharge, as well as the location of the discharge relative to the other discharges. The existing Saline WWTP is located downstream of the existing River Ridge MHC/Condos discharge and the potential discharge from Andelina Farms. Faust Acres will discharge along the Koch Warner Drain, which enters the Saline River downstream of the existing Saline WWTP and Saline Valley Farms is further downstream between Milkey and Mooreville Roads.

Alternative 2A, relocating the WWTP towards the west, would place the new Saline WWTP upstream of all of the dischargers. The impact on the limits would be determined by whether the dissolved oxygen curve had recovered prior to the discharges from River Ridge MCH/Condos and Andelina Farms. The new WWTP would be upstream of Mill Pond. EGLE frequently includes impoundments when determining Total Phosphorus limits. The potential for a lower than 0.5 mg/L limit with a discharge of upstream of Mill Pond is high. The proposed treatment technology, when properly operated and with the feeding of sufficient chemicals, can achieve Total Phosphorus effluent concentrations of 0.2 mg/L. However, if EGLE proposed a Total Phosphorus limit less than 0.2 mg/L, an alternate technology, such as a membrane bioreactor (MBR) would need to be considered. MBRs require less space than a conventional or extended aeration plant. However, operating costs are often higher. In addition, the membranes that ensure that the Total Suspended Solids and Total Phosphorus limits are met have a comparatively short lifespan (10 to 15 years). As the end of the equipment life span is neared, degradation in the quality of the wastewater would be expected to be observed, putting the WWTP in danger of exceeding permitted limits.

Relocating the WWTP towards the south, Alternative 2B, would place the new WWTP slightly closer to the Saline Valley Farms WWTP and further from the River Ridge MHC/Condos discharge. Whether this would result in more restrictive limits, depends on the length of the dissolved oxygen sag. It should be noted that the low flows in the Saline River in 2018 were higher than previously measured low flows in 2014, which should allow the dissolved oxygen in the River to recover more quickly, as there is a greater volume of flow in the river. There are no significant impoundments south of the existing Saline WWTP, making a lower Total Phosphorus limit unlikely.

Alternative 2C, relocating the Saline WWTP to the east, would require the new WWTP to discharge to the Koch and Warner Drain, which is significantly smaller than the Saline River. The discharge would likely cause a longer dissolved oxygen sag curve, which could result in more restrictive NPDES Permit limits (i.e., lower limits or limits in effect for a longer period of time) for CBOD₅, Ammonia-Nitrogen, or Dissolved Oxygen. In addition, the new WWTP would likely be in close proximity to the proposed discharge from Faust Acres. The interaction of the discharges on the dissolved oxygen curve could result in further restrictions on the NPDES Permit limits. In addition, there is a small impoundment on the Koch and Warner Drain upstream of the confluence with the Saline River. The presence of the impoundment was not taken into account in the development of the Faust Acres NPDES Permit. However, the new Saline WWTP would have a significantly higher flow than Faust Acres and there is a slight chance that the Total Phosphorus limit would be permitted below 0.5 mg/L.

Connecting to YCUA, Alternative 3, would not require a NPDES Permit, although the existing WWTP would likely need to be decommissioned. As part of the SRF Project Plan, an assessment of the potential for additional growth due to the presence of the sewer along US-12 would be required. The impact of the change in local limits on the three existing Significant Industrial Users would also need to be evaluated. It is likely cost effective for the City to maintain the discharge of the Saline Water Treatment Plant through its existing NPDES Permit, but the cost to send the filter backwash and reverse osmosis concentrate to YCUA should be evaluated, if this alternative is selected.

If Alternative 4, maintaining the existing WWTP and sending excess flows to YCUA, is selected, the City would need to maintain the NPDES Permit for the Saline WWTP.

5.0 ECONOMIC EVALUATION AND PROJECT SCHEDULE

5.1 ECONOMIC EVALUATION

The objective of this evaluation is to evaluate long-term alternatives for cost effective and efficient treatment of the City's wastewater flows. The evaluation of alternatives was conducted on both economic and noneconomic (such as land use plan and constructability) factors. Economic evaluations were performed on the basis of both capital cost and life-cycle costs (i.e. costs over a 20-year planning period inclusive of capital costs, annual costs, and salvage values at the end of the 20-year period). Life-cycle costs are expressed as a 20-year present worth cost which account for the time value of future costs.

A summary of the results is presented in Table 5-1:

Table 5-1 - Economic Evaluation of Alternatives

Alternative Worth Cost	Capital Cost ³	Present Worth Cost	Single-Family Home Quarterly Rate Impact
1. Existing WWTP Site ¹	\$76,003,000	\$82,508,000	\$283
2A. New WWTP (West)	\$94,376,000	\$92,700,000	\$353
2B. New WWTP (South)	\$89,747,000	\$89,792,000	\$334
2C. New WWTP (East)	\$95,910,000	\$92,658,000	\$357
3. Regional Treatment at YCUA ²	\$86,560,000	\$103,134,000	\$389
4. Combined YCUA and Existing WWTP	\$176,400,000	\$135,124,000	\$685

¹This alternative considered two different options for expanding the existing WWTP and the lowest life-cycle cost option is used in this table

²This alternative considered three different discharge locations and the least expensive in terms of both capital cost and lowest life-cycle cost is used in this table

³Capital costs in this table also include costs to sustain existing infrastructure

The economic evaluation suggests that Alternative 1 (Expanding at existing WWTP site either east or west of Monroe Street) has the lowest capital and present worth costs. Alternative 2B (constructing a new WWTP to the south) is the next lowest in terms of present worth cost.

Alternatives 1 and 2B have present worth costs within 10% of each other which is relatively close for a conceptual analysis. The Saline City Council may wish to also consider noneconomic factors such as the WWTP's proximity to residents in making a decision between these two alternatives.

Furthermore, there are some unknowns in connecting to YCUA that could reduce costs and make Alternative 3 more cost effective. For instance, if Pittsfield shared in the cost of the sewer work more than the 50% assumed in this report, this alternative could be more cost effective.

Table 5-1 also shows the approximate impact on quarterly sewer bill for a typical single family home including both debt service and operating cost changes. This value assumes the existing customer base so the quarterly rate impact will decrease as connection fees and additional users are added to the system.

It may be feasible to sequence the construction of proposed WWTP process treatment components so that the full project treatment capacity capital cost is not required with the initial improvements. This would be done by constructing only the necessary tanks and equipment to meet the current demand and a portion of the projected flows. Then, when additional growth occurs within the UDA, another WWTP expansion project would occur to construct the other tanks to provide full capacity. The precise approach would vary by alternative and would be further refined during a preliminary design stage. While such a sequenced approach would lower the initial cost, the initial cost likely would still be 80% or more of the total costs included within this report due to fixed costs (i.e. land acquisition, administration building, transmission improvements, etc.) that cannot be sequenced.

5.2 PROJECT SCHEDULE

Tetra Tech feels a design and construction schedule will look similarly for all alternatives. A nominal schedule would include one year for survey, design, permitting and construction bidding. Construction will take approximately two years for each alternative. Thus, a project will take approximately three years to implement.

The City will likely seek Michigan State Revolving Fund (SRF) loan to finance the improvements. The loan is administered by Michigan's Department of EGLE. This loan requires a detailed application (project plan) to be completed by July 1 prior to the state's next fiscal year. EGLE requests a notice of intent to be filed by April 1 in the year of the project plan's submittal. This study was initiated in October 2019 and completed in early 2020. Thus, the next opportunity to apply for this loan is with a Notice of Intent in April 2020 for Fiscal Year 2021. However, based on further dialog needed between Saline, Pittsfield Township, and YCUA, a SRF project plan submitted in 2021 for Fiscal Year 2022 is more likely. This would place the earliest construction completion in calendar year 2024.

6.0 RECOMMENDATIONS

We recommend the City of Saline further explore the feasibility of Alternatives 1, Alternative 2B and 3 (in that order) as there are additional details to be determined beyond the screening level evaluation conducted in this study. The present worth costs are similar and noneconomic factors, such as community acceptance or land availability, may drive the selection of an alternative. Working with adjacent authorities (Pittsfield Township and YCUA) requires detailed discussions regarding cost sharing. Specific answers to be sought are listed below:

Further Consideration of Expanding Existing WWTP (Alternative 1):

- This alternative has the lowest capital cost (by approximately \$14 million) and present worth cost. Would the residents adjacent to the existing WWTP be satisfied with keeping the WWTP at this location?
- Would expansion on the current parcel be satisfactory as it requires new processes closer to residents or should expanding west of Monroe be further considered?
- If expanding west of Monroe is desired, further research into the environmental responsibility for occupying the site should be performed.

Further Evaluation for New WWTP to South (Alternative 2B):

- Alternative 2B contains properties within both Saline Township and York Township. The properties within Saline Township would be preferred based on proximity and elevation above the Saline River floodplain. Are their properties potentially for sale in the area within Saline Township?
- How does Saline Township feel about locating a WWTP in that location and granting variances to current land use plans to construct a wastewater treatment plant.

Further Evaluation for Treatment at YCUA (Alternative 3) :

- Does YCUA have conveyance capacity to accept Saline's flow?
- What operating fees will Pittsfield Township charge to share trunk sewer capacity?
- What cost sharing will Pittsfield Township request for the shared trunk sewer?

