WASTEWATER TREATMENT CONSOLIDATION STUDY REPORT

Chemung County - New York

Civil & Environmental Engineering, Landscape Architecture and Land Surveying PLLC

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EXECUTIVE SUMMARY

Chemung County Sewer Districts (CCSD) owns and operates two municipal wastewater treatment plants (WWTP) servicing residents of the city of Elmira, New York and surrounding communities. The Lake Street WWTP services the Village of Elmira Heights, the majority of the Village of Horseheads, and portions of the Towns of Elmira, Horseheads, Veteran and Big Flats. The Milton Street WWTP services the City of Elmira, the Town of Elmira and portions of the Town of Southport. The Lake Street WWTP was placed into service in 1962, was upgraded in 1986. The Milton Street Plant entered service in 1987.

The components of both plants consist of influent headwork's to remove large material and grit that can damage the treatment plant equipment, primary clarifiers, secondary treatment consisting of trickling filters and secondary clarifiers. Both facilities currently use poly-aluminum chloride (PAC) to precipitate excess phosphorous upstream of the secondary clarifiers. The Milton Street WWTP also included chlorine contact chambers for effluent disinfection, though the chlorine dosing systems have been removed as the facility is not currently required to disinfect. Ancillary systems for both WWTPs waste solids handling at both facilities include anaerobic sludge digesters and belt filter presses.

CCSD retained the services of Civil & Environmental Engineering, Landscape Architecture, and Land Surveying, PLLC (CEE) to evaluate the two facilities and to develop recommendations for upgrades needed to meet future compliance with the Chesapeake Bay Total Maximum Daily Load (TMDL), as well as to address the long-term reliability of the aging plants. As part of the scope CEE was tasked to develop budgetary capital cost estimates for two upgrade alternatives: 1) upgrading each facility separately , and 2) abandoning most of the 50+ year old Lake Street WWTP and consolidating all treatment at the of the 30+ year old Milton Street WWTP.

The Chesapeake Bay TMDL allocates annual mass limits for total nitrogen and phosphorous to all NPDES dischargers in the Chesapeake Bay watershed. Initial limits for the two facilities were implemented as of January 1, 2015, with the final limits taking effect on January 1, 2025. The current (2015) and future (2025) for each facility are as follows:

Effective Year	Total P Milton Street [TP 12-ML] (lbs/yr)	Total P Lake Street [TP 12-ML] (lbs/yr)	Total N Adjusted Milton Street [TNA 12-ML] (lbs/yr)	Total N Adjusted Lake Street [TNA 12-ML] (lbs/yr)
2015	27,400	25,300	274,000	292,000
2025	18,300	18,300	292,000	292,000

In order to evaluate the ability of the current CCSD wastewater treatment facilities to achieve the 2025 mass limits for total nitrogen and phosphorous, CEE reviewed the influent and effluent data for the two facilities. Based on the influent and effluent data, the Milton Street facility is a consistently well performing treatment system, averaging 97 percent BOD5 removal and nitrifying on a year-round basis. In contrast, the Lake Street facility only achieved an average 86 percent BOD5 removal and the facility does not consistently nitrify. Two factors were identified as contributing to the superior performance of the Milton Street WWTP, despite Milton Street WWTP having the higher BOD5 loading : 1) the trickling filter media used at the Milton Street facility, and 2) the trickling filter design at Lake Street promotes short-circuiting of the primary effluent directly to the secondary clarifiers. For both facilities, the effluent phosphorous was found to be nearly similar.

CEE concludes that both facilities would need to implement additional phosphorous removal to assure compliance with the 2025 TMDLs. In order to achieve compliance with the 2025 TMDL for total phosphorous, CEE recommends installing effluent filtration at both facilities. As both facilities are currently adding PAC for phosphorous removal ahead of the secondary clarifiers, CEE estimates that effluent filtration would further reduce the effluent phosphorous concentrations to around 0.5 milligrams per liter, which is about half of what is currently achieved. CEE also concludes that the Milton Street facility will not likely achieve to 2025 total Nitrogen limit due to the high Nitrogen loading to that facility. To achieve compliance with the 2025 total nitrogen limit at the Milton Street facility, CEE recommends installing effluent denitrification at the Milton Street facility. Effluent denitrification wound consist of adding an organic substrate (typically methanol) upstream of a granular media filter, which serves for a supporting substrate for the growth of heterotrophic bacteria. Note that the filters at the Milton Street facility would serve the dual purpose of effluent denitrification and effluent phosphorous removal.

CEE developed preliminary designs for two alternatives for upgrading the CCSD WWTPs. Alternative #1 is to upgrade both WWTPs. Under Alternative #1, the major upgrades at the Lake Street WWTP would consist of replacing the influent headwords, primary clarifiers, trickling filters and secondary clarifiers, and adding a new septage receiving facility, effluent filtration and UV disinfection. The major upgrades at the Milton Street WWTP would consist of replacing the (3) Archimedes screw pumps, the influent bar screens, the primary and secondary clarifier weirs, launders and drives, and the trickling filter media and distributor mechanisms, repairing the trickling filter walls and installing effluent denitrification filters and UV disinfection. The estimated cost for the Alternative #1 upgrades is approximately $96,500,000.