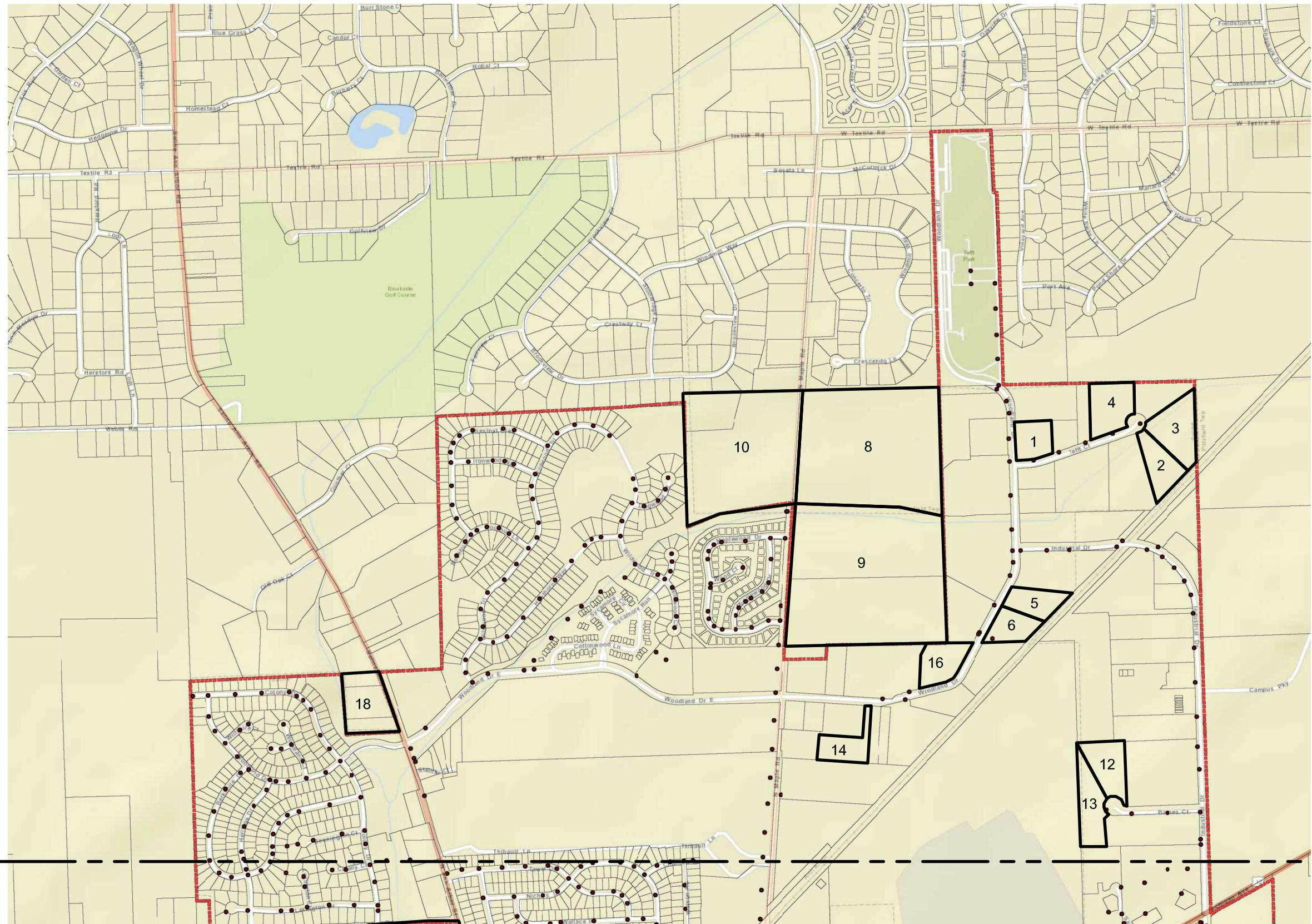
Meetings will need to be held with Saline Township, YCUA and Pittsfield Township to further evaluate these questions. Saline should plan on \$30,000 of professional fees (engineering and legal) to support these discussions. YCUA may pass along fees associated with their capacity analysis which cannot be quantified at this time.

The City should also consider conducting a detailed study on managing the biosolids at either the existing WWTP or proposed WWTP. Biosolid management is a point of concern for most wastewater utilities as the typical methods of disposing of biosolids has emerging restrictions due to the PFAS and other concerns. Furthermore, the City's existing WWTP has limited sludge storage volume. This study would further refine costs for the alternatives in this report and assist the City with managing biosolids in the interim. We suggest the City budget \$50,000 for this study.

We also recommend the City initiate discussions with its financial advisors regarding financing the future project. There may be financing approaches such as special assessment districts that allow for much of the cost of the future construction to be borne by developable properties.

APPENDIX A
GROWTH CALCULATIONS

Address of Lot	Vacant	Partial Vacant	Zone District	Current Lot Use	Area of Lot in acres	Est./Prop. # of Units	Units	Flow Per Unit	Gallons per Day (gpd)	Notes	Notes	Projected Gallons per Day (gpd)
1600 Woodland E.	Yes		I-2	vacant	5.0		Acre	1000	5,000	Redies Industrial Park, Lot 2		5,000
1314 Tett Ct.	Yes		I-2	vacant	4.0		Acre	1000	4,000	Redies Industrial Park, Lot 6		4,000
1366 Tett Ct.	Yes		I-2	vacant	5.0		Acre	1000	5,000	Redies Industrial Park, Lot 5		5,000
1255 Tett Ct.	Yes		I-2	vacant	7.0		Acre	1000	7,000	Redies Industrial Park, Lot 3		7,000
1370 Woodland E.	Yes		I-2	vacant	3.0		Acre	1000	3,000	Redies Industrial Park, Lot 12		3,000
1328 Woodland E.	Yes		I-2	vacant	4.0		Acre	1000	4,000	Redies Industrial Park, Lot 13		4,000
Maple Rd. Layher part A	Yes		PittsTwp Residents	farm	35.0		Acre	1000	35,000	Future I-2	Unannexed Layher Property 35 acres	35,000
Maple Rd. Layher part C	Yes		Pitts Twp Residents	farm	27.8	100	REU	225	22,500	Future R-1A	Unannexed Layher Property - 100 REUs in report	22,500
1270 Barnes Ct. part 1	Yes		I-2	vacant	7.8		Acre	1000	7,800			7,800
1270 Barnes Ct. part 2	Yes		I-2	vacant	2.8		Acre	1000	2,800			2,800
840 Woodland E.	Yes		I-2	vacant	3.4		Acre	1000	3,400			3,400
975 Woodland E.	Yes		I-2	vacant	3.0		Acre	1000	3,000		Saline Industries Lot 27	3,000
N. Ann Arbor Lodi Twp			Twp Residents	3 Single Family Homes		3	REU	225	675			675
175 S. Industrial	Yes		I-2	vacant	7.0		Acre	1000	7,000	Sauk Trail Business, Lot 3		7,000
1250 Beach St.	Yes		I-2	vacant	6.1		Acre	1000	6,100	Sauk Trail Business Park, Lot 12		6,100
1238 Beach St.	Yes		I-2	vacant	3.6		Acre	1000	3,600	Sauk Trail Business Park, Lot 13		3,600
1283 Beach St.	Yes		I-2	vacant	4.6		Acre	1000	4,600	Sauk Trail Business Park, Lot 15		4,600
1235 Beach St.	Yes		I-2	vacant	4.9		Acre	1000	4,900	Sauk Trail Business Lots 8-20		4,900
585 E. Mich. Ave	Yes		SPA-1	vacant	6.6		Acre	1000	6,600			6,600
210 Leutheuser	Yes		SPA-1	vacant	1.5		Acre	750	1,125			1,125
Waterworks - Lodi Twp lots	No		Twp Residents	2 churches		21	REU	225	4,725	approx 500-member congregations		4,725
Waterworks - Lodi Twp lots	No		Twp Residents	6 homes		6	REU	225	1,350			1,350
Lodi Twp, south of Breconshire City, west of Woodcreek	Yes		Twp Residents	vacant	6.2		Acre	1000	6,200			6,200
147 W. Mich Ave	Yes		D-2	vacant		32	REU	225	9,200	50 REUs in report		10,700
440 Russell	Yes		R-1A	Assisted Living	2.7		Acre	1000	2,700	32 REU plus 20,000 sft		9,200
910 Austin Dr.	Yes		R-1A	Church	7.0	10	REU	225	2,250			2,250
2275 Willis A	Yes		R-1	vacant		1	REU	225	225			225
8910 S. Ann Arbor	Yes		R-1A	vacant		1	REU	225	225			225
8900 S. Ann Arbor	Yes		R-1A	vacant		1	REU	225	225			225
Saline Twp. Macon Road	No		Twp Residents	Residents		10	REU	225	2,250			2,250
Saline Twp. Riverside Dr.	No		Twp Residents	Residents		8		225	1,800			1,800
Potential Increase in Ex User Demands									100,000			100,000
							TOTAL		278,950	Yet to be Developed Total Projection in Existing Service Area		278,950
Yes			UDA Residential Development Commercial	Acres	1916 100	REU	4,905	225 1000	1,103,616 100,000	Total UDA Projected Development		1,103,616 100,000 1,203,616
										Total Projected Development		1,482,566



PARCEL LOCATION LEGEND

PARCEL NO.
1
2
3
4
5
6
8
9
10
12
13
14
16
18

ADDRESS
 1600 WOODLAND
 1314 TETTF CT.
 1366 TETTF CT.
 1255 TETTF CT.
 1370 WOODLAND E.
 1328 WOODLAND E.
 MAPLE RD. LAYHER (PART A)
 MAPLE RD. LAYHER (PART B)
 MAPLE RD. LAYHER (PART C)
 1270 BARNES CT. (PART 1)
 1270 BARNES CT. (PART 2)
 840 WOODLAND E.
 975 WOODLAND E.
 N. ANN ARBOR LODI TWP



TETRA TECH

www.tetratech.com

710 Avis Drive, Suite 100
 Ann Arbor, Michigan 48108
 PH: 734-665-6000, FAX: 734-213-3003

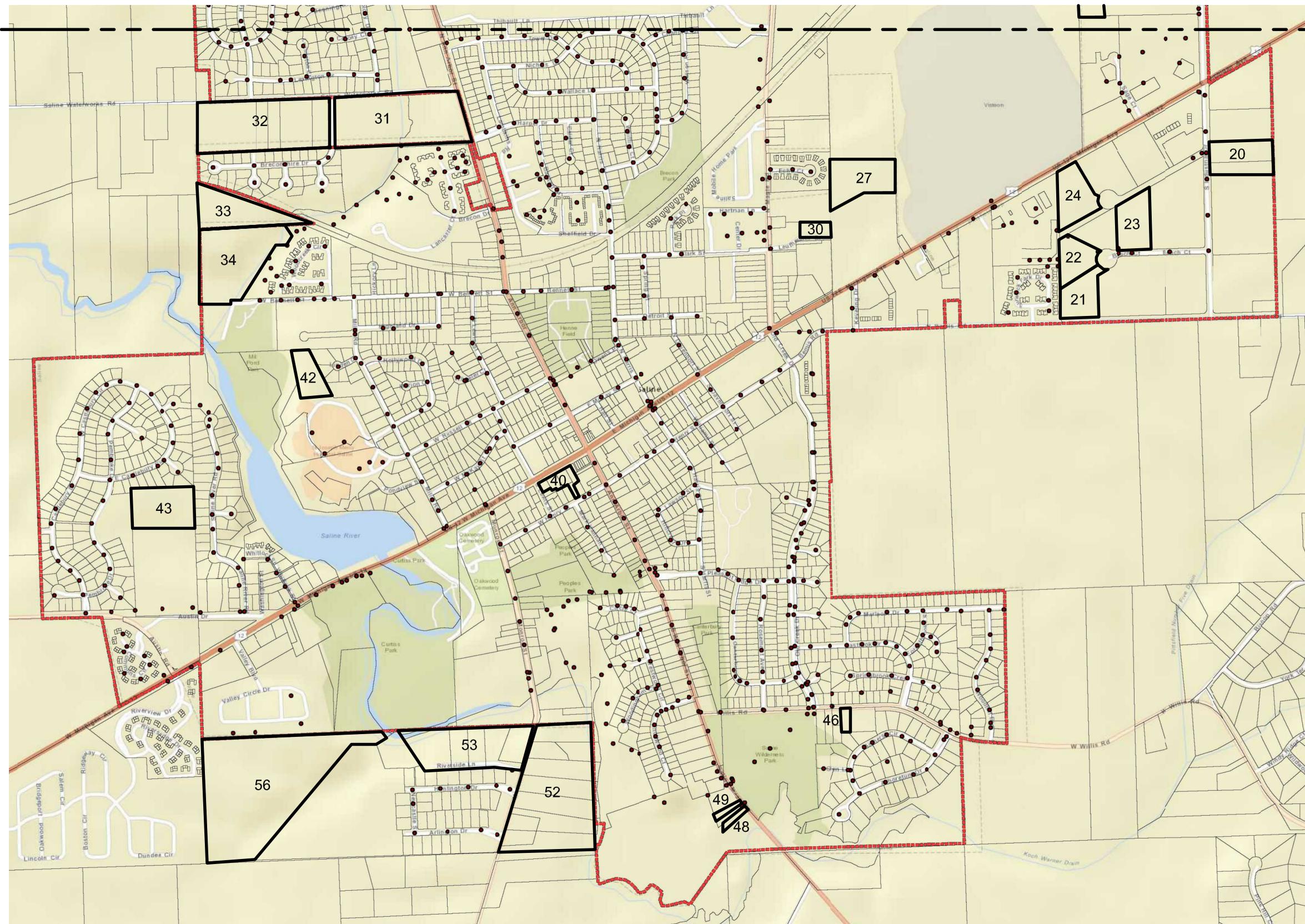
SALINE, MICHIGAN

WWTP SITING STUDY
 UNDEVELOPED PARCELS

Project No.: 200-12789-15003
 Date: 1/2/2019
 Designed By: B. BODE

FIGURE

A-1



CONTINUED ON FIG. NO. A-1

PARCEL LOCATION LEGEND

<u>PARCEL NO.</u>	<u>ADDRESS</u>
20	175 S. INDUSTRIAL
21	1250 BEACH ST.
22	1238 BEACH ST.
23	1283 BEACH ST.
24	1235 BEACH ST.
27	585 E. MICH. AVE.
30	210 LEUTHEUSER
31	WATERWORKS - LODI TWP LOTS
32	WATERWORKS - LODI TWP LOTS
33	LODI TWP, S. OF BRECONSHIRE CITY, W. OF WOODCREEK
34	147 W. MICH AVE.
40	440 RUSSELL
42	910 AUSTIN DR.
43	2275 WILLIS A
46	8910 S. ANN ARBOR
48	8900 S. ANN ARBOR
49	SALINE TWP MACON RD.
52	SALINE TWP RIVERSIDE RD.
53	HUNTINGTON PH. 3
56	



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Ann Arbor, Michigan 48108
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SALINE, MICHIGAN

WWTP SITING STUDY
UNDEVELOPED PARCELS

Project No.: 200-12789-15003

Date: 1/2/2019

Designed By: B. BODE

FIGURE

A-2

APPENDIX B
OPINIONS OF COST

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	SITE IMPROVEMENTS				
2	Land Acquisition across Monroe	0	Acre	\$20,000.00	
3	Site Clearing	0	Acre	\$10,000.00	
4	Site Grading	1	LS	\$75,000.00	\$75,000.00
5	Erosion Control	1	LS	\$25,000.00	\$25,000.00
6	Paving	1	LS	\$62,500.00	\$63,000.00
7	Site Drainage	1	LS	\$75,000.00	\$75,000.00
8	Primary Electrical Substation Upgrade	1	LS	\$750,000.00	\$750,000.00
9					
10	Contingency	30	%		\$297,000.00
11	Inflation	10	%		\$129,000.00
11	Subtotal				\$1,414,000.00
12					
13	INFLUENT SCREEN, PUMP STATION AND GRIT REMOVAL				
14					
15	Excavation and Backfill	2,963	CYD	\$25.00	\$75,000.00
16	Influent Sewer	1	LS	\$120,000.00	\$120,000.00
17	Headworks Structure	1,381	CYD	\$1,000.00	\$1,382,000.00
18	Headworks Building	2,500	SFT	\$200.00	\$500,000.00
19	Screen Equipment	2	EA	\$175,000.00	\$350,000.00
20	Compactors	2	EA	\$81,250.00	\$163,000.00
21	RS Pumps	4	EA	\$105,000.00	\$420,000.00
22	Piping and Valves	1	LS	\$210,000.00	\$210,000.00
23	RS Discharge Pipe to Ex Grit	1	LS	\$344,000.00	\$344,000.00
24					
25					
26	New Grit Tank Expansion	124	CYD	\$1,000.00	\$125,000.00
27	Grit Mechanism and Handling	1	EA	\$227,500.00	\$228,000.00
28					
29					
30					
31	Generator Replacement	1	LS	\$500,000.00	\$500,000.00
32	Mechanical	10	%		\$442,000.00
33	Electrical/Instrumentation	20	%		\$884,000.00
34	Contingency	30	%		\$1,326,000.00
35	Inflation	10	%		\$486,000.00
35	Subtotal				\$7,555,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
36					
36					
37	1.5 MG EQUALIZATION BASING				
37	1.5 MG of Storage Tank	1.5	MG	\$1,950,000.00	\$1,950,000.00
38	Site Improvements	1	LS	\$55,000.00	\$55,000.00
38	Foundation	465	CYD	\$1,000.00	\$466,000.00
39	Piping and Valves	1	LS	\$350,000.00	\$350,000.00
39					
40	Odor Control Connection	1	LS	\$75,000.00	\$75,000.00
40	Mechanical	5	%		\$145,000.00
41	Electrical/Instrumentation	10	%		\$290,000.00
41	Contingency	30	%		\$1,000,000.00
42	Inflation	10	%		\$434,000.00
42	Subtotal				\$4,770,000.00
43					
43	PRIMARY TANK REHAB AND CONSTRUCTION				
44	Concrete Rehab	1		\$250,000.00	\$250,000.00
45	Demo Trickling Filter	2		\$25,000.00	\$50,000.00
46	Site Piping	1		\$300,000.00	\$300,000.00
47	Excavation	5,954		\$25.00	\$149,000.00
48	Backfill	1,640		\$15.00	\$25,000.00
49	Concrete Structure	642		\$1,000.00	\$642,000.00
50	60' Dia. Clarifier Mechanism	4		\$200,000.00	\$800,000.00
51	Mechanism Installation	4		\$50,000.00	\$200,000.00
52	Weirs and Baffles	2		\$45,000.00	\$90,000.00
53	Cover	2		\$175,000.00	\$350,000.00
54	Primary Sludge Piping and Valve	1		\$150,000.00	\$150,000.00
55	Primary Sludge Pump	1		\$55,000.00	\$55,000.00
56					
57					
58	Mechanical	5	%		\$141,000.00
59	Electrical/Instrumentation	10	%		\$282,000.00
60	Contingency	30	%		\$1,046,000.00
61	Inflation	10	%		\$453,000.00
61	Subtotal				\$4,983,000.00
62					
63	AERATION SYSTEM IMPROVEMENTS				

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
64	Demo RBC's	1	LS	\$75,000.00	\$75,000.00
65	Excavation and Backfill	14,459	CYD	\$25.00	\$362,000.00
66	Site Piping Modifications	1	LS	\$454,000.00	\$454,000.00
67	New Aeration Tank Structure	1,817	CYD	\$1,000.00	\$1,817,000.00
68	New Aeration Equipment	1	LS	\$225,000.00	\$225,000.00
69	New Aeration Piping and Valve	1	LS	\$472,500.00	\$473,000.00
70	Gates	4	EA	\$25,000.00	\$100,000.00
71	Flow Split Structure	133	CYD	\$1,000.00	\$134,000.00
72	New Aeration Blower/RAS Building Structure	444	CYD	\$1,000.00	\$445,000.00
73	New Aeration Blower Building	3,200	SFT	\$200.00	\$640,000.00
74	New Aeration Blowers - 3,500 CFM @ 8 psi	3	EA	\$245,000.00	\$735,000.00
75	Chemical Feed System	1	LS	\$45,000.00	\$45,000.00
76	Chemical Storage Tanks	2	EA	\$25,000.00	\$50,000.00
77	Piping	1	LS	\$75,000.00	\$75,000.00
78	RAS Pump	4	EA	\$40,000.00	\$160,000.00
79	RAS Piping and Valves	1	LS	\$374,000.00	\$374,000.00
80	Ex. Blower Building Rehab	1	LS	\$125,000.00	\$125,000.00
81	Flowmeter	5	EA	\$16,000.00	\$80,000.00
82	Mechanical	10	%		\$637,000.00
83	Electrical/Instrumentation	15	%		\$956,000.00
84	Contingency	30	%		\$2,389,000.00
85	Inflation	10	%		\$1,028,000.00
85	Subtotal				\$11,379,000.00
86					
87	FINAL CLARIFIER IMPROVEMENTS - 65' DIA				
88					
89	Excavation	3,720	CYD	\$25.00	\$93,000.00
90	Backfill	1,640	CYD	\$15.00	\$24,600.00
91					
92	Concrete Structure	310	CYD	\$1,000.00	\$310,000.00
93	60' Dia. Clarifier Mechanism	4	EA	\$147,000.00	\$588,000.00
94	Mechanism Installation	4	EA	\$50,000.00	\$200,000.00
95	Weirs and Baffles	2	EA	\$87,360.00	\$174,720.00
96	Weir Cover	2	EA	\$54,600.00	\$110,000.00
97	Railing	204	LFT	\$125.00	\$26,000.00
98	Secondary Influent Pipe	1	LS	\$510,000.00	\$510,000.00
99	Secondary Effluent Pipe	1	LS	\$554,750.00	\$554,750.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
100					
101	6-inch Scum Pipe	250	LFT	\$75.00	\$18,750.00
102					
103					
104	Mechanical	3	%		\$78,000.00
105	Electrical/Instrumentation	10	%		\$261,000.00
106	Contingency	30	%		\$885,000.00
107	Inflation	10	%		\$375,000.00
107	Subtotal				\$4,209,000.00
108					
109					
110	TERTIARY FILTERS AND UV DISINFECTION				
111	Building Repairs and Improvements	1	LS	\$275,000.00	\$275,000.00
112	Sawcut existing walls	1	LS	\$12,000.00	\$12,000.00
113	20-inch Tee	3	LS	\$10,000.00	\$30,000.00
114	20-inch DI	1	LS	\$60,000.00	\$60,000.00
115					
116	20-inch SCH 80 PVC Pipe	350	LFT	\$250.00	\$88,000.00
117	20-inch SCH 80 PVC Fittings	18	EA	\$8,000.00	\$144,000.00
118	20-inch Butterfly Valve	3	EA	\$15,400.00	\$47,000.00
119	Filter Units	1	LS	\$348,000.00	\$348,000.00
120	Filter Unit Installation	1	LS	\$34,800.00	\$35,000.00
121	Equipment Pad	1	EA	\$5,000.00	\$5,000.00
122	Misc Piping and Valves	1	LS	\$20,000.00	\$20,000.00
123	Gate Replacement	1	LS	\$75,000.00	\$75,000.00
124					
125					
126	UV Piping	1	LS	\$175,000.00	\$175,000.00
127	Valves	2	EA	\$55,000.00	\$110,000.00
128					
129	UV Disinfection Equipment	2	EA	\$262,500.00	\$525,000.00
130	UV Installation	2	EA	\$75,000.00	\$150,000.00
131					
132					
133					
134	FEW Pumps	3	EA	\$45,000.00	\$135,000.00
135					

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
136					
137	Mechanical	15	%		\$336,000.00
138	Electrical/Instrumentation	15	%		\$294,000.00
139	Contingency	30	%		\$860,000.00
140	Inflation	10	%		\$345,000.00
140	Subtotal				\$4,069,000.00
141					
142	SOLIDS HANDLING				
143					
144	Solids Thickening Equipment	2	EA	\$180,000.00	\$360,000.00
145	Thickener Installation	2	EA	\$54,000.00	\$108,000.00
146	Feed Pump	2	EA	\$45,000.00	\$90,000.00
147	Chemical Feed and Storage	1	LS	\$110,000.00	\$110,000.00
148	Piping and Valves	1	LS	\$150,000.00	\$150,000.00
149					
150					
151	<i>30-feet Diameter Digester Modifications</i>				
152					
153	Tank Modifications	1	LS	\$67,500.00	\$67,500.00
154	Mixing Equipment	1	LS	\$156,250.00	\$156,250.00
155	Mixing Pumps	1	LS	\$67,500.00	\$67,500.00
156	Piping	1	LS	\$75,000.00	\$75,000.00
157	Valves	1	LS	\$30,000.00	\$30,000.00
158	Misc. Components	1	LS	\$50,000.00	\$50,000.00
159					
160					
161	<i>Circular 350,000 gal Sludge Storage Tank</i>				
162					
163					
164	Excavation/Backfill	4,361	LS	\$25.00	\$110,000.00
165	8-inch Sludge Pipe	300	LFT	\$350.00	\$105,000.00
166	Valves	1	LS	\$75,000.00	\$75,000.00
167					
168	Concrete Structure	440	CYD	\$1,000.00	\$439,600.00
169					
170					
171	<i>Rectangular 430,000 gal Sludge Storage Tank Expansion</i>				

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
172					
173	Excavation/Backfill	2,133	LS	\$25.00	\$54,000.00
174	Concrete Structure	658	CYD	\$1,000.00	\$658,000.00
175					
176					
177	<i>1.3 MG Offsite Sludge Storage</i>				
178					
179	Land Acquisition	1	AC	\$20,000.00	\$20,000.00
180	Site Improvements	1	LS	\$50,000.00	\$50,000.00
181	Excavation	1	LS	\$50,000.00	\$50,000.00
182	1.3 MG Storage Tank	1	LS	\$3,900,000.00	\$3,900,000.00
183	Piping and Valves	1	LS	\$125,000.00	\$125,000.00
184					
185	Subtotal				\$6,851,000.00
186					
187					
188	Mechanical	10	%		\$686,000.00
189	Electrical/Instrumentation	10	%		\$686,000.00
190	Contingency	30	%		\$2,467,000.00
191	Inflation	10	%		\$1,069,000.00
191	Subtotal				\$11,760,000.00
192					
193					
194	ADMINISTRATION BUILDING RENOVATION				
195					
196					
197					
198	Building Updates	3,000	SFT	\$175.00	\$525,000.00
199	Lab Equipment	1	LS	\$250,000.00	\$250,000.00
200	Office Equipment	1	LS	\$150,000.00	\$150,000.00
199					
200					
201	Mechanical	20	%		\$185,000.00
202	Electrical/Instrumentation	20	%		\$185,000.00
203	Contingency	30	%		\$389,000.00
204	Inflation	10	%		\$169,000.00
204	Subtotal				\$1,860,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Expand WWTP on Existing Site - Alternate 1A

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
205					
206					
207					
208					
209					
210					
211					
TOTAL CONSTRUCTION COST					\$51,999,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Expand WWTP adjacent to Existing Location - Alternate 1B

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	SITE IMPROVEMENTS				
2	Land Acquisition across Monroe	8	Acre	\$20,000.00	\$160,000.00
3	Site Clearing	8	Acre	\$10,000.00	\$80,000.00
4	Site Grading	1	LS	\$150,000.00	\$150,000.00
5	Erosion Control	1	LS	\$55,000.00	\$55,000.00
6	Paving	1	LS	\$125,000.00	\$125,000.00
7	Site Drainage	1	LS	\$150,000.00	\$150,000.00
8	Primary Electrical Substation Upgrade	1	LS	\$750,000.00	\$750,000.00
9	Demo RBC's	1	LS	\$75,000.00	\$75,000.00
10	Contingency	30	%		\$464,000.00
11	Inflation	10	%		\$185,000.00
12	Subtotal				\$2,194,000.00
13					
14	1.5 MG Equalization Basin				
15					
16	1.5 MG of Storage Tank	1.5	MG	\$1,950,000.00	\$1,950,000.00
17	Site Improvements	1	LS	\$55,000.00	\$55,000.00
18	Foundation	465	CYD	\$1,000.00	\$466,000.00
19	Piping and Valves	1	LS	\$350,000.00	\$350,000.00
20					
21	Odor Control Connection	1	LS	\$75,000.00	\$75,000.00
22	Mechanical	5	%		\$145,000.00
23	Electrical/Instrumentation	10	%		\$290,000.00
24	Contingency	30	%		\$1,000,000.00
25	Inflation	10	%		\$434,000.00
26	Subtotal				\$4,765,000.00
27					
28					
29	INFLUENT SCREEN, PUMP STATION AND GRIT REMOVAL				
30					
31	Excavation and Backfill	2,963	CYD	\$25.00	\$75,000.00
32	Influent Sewer	1	LS	\$120,000.00	\$120,000.00
33	Headworks Structure	1,381	CYD	\$1,000.00	\$1,382,000.00
34	Headworks Building	2,500	SFT	\$200.00	\$500,000.00
35	Screen Equipment	2	EA	\$175,000.00	\$350,000.00
36	Compactors	2	EA	\$81,250.00	\$163,000.00
37	RS Pumps	4	EA	\$105,000.00	\$420,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Expand WWTP adjacent to Existing Location - Alternate 1B

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
38	Piping and Valves	1	LS	\$210,000.00	\$210,000.00
39	RS Discharge Pipe to Ex Grit	1	LS	\$344,000.00	\$344,000.00
40					
41					
42	New Grit Tank Expansion	124	CYD	\$1,000.00	\$125,000.00
43	Grit Mechanism and Handling	1	EA	\$227,500.00	\$228,000.00
44					
45					
46					
47	Generator	1	LS	\$500,000.00	\$500,000.00
48	Mechanical	10	%		\$442,000.00
49	Electrical/Instrumentation	20	%		\$884,000.00
50	Contingency	30	%		\$1,326,000.00
51	Inflation	10	%		\$486,000.00
51	Subtotal				\$7,555,000.00
52					
53					
54	PRIMARY TANK REHAB AND CONVERT SECONDARY TANKS				
55					
56	Site Piping	1	LS	\$350,000.00	\$350,000.00
57	Remove Secondary Mechanism	2	EA	\$10,000.00	\$20,000.00
58	Primary Tank Mechanism	4	EA	\$147,000.00	\$588,000.00
59	Tank Covers	2	EA	\$175,000.00	\$350,000.00
60	Primary Sludge Pump	2	EA	\$55,000.00	\$110,000.00
61	Piping and Valves	1	LS	\$125,000.00	\$125,000.00
62	Primary Effluent Pipe to New Portion of WWTP	1	LS	\$860,000.00	\$860,000.00
63	Primary Sludge to Digester	1	LS	\$55,000.00	\$55,000.00
64					
65	Mechanical	5	%		\$123,000.00
66	Electrical/Instrumentation	10	%		\$246,000.00
67	Contingency	30	%		\$849,000.00
68	Inflation	10	%		\$368,000.00
68	Subtotal				\$4,044,000.00
69					
70	AERATION SYSTEM IMPROVEMENTS				
71	Excavation and Backfill	14,459	CYD	\$25.00	\$362,000.00
72					

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Expand WWTP adjacent to Existing Location - Alternate 1B

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
73	Site Piping Modifications	1	LS	\$454,000.00	\$454,000.00
74	New Aeration Tank Structure	1,817	CYD	\$1,000.00	\$1,817,000.00
75	New Aeration Equipment	1	LS	\$225,000.00	\$169,000.00
76	New Aeration Piping and Valve	1	LS	\$517,500.00	\$389,000.00
77	Gates	4	EA	\$25,000.00	\$100,000.00
78	Flow Split Structure	133	CYD	\$1,000.00	\$134,000.00
79	New Aeration Blower/RAS Building Structure	611	CYD	\$1,000.00	\$612,000.00
80	New Aeration Blower Building	5,000	SFT	\$200.00	\$1,000,000.00
81	New Aeration Blowers - 3,500 CFM @ 8 psi	3	EA	\$245,000.00	\$735,000.00
82	Chemical Feed System	1	LS	\$20,000.00	\$20,000.00
83	Chemical Storage Tanks	2	EA	\$25,000.00	\$50,000.00
84	Piping	1	LS	\$45,000.00	\$45,000.00
85	RAS Pump	4	EA	\$40,000.00	\$160,000.00
86	RAS Piping and Valves	1	LS	\$374,000.00	\$374,000.00
87	Yard Piping (Clarifiers to AT)	1	LS	\$993,500.00	\$994,000.00
88	Flowmeter	5	EA	\$16,000.00	\$80,000.00
89	Mechanical	5	%		\$375,000.00
90	Electrical/Instrumentation	15	%		\$1,125,000.00
91	Contingency	30	%		\$2,699,000.00
92	Inflation	10	%		\$1,134,000.00
92	Subtotal				\$12,828,000.00
93					
94	FINAL CLARIFIER IMPROVEMENTS - 65' DIA				
95	Excavation	11,909	CYD	\$25.00	\$298,000.00
96	Concrete Structure	1,921	CYD	\$1,000.00	\$1,922,000.00
97	Mechanism	4	EA	\$147,000.00	\$588,000.00
98	Wier and Baffles	4	EA	\$87,360.00	\$350,000.00
99	Weir Cover	4	EA	\$54,600.00	\$219,000.00
100	Railing	816	LFT	\$125.00	\$103,000.00
101					
102	Effluent Pipe to Filters	1	EA	\$522,000.00	\$522,000.00
103					
104					
105	Mechanical	3	%		\$121,000.00
106	Electrical/Instrumentatoin	10	%		\$401,000.00
107	Contingency	30	%		\$1,358,000.00
108	Inflation	10	%		\$559,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Expand WWTP adjacent to Existing Location - Alternate 1B

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
108	Subtotal				\$6,441,000.00
109					
110					
111	TERTIARY FILTERS AND UV DISINFECTION				
112					
113	Excavation	867	CYD	\$25.00	\$22,000.00
114	Concrete Structure	228	CYD	\$1,000.00	\$228,000.00
115	Building	3,900	SFT	\$200.00	\$780,000.00
116	Disc Filter Units	3	EA	\$406,250.00	\$1,219,000.00
117	Piping and Valve	1	LS	\$250,000.00	\$250,000.00
118	UV Units	3	EA	\$125,000.00	\$375,000.00
119	FEW Pumps	3		\$45,000.00	\$135,000.00
120					
121	Effluent Pipe to Ex Outfall	1	EA	\$850,000.00	\$850,000.00
122					
123					
124	Mechanical	5	%		\$193,000.00
125	Electrical/Instrumentation	15	%		\$579,000.00
126	Contingency	30	%		\$1,390,000.00
127	Inflato	10	%		\$600,000.00
127	Subtotal				\$6,621,000.00
128					
129	SOLIDS HANDLING				
130	Dewatering Building Excavation	933	CYD	\$25.00	\$23,333.33
131	Dewatering Building Structure	304	CYD	\$1,000.00	\$304,444.44
132	Dewatering Building	4,200	SFT	\$200.00	\$840,000.00
133	Dewatering Equipment	2	LS	\$385,000.00	\$770,000.00
134	Installation	2	LS	\$75,000.00	\$150,000.00
135	Conveyors	2	LS	\$100,000.00	\$200,000.00
136	Piping and Valves	1	LS	\$170,000.00	\$170,000.00
137	Pumps	2	EA	\$35,000.00	\$70,000.00
138	Chemical Feed and Storage	1	LS	\$125,000.00	\$125,000.00
139	Recycle Pumps	2	EA	\$45,000.00	\$90,000.00
140	Pipe from Digesters	1	LS	\$549,600.00	\$549,600.00
141	Thickening Equipment	1		\$250,000.00	\$250,000.00
142	Odor Control Equipment	1		\$175,000.00	\$175,000.00
143					

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
LOCATION: _____
BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
WORK: Expand WWTP adjacent to Existing Location - Alternate 1B

DATE: 12/26/2019
PROJECT NO. 200-12789-20001
ESTIMATOR: BGB
CHECKED BY: _____
CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
144	Mechanical	3	%		\$112,000.00
145	Electrical/Instrumentation	10	%		\$372,000.00
146	Contingency	30	%		\$1,261,000.00
147	Inflation	10	%		\$544,000.00
147	Subtotal				\$6,010,000.00
148					
149					
150	ADMINISTRATION BUILDING				
151					
152	Excavation	1,185	\$25.00		\$30,000.00
153	Building Structure	299	\$1,000.00		\$300,000.00
154	Building Structure	4,000	\$250.00		\$1,000,000.00
155	Lab Equipment	1	\$250,000.00		\$250,000.00
156	Office Equipment	1	\$150,000.00		\$150,000.00
155					
156					
157	Mechanical	5	%		\$87,000.00
158	Electrical/Instrumentation	15	%		\$260,000.00
159	Contingency	30	%		\$624,000.00
160	Inflation	10	%		\$268,000.00
160	Subtotal				\$2,970,000.00
161					
162					
163					
164					
165					
166					
167					
TOTAL CONSTRUCTION COST					\$53,428,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Construct New WWTP at New Locaiton - Alternative 2

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	SITE IMPROVEMENTS				
2	Land Acquisition	15	AC	\$20,000.00	\$300,000.00
3	Site Grading	1	LS	\$125,000.00	\$125,000.00
4	Erosion Control	1	LS	\$55,000.00	\$55,000.00
5	Paving	1	LS	\$250,000.00	\$250,000.00
6	Site Drainage	1	LS	\$200,000.00	\$200,000.00
7	Primary Electrical Substation	1	LS	\$1,500,000.00	\$1,500,000.00
8	Utilities	1	LS	\$150,000.00	\$150,000.00
9	Removal of Ex Equipment and Structures at Ex. WWTP	1	LS	\$1,500,000.00	\$1,500,000.00
10	Contingency	30	%		\$1,224,000.00
11	Inflation	10	%		\$501,000.00
11	Subtotal				\$5,805,000.00
12					
13	INFLUENT SCREEN, PUMP STATION AND GRIT REMOVAL				
14					
15	Excavation and Backfill	2,963	CYD	\$25.00	\$75,000.00
16	Influent Sewer	1	LS	\$60,000.00	\$60,000.00
17	Headworks Structure	1,381	CYD	\$1,000.00	\$1,382,000.00
18	Headworks Building	2,500	SFT	\$200.00	\$500,000.00
19	Screen Equipment	2	EA	\$175,000.00	\$350,000.00
20	Compactors	2	EA	\$81,250.00	\$163,000.00
21	RS Pumps	4	EA	\$105,000.00	\$420,000.00
22	Piping and Valves	1	LS	\$310,000.00	\$310,000.00
23	RS Discharge Pipe to Primary Tank	1	LS	\$384,000.00	\$384,000.00
24	Grit Tanks with Vortex at Ex Grit Tanks	199	CYD	\$1,000.00	\$199,000.00
25	Grit Mechanism and Handling	2	EA	\$227,500.00	\$455,000.00
26					
27	24,000 SCFM Odor Control	1	LS	\$175,000.00	\$175,000.00
28					
29	Generator	1		\$500,000.00	\$500,000.00
30	Mechanical	10	%		\$498,000.00
31	Electrical/Instrumentation	20	%		\$995,000.00
32	Contingency	30	%		\$1,492,000.00
33	Inflation	10	%		\$548,000.00
33	Subtotal				\$8,506,000.00
34					
34	1.5 MG Equalization Basin				

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Construct New WWTP at New Locaiton - Alternative 2

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
35					
35	1.5 MG of Storage Tank	1.5	MG	\$1,950,000.00	\$1,950,000.00
36	Site Improvements	1	LS	\$55,000.00	\$55,000.00
36	Foundation	465	CYD	\$1,000.00	\$466,000.00
37	Piping and Valves	1	LS	\$350,000.00	\$350,000.00
37					
38	Odor Control Connection	1	LS	\$75,000.00	\$75,000.00
38					
39	Mechanical	5	%		\$145,000.00
39	Electrical/Instrumentation	10	%		\$290,000.00
40	Contingency	30	%		\$1,000,000.00
40	Inflation	10	%		\$434,000.00
41	Subtotal				\$4,765,000.00
41					
42					
42	PRIMARY TANK				
43	Excavation	10,000	CYD	\$25.00	\$250,000.00
44	Site Piping	1	LS	\$155,000.00	\$155,000.00
45	Primary Tank Structure	2,200	CYD	\$1,000.00	\$2,200,000.00
46	Primary Tank Mechanism	3	EA	\$253,500.00	\$761,000.00
47					
48	Primary Sludge Pump	3	EA	\$55,000.00	\$165,000.00
49	Piping and Valves	1	LS	\$250,000.00	\$250,000.00
50					
51	24,000 CFM Odor Control Replacement	1	LS	\$325,000.00	\$325,000.00
52	Mechanical	10	%		\$411,000.00
53	Electrical/Instrumentation	10	%		\$411,000.00
54	Contingency	30	%		\$1,479,000.00
55	Inflation	10	%		\$616,000.00
55	Subtotal				\$7,023,000.00
56					
57	AERATION SYSTEM IMPROVEMENTS				
58	Excavation and Backfill	14,459	CYD	\$25.00	\$362,000.00
59					
60	Site Piping Modifications	1	LS	\$454,000.00	\$454,000.00
61	New Aeration Tank Structure	1,817	CYD	\$1,000.00	\$1,817,000.00
62	New Aeration Equipment	1	LS	\$225,000.00	\$169,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan

LOCATION: _____

BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL

WORK: Construct New WWTP at New Locaiton - Alternative 2

DATE: 12/26/2019

PROJECT NO. 200-12789-20001

ESTIMATOR: BGB

CHECKED BY: _____

CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
63	New Aeration Piping and Valve	1	LS	\$517,500.00	\$389,000.00
64	Gates	4	EA	\$25,000.00	\$100,000.00
65	Flow Split Structure	133	CYD	\$1,000.00	\$134,000.00
66	New Aeration Blower/RAS Building Structure	611	CYD	\$1,000.00	\$612,000.00
67	New Aeration Blower Building	5,000	SFT	\$200.00	\$1,000,000.00
68	New Aeration Blowers - 3,500 CFM @ 8 psi	3	EA	\$245,000.00	\$735,000.00
69	Chemical Feed System	1	LS	\$20,000.00	\$20,000.00
70	Chemical Storage Tanks	2	LS	\$25,000.00	\$50,000.00
71	Piping	1	LS	\$155,000.00	\$155,000.00
72	RAS Pump	4	EA	\$40,000.00	\$160,000.00
73	RAS Piping and Valves	1	LS	\$374,000.00	\$374,000.00
74	Yard Piping (Clarifiers to AT)	1	LS	\$968,000.00	\$968,000.00
75	Flowmeter	5	EA	\$16,000.00	\$80,000.00
76	Mechanical	10	%		\$758,000.00
77	Electrical	15	%		\$1,137,000.00
78	Contingency	30	%		\$2,843,000.00
79	Inflation	10	%		\$1,196,000.00
79	Subtotal				\$13,513,000.00
80					
81	FINAL CLARIFIER IMPROVEMENTS - 65' DIA				
82	Excavation	11,909	CYD	\$25.00	\$298,000.00
83	Concrete Structure	1,921	CYD	\$1,000.00	\$1,922,000.00
84	Mechanism	4	EA	\$147,000.00	\$588,000.00
85	Weir and Baffles	4	EA	\$87,360.00	\$350,000.00
86	Weir Cover	4	EA	\$54,600.00	\$219,000.00
87	Railing	816	LF	\$125.00	\$103,000.00
88					
89	Effluent Pipe	1	EA	\$315,000.00	\$315,000.00
90					
91					
92	Mechanical	5	%		\$190,000.00
93	Electrical/Instrumentation	15	%		\$570,000.00
94	Contingency	30	%		\$1,367,000.00
95	Inflation	10	%		\$563,000.00
95	Subtotal				\$6,485,000.00
96					
97					

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Construct New WWTP at New Locaiton - Alternative 2

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
98	TERTIARY FILTERS AND UV DISINFECTION				
99					
100	Excavation	1,444	CYD	\$25.00	\$37,000.00
101	Concrete Structure	228	CYD	\$1,000.00	\$228,000.00
102	Building	3,900	SFT	\$200.00	\$780,000.00
103	Disc Filter Units	3	EA	\$406,250.00	\$1,219,000.00
104	Piping and Valve	1	LS	\$250,000.00	\$250,000.00
105	UV Units	3	EA	\$125,000.00	\$375,000.00
106	FEW Pumps	3	EA	\$45,000.00	\$135,000.00
107					
108	Effluent Pipe	1	LS	\$315,000.00	\$315,000.00
109	Outfall	1	LS	\$450,000.00	\$450,000.00
110					
111	Mechanical	5	%		\$190,000.00
112	Electrical/Instrumentation	10	%		\$379,000.00
113	Contingency	30	%		\$1,308,000.00
114	Inflation	10	%		\$563,000.00
114	Subtotal				\$6,229,000.00
115					
116	SOLIDS HANDLING				
117					
118	Storage Tank Excavation	1,675	CYD	\$25.00	\$42,000.00
119	Storage Tank Structure	377	CYD	\$1,000.00	\$377,000.00
120	Mixing System	1	LS	\$250,000.00	\$250,000.00
121					
122	Dewatering Building Excavation	933	CYD	\$25.00	\$24,000.00
123	Dewatering Building Structure	304	CYD	\$1,000.00	\$305,000.00
124	Dewatering Building	4,200	SFT	\$200.00	\$840,000.00
125	Dewatering Equipment	2	LS	\$385,000.00	\$770,000.00
126	Installation	2	LS	\$75,000.00	\$150,000.00
127	Conveyors	2	LS	\$100,000.00	\$200,000.00
128	Piping and Valves	1	LS	\$170,000.00	\$170,000.00
129	Pumps	4	EA	\$35,000.00	\$140,000.00
130	Chemical Feed and Storage	1	LS	\$125,000.00	\$125,000.00
131	Recycle Pumps	2	EA	\$45,000.00	\$90,000.00
132	Thickening	1		\$250,000.00	\$250,000.00
133	Odor Control System	1		\$175,000.00	\$175,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
LOCATION: _____
BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
WORK: Construct New WWTP at New Locaiton - Alternative 2

DATE: 12/26/2019
PROJECT NO. 200-12789-20001
ESTIMATOR: BGB
CHECKED BY: _____
CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
134					
135	Mechanical	5	%		\$196,000.00
136	Electrical/Instrumentation	10	%		\$391,000.00
137	Contingency	30	%		\$1,349,000.00
138	Inflation	10	%		\$581,000.00
138	Subtotal				\$6,430,000.00
139					
140					
141	ADMINISTRATION BUILDING				
142					
143	Excavation	1,185		\$25.00	\$30,000.00
144	Building Structure	299		\$1,000.00	\$300,000.00
145	Building Structure	4,000		\$300.00	\$1,200,000.00
146	Lab Equipment	1		\$250,000.00	\$250,000.00
147	Office Equipment	1		\$150,000.00	\$150,000.00
148					
149	Mechanical	10	%		\$193,000.00
150	Electrical/Instrumentation	20	%		\$386,000.00
151	Contingency	30	%		\$753,000.00
152	Inflation	10	%		\$324,000.00
152	Subtotal				\$3,590,000.00
153					
154					
155					
156					
157					
158					
159					
TOTAL CONSTRUCTION COST					\$62,346,000.00

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Force Main Alternate 2A-West (24-inch Force Main)

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 359,400.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 215,700.00
3	Audio Visual	1	LS	-	\$ 10,000.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 143,800.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 215,700.00
6					
	Pipe Construction Cost				
7	Pavement Removal	8,890	SYD	\$ 10.00	\$ 88,900.00
8	Curb and Gutter Removal	2,000	FT	\$ 10.00	\$ 20,000.00
9	Clearing	3	ACR	\$ 25,000.00	\$ 75,000.00
10	Remove Existing Sanitary Sewer, 15-inch	5,650	FT	\$ 15.00	\$ 84,750.00
11	Remove Existing Manholes	30	EA	\$ 2,000.00	\$ 60,000.00
12	Sanitary Sewer, 15-inch PVC SDR 26	5,650	FT	\$ 150.00	\$ 847,500.00
13	48-inch Diameter Manhole	30	EA	\$ 10,000.00	\$ 300,000.00
14	Sanitary Force Main, DIP, 24-inch	6,820	FT	\$ 375.00	\$ 2,557,500.00
15	Sanitary Force Main, 24-inch, Directionally Drilled	800	FT	\$ 2,000.00	\$ 1,600,000.00
16	Air Relief Manhole	17	EA	\$ 15,000.00	\$ 255,000.00
17	Force Main Discharge Structure	1	EA	\$ 100,000.00	\$ 100,000.00
18	Sanitary Sewer Reconnection, 24x6	27	EA	\$ 5,000.00	\$ 135,000.00
19	Post-Construction CCTV	12,470	FT	\$ 10.00	\$ 124,700.00
20	Road Restoration, 40 foot wide	2,000	LF	\$360.00	\$ 720,000.00
21	Turf Restoration	14,520	SYD	\$15.00	\$ 217,800.00
	Pipe Construction Subtotal				\$ 7,187,000.00
	Construction Subtotal				\$ 8,132,000.00
	Inflation (10%)				\$ 813,200.00
	Contingency (30%)				\$ 2,439,600.00

TOTAL PROJECT COST				\$ 11,385,000.00

Assumptions

1. Force main sewage transmission from site of existing WWTP to proposed West site
2. Approximate average depth of bury ~5.5 ft
3. Roads to be restored to existing conditions following sewer force main installation (40 foot wide roadways; 5.5-in pavements)
4. Does not include price of potential easements and property acquisitions
5. Replacement of existing 15-inch sanitary sewer in green area on east side of Mill Pond to accommodate installation of 24-inch force main
6. Clearing acreage in trees along east side of Mill Pond to accommodate trench widths and work areas for replacement of existing 15-inch sanitary sewer
7. 24-inch force main based on hydraulic analysis; 24-inch option assumes approximately 4 MGD storage at WWTP

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Gravity Mains & WWTP Site Locations-Alternate 2B-South

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 245,100.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 147,100.00
3	Audio Visual	1	LS	-	\$ 10,000.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 98,100.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 147,100.00
6					
	Pipe Construction Cost				
7	Pavement Removal	12,511	SYD	\$ 10.00	\$ 125,110.00
8	Curb and Gutter Removal	800	FT	\$ 10.00	\$ 8,000.00
9	96-inch Diameter Manhole	10	EA	\$ 30,000.00	\$ 300,000.00
10	Sanitary Sewer, 48-inch RCP	3,600	FT	\$ 650.00	\$ 2,340,000.00
11	Sanitary Sewer, 24-inch, Directionally Drilled	250	FT	\$ 2,000.00	\$ 500,000.00
12	US Siphon Chamber	1	EA	\$ 300,000.00	\$ 300,000.00
13	DS Siphon Chamber	1	EA	\$ 300,000.00	\$ 300,000.00
14	24-inch Siphon Riser Piping	40	FT	\$ 1,200.00	\$ 48,000.00
15	Post-Construction CCTV	3,600	FT	\$ 10.00	\$ 36,000.00
16	Road Restoration, 40 foot wide	2,500	LF	\$ 360.00	\$ 900,000.00
17	Turf Restoration	2,900	SYD	\$ 15.00	\$ 43,500.00
	Pipe Construction Subtotal				\$ 4,901,000.00
	Construction Subtotal				\$ 5,549,000.00
	Inflation (10%)				\$ 554,900.00
	Contingency (30%)				\$ 1,664,700.00
	TOTAL PROJECT COST				\$ 7,769,000.00

Assumptions

1. Gravity sewage transmission from site of existing WWTP to proposed South site

2. Approximate depth of bury of gravity sewage lines ~15-30 ft (not including siphon).
3. Roads to be restored to existing conditions following sewer force main installation (40 foot wide roadways; 5.5-in pavement thickness; 18-in road cut; curb replacement where existing)
4. Does not include price of potential easements and property acquisitions

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Gravity Mains & WWTP Site Locations Alternate 2C-East

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 397,600.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 238,600.00
3	Audio Visual	1	LS	-	\$ 1,500.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 159,100.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 238,600.00
6					
	Pipe Construction Cost				
7	Pavement Removal	22,000	SYD	\$ 10.00	\$ 220,000.00
8	Curb and Gutter Removal	9,600	FT	\$ 10.00	\$ 96,000.00
9	Clearing	1	ACR	\$ 25,000.00	\$ 25,000.00
10	Remove Existing Sanitary Sewer, 12-18-inch	2,600	FT	\$ 15.00	\$ 39,000.00
11	Remove Existing Sanitary Manholes	20	EA	\$ 2,000.00	\$ 40,000.00
12	Sanitary Sewer, 18-inch SDR 26	2,600	FT	\$ 175.00	\$ 455,000.00
13	Sanitary Sewer, 12-inch SDR 26	1,200	FT	\$ 135.00	\$ 162,000.00
14	48-inch Diameter Manhole	20	EA	\$ 10,000.00	\$ 200,000.00
15	96-inch Diameter Manhole	16	EA	\$ 30,000.00	\$ 480,000.00
16	Sanitary Sewer, 48-inch RCP	6,300	FT	\$ 650.00	\$ 4,095,000.00
17	Sanitary Sewer Reconnection, 18x6	30	EA	\$ 5,000.00	\$ 150,000.00
18	Sanitary Sewer Reconnection, 12x6	18	EA	\$ 4,500.00	\$ 81,000.00
19	Post-Construction CCTV	10,100	FT	\$ 10.00	\$ 101,000.00
20	Road Restoration	4,800	LF	\$ 360.00	\$ 1,728,000.00
21	Turf Restoration	5,325	SYD	\$ 15.00	\$ 79,875.00
	Pipe Construction Subtotal				\$ 7,952,000.00
	Construction Subtotal				\$ 8,988,000.00
	Inflation (10%)				\$ 898,800.00
	Contingency (30%)				\$ 2,696,400.00
	TOTAL PROJECT COST				\$ 12,584,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734)-665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
 LOCATION: _____
 BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Ex. WWTP Pump Station to YCUA - Alternative 3

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: BGB
 CHECKED BY: _____
 CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	SITE IMPROVEMENTS				
2	Removal of Existing Equipment and Structures	1		\$1,250,000.00	\$1,250,000.00
3	Site Grading and Restoration	1		\$150,000.00	\$150,000.00
4					
5					
6	INFLUENT SCREEN AND PUMP STATION				
7					
8	Excavation and Backfill	2,963	CYD	\$25.00	\$75,000.00
9	Influent Sewer	1	LS	\$120,000.00	\$120,000.00
10	Headworks Structure	1,381	CYD	\$1,000.00	\$1,382,000.00
11	Headworks Building	2,500	SFT	\$200.00	\$500,000.00
12	Screen Equipment	2	EA	\$175,000.00	\$350,000.00
13	Compactors	2	EA	\$81,250.00	\$163,000.00
14	RS Pumps	4	EA	\$490,000.00	\$1,960,000.00
15	Piping and Valves	1	LS	\$210,000.00	\$210,000.00
16					
17	Generator Replacement	1	LS	\$500,000.00	\$500,000.00
18	Mechanical	10	%		\$526,000.00
19	Electrical/Instrumentation	20	%		\$1,052,000.00
20	Contingency	30	%		\$2,472,000.00
21	Inflation	10	%		\$1,071,000.00
22	Subtotal				\$11,781,000.00
23					
24	1.5 MG Equalization Basin				
25					
26	1.5 MG Storage Tank	1.5	MG	\$1,950,000.00	\$1,950,000.00
27	Site Improvements	1	LS	\$55,000.00	\$55,000.00
28	Foundation	465	CYD	\$1,000.00	\$466,000.00
29	Piping and Valves	1	LS	\$350,000.00	\$350,000.00
30					
31	Odor Control Connection	1	LS	\$75,000.00	\$75,000.00
32	Mechanical	5	%		\$145,000.00
33	Electrical/Instrumentation	10	%		\$290,000.00
34	Contingency	30	%		\$869,000.00
35	Subtotal				\$4,200,000.00
36					
37					
38	ADMINISTRATION BUILDING RENOVATION (NOT IN SUMMARY)				

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline WWTP Siting Plan
LOCATION: _____
BASIS FOR ESTIMATE: [] CONCEPTUAL [] PRELIMINARY [] FINAL
WORK: Ex. WWTP Pump Station to YCUA - Alternative 3

DATE: 12/26/2019
PROJECT NO. 200-12789-20001
ESTIMATOR: BGB
CHECKED BY: _____
CURRENT ENR: _____

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
39					
40					
41					
42	Building Updates	3,000	SFT	\$120.00	\$360,000.00
43	Lab Equipment	1	LS	\$250,000.00	\$250,000.00
44	Office Equipment	1	LS	\$150,000.00	\$150,000.00
45					
46					
47	Mechanical	15	%		\$114,000.00
48	Electrical/Instrumentation	20	%		\$152,000.00
49	Contingency	30	%		\$308,000.00
50	Inflation	10	%		\$134,000.00
50	Subtotal				\$1,470,000.00
51					
52					
53					
54					
55					
56					
57					
TOTAL CONSTRUCTION COST					\$15,981,000.00

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Force Main Alternate 3A (24-inch Force Main)

Telephone: (734) 665-6000 FAX: (734) 665-2570

DATE:	12/26/2019
PROJECT NO.	200-12789-20001
ESTIMATOR:	JTM
CHECKED BY:	JCS
CURRENT ENR:	11326
PROJ. ENR	

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 1,053,500.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 632,100.00
3	Audio Visual	1	LS	-	\$ 1,500.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 421,400.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 632,100.00
6					
	Pipe Construction Cost				
7	Pavement Removal	64,817	SYD	\$ 10.00	\$ 648,170.00
8	Curb and Gutter Removal	12,935	FT	\$ 15.00	\$ 194,025.00
9	Clearing	1	ACR	\$ 25,000.00	\$ 25,000.00
10	Remove Sanitary Sewer, 20-inch	4,700	FT	\$ 50.00	\$ 235,000.00
11	Remove Sanitary Sewer Manhole	25	EA	\$ 2,000.00	\$ 50,000.00
12	Sanitary Sewer, 20-inch, PVC SDR 26	4,700	FT	\$ 300.00	\$ 1,410,000.00
13	48-inch Diameter Manhole	25	EA	\$ 10,000.00	\$ 250,000.00
14	Sanitary Sewer Reconnection, 12x6	13	EA	\$ 5,500.00	\$ 71,500.00
15	Sanitary Sewer Reconnection, 18x6	10	EA	\$ 5,500.00	\$ 55,000.00
16	Sanitary Sewer Reconnection, 20x6	27	EA	\$ 5,500.00	\$ 148,500.00
17	Sanitary Force Main, DIP, 24-inch	28,227	FT	\$ 375.00	\$ 10,585,125.00
18	Sanitary Force Main, 24-inch, Directionally Drilled	300	FT	\$ 2,000.00	\$ 600,000.00
19	Air Relief Manhole	17	EA	\$ 15,000.00	\$ 255,000.00
20	Force Main Discharge Structure	1	EA	\$ 100,000.00	\$ 100,000.00
21	Turf Restoration	4,840	SYD	\$ 15.00	\$ 72,600.00
22	Post-Construction CCTV	4,700	FT	\$ 10.00	\$ 47,000.00
23	Road Restoration, Pavement, 25-foot	14,456	FT	\$ 250.00	\$ 3,614,000.00
24	Road Restoration, Pavement, 40-foot	5,955	FT	\$ 360.00	\$ 2,143,800.00
25	Road Restoration, Gravel	18,833	SYD	\$ 30.00	\$ 564,990.00
	Pipe Construction Subtotal				\$ 21,070,000.00
	Construction Subtotal				\$ 23,811,000.00

	Increase 10% for inflation				\$ 2,381,100.00
	Contingency (30%)				\$ 7,143,300.00
	Pittsfield Sewer Project				
34	Warner to Platt along US-12 (2.5 Miles, 50% of Cost to City of Saline)	6,072	FT	\$ 1,900.00	\$ 5,768,400.00
35	Platt to Munger along US-12 (1.15 Miles, 50% of Cost to City of Saline)	13,200	FT	\$ 1,900.00	\$ 12,540,000.00
	TOTAL PROJECT COST				\$ 51,644,000.00

Assumptions

1. Force main sewage transmission from site of existing WWTP/South Side PS to existing YCUA/Pittsfield service in Michigan A
2. Approximate average depth of bury ~5.5 ft
3. Roads to be restored to existing conditions following sewer force main installation (40 foot wide or 25 foot wide roadways;
5. Does not include price of potential easements and property acquisitions
6. Replacement of existing 20-inch sanitary sewer in Old Creek Dr. to accommodate installation of 24-inch FM
7. Clearing acreage in trees between South Side PS and Old Creek Dr. to accommodate trench widths and work areas for repla
8. Turf restoration covers Clearing area
9. 24-inch force main based on hydraulic analysis; 24-inch option assumes approximately 4 MGD storage at WWTP
10. \$1,200 per foot of sewer for Pittsfield Sewer Project based on 13,200 foot total distance and \$16,000,000 total cost

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Force Main Alternate 3B-Platt (24-inch Force Main)

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 1,414,800.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 848,900.00
3	Audio Visual	1	LS	-	\$ 1,500.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 566,000.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 848,900.00
6					
	Pipe Construction Cost				
7	Pavement Removal	104,536	SYD	\$ 10.00	\$ 1,045,360.00
8	Curb and Gutter Removal	15,326	FT	\$ 15.00	\$ 229,890.00
9	Clearing	1	ACR	\$ 25,000.00	\$ 25,000.00
10	Remove Sanitary Sewer, 20-inch	4,700	FT	\$ 50.00	\$ 235,000.00
11	Remove Sanitary Sewer Manhole	25	EA	\$ 2,000.00	\$ 50,000.00
12	Sanitary Sewer, 20-inch, PVC SDR 26	4,700	FT	\$ 300.00	\$ 1,410,000.00
13	48-inch Diameter Manhole	25	EA	\$ 10,000.00	\$ 250,000.00
14	Sanitary Sewer Reconnection, 12x6	13	EA	\$ 5,500.00	\$ 71,500.00
15	Sanitary Sewer Reconnection, 18x6	10	EA	\$ 5,500.00	\$ 55,000.00
16	Sanitary Sewer Reconnection, 20x6	27	EA	\$ 5,500.00	\$ 148,500.00
17	Sanitary Force Main, DIP, 24-inch	35,885	FT	\$ 375.00	\$ 13,456,875.00
18	Sanitary Force Main, 24-inch, Directionally Drilled	300	FT	\$ 2,000.00	\$ 600,000.00
19	Air Relief Manhole	17	EA	\$ 15,000.00	\$ 255,000.00
20	Force Main Discharge Structure	1	EA	\$ 100,000.00	\$ 100,000.00
21	Turf Restoration	4,840	SYD	\$ 15.00	\$ 72,600.00
22	Post-Construction CCTV	4,700	FT	\$ 10.00	\$ 47,000.00
23	Road Restoration, Pavement, 25-foot	26,188	FT	\$ 250.00	\$ 6,547,000.00
24	Road Restoration, Pavement, 40-foot	8,700	FT	\$ 360.00	\$ 3,132,000.00
25	Road Restoration, Gravel	18,833	SYD	\$ 30.00	\$ 564,990.00
	Pipe Construction Subtotal				\$ 28,296,000.00

	Construction Subtotal				\$	31,977,000.00
	Increase 10% for inflation				\$	3,197,700.00
	Contingency (30%)				\$	9,593,100.00
	Pittsfield Sewer Project					
34	Platt to Munger along US-12 (1.15 Miles, 50% of Cost to City of Saline)	13,200	FT	\$ 1,900.00	\$	12,540,000.00
	TOTAL PROJECT COST				\$	57,308,000.00

Assumptions

1. Force main sewage transmission from site of existing WWTP/South Side PS to existing YCUA/Pittsfield service in Michigan.
2. Approximate average depth of bury ~5.5 ft
3. Roads to be restored to existing conditions following sewer force main installation (40 foot wide or 25 foot wide roadways)
5. Does not include price of potential easements and property acquisitions
6. Replacement of existing 20-inch sanitary sewer in Old Creek Dr. to accommodate installation of 24-inch FM
7. Clearing acreage in trees between South Side PS and Old Creek Dr. to accommodate trench widths and work areas for repl
8. Turf restoration covers Clearing area
9. 24-inch force main based on hydraulic analysis; 24-inch option assumes approximately 4 MGD storage at WWTP

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

Telephone: (734) 665-6000 FAX: (734) 665-2570

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: [x] CONCEPTUAL [] PRELIMINARY [] FINAL
 WORK: Proposed Force Main Alternate 3C-Munger (24-inch Force Main)

DATE: 12/26/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 1,836,700.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 1,102,000.00
3	Audio Visual	1	LS	-	\$ 1,500.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 734,700.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 1,102,000.00
6					
	Pipe Construction Cost				
7	Pavement Removal	113,997	SYD	\$ 10.00	\$ 1,139,970.00
8	Curb and Gutter Removal	9,445	FT	\$ 10.00	\$ 94,450.00
9	Clearing	1	ACR	\$ 25,000.00	\$ 25,000.00
10	Remove Sanitary Sewer, 20-inch	4,700	FT	\$ 50.00	\$ 235,000.00
11	Remove Sanitary Sewer Manhole	25	EA	\$ 2,000.00	\$ 50,000.00
12	Sanitary Sewer, 20-inch, PVC SDR 26	4,700	FT	\$ 300.00	\$ 1,410,000.00
13	48-inch Diameter Manhole	25	EA	\$ 10,000.00	\$ 250,000.00
14	Sanitary Sewer Reconnection, 12x6	13	EA	\$ 5,500.00	\$ 71,500.00
15	Sanitary Sewer Reconnection, 18x6	10	EA	\$ 5,500.00	\$ 55,000.00
16	Sanitary Sewer Reconnection, 20x6	27	EA	\$ 5,500.00	\$ 148,500.00
17	Sanitary Force Main, DIP, 24-inch	53,102	FT	\$ 375.00	\$ 19,913,250.00
18	Sanitary Force Main, 24-inch, Directionally Drilled	775	FT	\$ 2,000.00	\$ 1,550,000.00
19	Air Relief Manhole	20	EA	\$ 15,000.00	\$ 300,000.00
20	Force Main Discharge Structure	1	EA	\$ 100,000.00	\$ 100,000.00
21	Post-Construction CCTV	4,700	FT	\$ 10.00	\$ 47,000.00
22	Turf Restoration	4,840	SYD	\$ 15.00	\$ 72,600.00
23	Road Restoration, Pavement, 25-foot	33,396	LS	\$ 250.00	\$ 8,349,000.00
24	Road Restoration, Pavement, 40-foot	4,892	LS	\$ 360.00	\$ 1,761,120.00
25	Road Restoration, Gravel	38,683	SYD	\$ 30.00	\$ 1,160,490.00
	Pipe Construction Subtotal				\$ 36,733,000.00
	Construction Subtotal				\$ 41,510,000.00

	Increase 10% for inflation				\$ 4,151,000.00
	Contingency (30%)				\$ 12,453,000.00
	TOTAL PROJECT COST				\$ 58,114,000.00

Assumptions

1. Force main sewage transmission from site of existing WWTP/South Side PS to existing YCUA/Pittsfield service in Michigan /
2. Approximate average depth of bury ~5.5 ft
3. Roads to be restored to existing conditions following sewer force main installation (40 foot wide or 25 foot wide roadways)
5. Does not include price of potential easements and property acquisitions
5. Replacement of existing 20-inch sanitary sewer in Old Creek Dr. to accommodate installation of 24-inch FM
6. Clearing acreage in trees between South Side PS and Old Creek Dr. to accommodate trench widths and work areas for repl.
7. Turf restoration covers Clearing area
8. 24-inch force main based on hydraulic analysis; 24-inch option assumes approximately 4 MGD storage at WWTP

OPINION OF PROBABLE PROJECT COST

TETRA TECH

710 Avis Rd. Ann Arbor, MI 48108

PROJECT: Saline Sewer Routing Alternatives for New WWTP
 LOCATION: City of Saline
 BASIS FOR ESTIMATE: CONCEPTUAL PRELIMINARY FINAL
 WORK: Pumping Portion of Saline Flow to YCUA - Alternative 4

Telephone: (734) 665-6000 FAX: (734) 665-2570
 DATE: 1/2/2019
 PROJECT NO. 200-12789-20001
 ESTIMATOR: JTM
 CHECKED BY: JCS
 CURRENT ENR: 11326
 PROJ. ENR

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
	General				
1	Mobilization (5% of Construction Cost)	1	LS	-	\$ 3,469,800.00
2	Traffic Control (3% of Construction Cost)	1	LS	-	\$ 2,081,900.00
3	Audio Visual	1	LS	-	\$ 1,500.00
4	Soil Erosion/Sedimentation Control (2% of Construction Cost)	1	LS	-	\$ 1,387,900.00
5	Utility Allowance (3% of Construction Cost)	1	LS	-	\$ 2,081,900.00
6					
	Pipe Construction Cost				
7	Pavement Removal	32,087	SYD	\$ 10.00	\$ 320,870.00
8	Curb and Gutter Removal	9,626	FT	\$ 10.00	\$ 96,260.00
9	Remove Sanitary Sewer, 8-inch	9,626	FT	\$ 50.00	\$ 481,300.00
10	Remove Sanitary Sewer Manhole	25	EA	\$ 2,000.00	\$ 50,000.00
11	Sanitary Sewer, 8-inch, PVC SDR 26	9,626	FT	\$ 75.00	\$ 721,950.00
12	48-inch Diameter Manhole	25	EA	\$ 10,000.00	\$ 250,000.00
13	Sanitary Sewer Reconnection, 8x6	67	EA	\$ 5,500.00	\$ 368,500.00
14	Sanitary Force Main, DIP, 16-inch	9,626	FT	\$ 250.00	\$ 2,406,500.00
15	Sanitary Force Main, Directionally Drilled	30,795	FT	\$ 2,000.00	\$ 61,590,000.00
16	Air Relief Manhole	20	EA	\$ 15,000.00	\$ 300,000.00
17	Force Main Discharge Structure	1	EA	\$ 100,000.00	\$ 100,000.00
18	Post-Construction CCTV	9,626	FT	\$ 10.00	\$ 96,260.00
19	Turf Restoration	13,764	SYD	\$ 15.00	\$ 206,460.00
20	Road Restoration, Pavement, 30-foot	9,626	FT	\$ 250.00	\$ 2,406,500.00
	Pipe Construction Subtotal				\$ 69,394,600.00
	1.5 MG Equalization Basin				
21	1.5 MG of Storage Tank	1.5	MG	\$1,950,000.00	\$1,950,000.00
22	Site Improvements	1	LS	\$55,000.00	\$55,000.00
23	Foundation	465	CYD	\$1,000.00	\$466,000.00
24	Piping and Valves	1	LS	\$350,000.00	\$350,000.00
25	Odor Control Connection	1	LS	\$75,000.00	\$75,000.00
26	Mechanical	5	%		\$145,000.00
27	Electrical/Instrumentation	10	%		\$290,000.00
28	Contingency	30	%		\$869,000.00
	Subtotal				\$4,200,000.00

	Raw Sewage Pump Station				
29	Pump Station	1	LS	\$9,275,000.00	\$9,275,000.00
30					
31					
32		Subtotal			\$9,275,000.00
		Construction Subtotal			\$ 91,893,000.00
		Inflation (10%)			\$ 9,190,000.00
		Contingency (30%)			\$ 27,568,000.00
TOTAL PROJECT COST					\$ 128,651,000.00

Assumptions

1. Force main sewage transmission from site of proposed PS at SE corner of Mill Pond in US12 ROW to existing YCUA/Pittsfield service in
2. Approximate average depth of bury ~5.5 ft
3. Roads to be restored to existing conditions following sewer force main installation (30 foot wide roadways to accommodate keeping a lane open in US12; 5.5-in pavement thickness; 18-in road cut; curb replacement where existing)
4. Does not include price of potential easements and property acquisitions
5. Replacement of existing 8-inch sanitary sewer in US12 to accommodate installation of 16-inch FM
6. Turf restoration covers directional drill receiving pit disturbances
7. 16-inch force main based on hydraulic analysis

APPENDIX C
Life-cycle Cost Analyses



SALINE WWTP SITING STUDY
ECONOMIC ANALYSIS OF ALTERNATIVES

	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B	Alternative 2C	Alternative 3A	Alternative 3B	Alternative 3C	Alternative 4
	Expanded Ex. WWTP	Expanded Ex. WWTP - W. of Monroe	New WWTP (West)	New WWTP (South)	New WWTP (East)	Connection to YCUA System - Warner	Connection to YCUA System - Platt	Connection to YCUA System - Munger	Combined Ex. WWTP and YCUA
Capital Cost									
Sewer	\$ -	\$ 11,385,000	\$ 7,769,000	\$ 12,584,000	\$ 51,644,000	\$ 57,308,000	\$ 58,114,000	\$ 115,666,000	
WWTP	\$ 51,999,000	\$ 53,428,000	\$ 62,346,000	\$ 62,346,000	\$ 62,346,000	\$ 15,981,000	\$ 15,981,000	\$ 15,981,000	\$ 12,984,800
Capital Subtotal	\$ 51,999,000	\$ 53,428,000	\$ 73,731,000	\$ 70,115,000	\$ 74,930,000	\$ 67,625,000	\$ 73,289,000	\$ 74,095,000	\$ 128,650,800
General Requirements, Bonds, - 8%	\$ 4,159,920	\$ 4,274,240	\$ 5,898,480	\$ 5,609,200	\$ 5,994,400	\$ 5,410,000	\$ 5,863,120	\$ 5,927,600	\$ 10,293,000
Administration, Engineering - 20%	\$ 10,399,800	\$ 10,685,600	\$ 14,746,200	\$ 14,023,000	\$ 14,986,000	\$ 13,525,000	\$ 14,657,800	\$ 14,819,000	\$ 25,731,000
Total Capital Costs	\$ 66,558,720	\$ 68,387,840	\$ 94,375,680	\$ 89,747,200	\$ 95,910,400	\$ 86,560,000	\$ 93,809,920	\$ 94,841,600	\$ 164,675,000
Annual Operation Costs									
Electricity	\$ 156,000	\$ 141,000	\$ 140,000	\$ 108,000	\$ 108,000	\$ 46,000	\$ 38,000	\$ 26,000	\$ 156,000
water (FEW)	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 20,000
Chemical	\$ 94,000	\$ 94,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 63,000
Polymer	\$ -	\$ 9,000	\$ 59,000	\$ 59,000	\$ 59,000	\$ -	\$ -	\$ -	\$ -
Land Application	\$ 90,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 90,000
Landfill	\$ -	\$ 30,000	\$ 197,000	\$ 197,000	\$ 197,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000
fuel oil	\$ 11,000	\$ 11,000	\$ 11,000	\$ 11,000	\$ 11,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 11,000
Other	\$ 332,440	\$ 332,440	\$ 242,440	\$ 242,440	\$ 242,440	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000
Staff Salary and Benefits	\$ 477,000	\$ 572,400	\$ 572,400	\$ 572,400	\$ 572,400	\$ 119,250	\$ 119,250	\$ 119,250	\$ 477,000
Retirement Benefits	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000	\$ 331,000
YCUA debt service						\$ 303,000	\$ 303,000	\$ 303,000	\$ 126,254
YCUA O&M						\$ 1,674,000	\$ 1,674,000	\$ 1,674,000	\$ 581,000
Total Annual O&M	\$ 1,511,440	\$ 1,540,840	\$ 1,572,840	\$ 1,540,840	\$ 1,540,840	\$ 2,694,250	\$ 2,686,250	\$ 2,674,250	\$ 2,068,254
Planning Period	20	20	20	20	20	20	20	20	20
Discount Rate	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Growth Rate	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Total Present Worth of O&M	\$ 33,793,875	\$ 34,500,798	\$ 35,270,238	\$ 34,500,798	\$ 34,500,798	\$ 59,901,441	\$ 59,709,081	\$ 59,420,541	\$ 46,210,312
Total Capital Cost	\$ 66,558,720	\$ 68,387,840	\$ 94,375,680	\$ 89,747,200	\$ 95,910,400	\$ 86,560,000	\$ 93,809,920	\$ 94,841,600	\$ 164,675,000
PW of AMP Costs	\$ 9,005,000	\$ 7,615,000							\$ 11,725,000
Salvage Value of Capital (Yr. 20)	\$ 35,800,000	\$ 41,600,000	\$ 54,900,000	\$ 51,200,000	\$ 56,100,000	\$ 64,383,000	\$ 70,183,000	\$ 71,009,000	\$ 130,000,000
PW of Salvage Value	\$ 24,092,374	\$ 27,995,607	\$ 36,946,126	\$ 34,456,132	\$ 37,753,692	\$ 43,327,913	\$ 47,231,147	\$ 47,787,021	\$ 87,486,273
Total Present Worth of Project	\$ 85,265,221	\$ 82,508,030	\$ 92,699,792	\$ 89,791,866	\$ 92,657,506	\$ 103,133,528	\$ 106,287,854	\$ 106,475,120	\$ 135,124,038