Under Alternative #2, the Lake Street WWTP would be largely abandoned and virtually all treatment would occur at the Milton Street WWTP. The Milton Street WWTP does not have the ability or capacity to accept flow from the Lake Street WWTP. Transferring the pre-treated (screened and grit removal) flow from the Lake Street WWTP requires major capital construction by extending already existing piping as well as the rehabilitating and adding new treatment components to the Milton Street WWTP. However, the age and condition of the Lake Street WWTP makes the concept of consolidation more cost-effective for long-term treatment of the flows handled by CCSD. Upgrades at the Lake Street would consist of replacing the influent headwork's and adding a new septage receiving facility, but the primary clarifiers, trickling filters and secondary clarifiers would all be abandoned. The Lake Street facility effluent outfall pipe would be extended 5,000 feet downstream of the current discharge location to a new siphon under the river to the Milton Street WWTP property, A second train of primary clarifiers, trickling filters and secondary clarifiers would be constructed similar in design to the existing Milton Street WWTP. The major upgrades at the existing Milton Street WWTP would be the same as those for Alternative #1, however, an additional sludge thickener and sludge digester would be added to handle the additional sludge volume produced, and the effluent denitrification filters and UV disinfection would be sized to handle the combined flows. The estimated cost for the Alternative #2 upgrades is approximately $80,800,000.

Based on the capital cost and Present Worth analysis, it is recommended that the consolidation of treatment at the Milton Street WWTP (Alternative #2) be the future capital improvement plan for consideration by the CCSD.

1.0 INTRODUCTION

Civil & Environmental Engineering, Landscape Architecture, and Land Surveying, PLLC (CEE) has been contracted by the Chemung County Sewer Districts (CCSD) to evaluate the improvements to the Milton Street and Lake Street Wastewater Treatment facilities, and the possible consolidation of both facilities to allow more efficient compliance with upcoming regulation changes and reduced operating costs. Because both facilities are aging, upgrades to the existing infrastructure will be necessary in upcoming years. Additionally, recent SPDES permits require disinfection of effluent and more stringent nutrient (Nitrogen and Phosphorus) reductions will be required in coming years, both of which will require upgrades and new infrastructure at both facilities.

The report is based on a combination of on-site field evaluations and inspections at each of the CCSD facilities, meetings and discussions with the CCSD operating staff, and review and analysis of archived operating data provided by CCSD. This report first provides basic information about each facility (Section 1.0), followed by an assessment of operating data for the facilities and the assessment of the ability of each facility to meet current and future regulatory requirements (See Section 2.0). Sections 3.0 and 4.0 provide an assessment of the condition of each of the facilities, while Section 5.0 provides a preliminary design and cost estimate for the alternatives for future WWTP operations.

1.1 Lake Street WWTP

The Lake Street WWTP services the Village of Elmira Heights, the majority of the Village of Horseheads, and portions of the Towns of Elmira, Horseheads, Veteran and Big Flats. The Lake Street WWTP was constructed in 1962 and was upgraded in both 1968 and 1986. The CCSD has also completed smaller improvement projects intermittently throughout the years. The Lake Street WWTP has a design average flow (DAF) of 12.2 MGD. Based on the available operating data, the peak flow through the Lake Street is 20.0 MGD; however, the repeatedly reported values of 19.9 and 20.0 MGD would seem to indicate that the maximum reading on the monitoring device is 20 MGD and that the actual flows have likely exceeded 20 MGD at times.

The CCSD operates the WWTP under SPDES Permit No. NY0036986, which permits discharge to the Chemung River. SPDES permits are renewed every five years, and the current permit has an expiration date of August 31, 2019. A copy of the Lake St. WWTP permit is included in Appendix A. The plant discharge must not exceed the permit effluent limits identified in Table 1.

TABLE 1: Lake Street WWTP Effluent Limits, SPDES No.NY0036986

Parameter	Monthly Average	Weekly Average	Daily Maximum	Units
$CBOD_5$	25	40	--	mg/L
	2,544	4,070	--	lbs/d
UOD	3,395	--	--	lbs/d
Suspended Solids	30	45	--	mg/L
	3,052	4,579	--	lbs/d
Dissolved Oxygen	Shall not be less than 6 mg/L			
pH	Shall be in the range of 6 to 9 standard units			
Ammonia Nitrogen (as N)				
June – October	305	--	--	lbs/d
	Monitor	--	--	mg/L
November – May	Monitor	--	--	lbs/d
	Monitor	--	--	mg/L
Aluminum, Total	--	--	12	lbs/d
Antimony, Total	--	--	1.02	lbs/d
Cadmium, Total	--	--	0.23	lbs/d
Lead, Total	--	--	0.41	lbs/d
Thallium, Total	--	--	0.41	lbs/d
Cyanide	--	--	2.68	lbs/d
Phenols, Total	--	--	0.61	lbs/d
Mercury, Total	--	--	50	ng/L

The Lake Street WWTP process consists of a headworks building containing communitors, a Parshall flume influent flowmeter, grit removal and lift station, primary clarifiers, secondary treatment consisting of trickling filters and secondary clarifiers, and post aeration. Ancillary systems for waste solids handling include two anaerobic sludge digesters and a belt filter press. The dewatered sludge cake is hauled from the site and disposed of at an approved facility. The Lake Street WWTP does not have the capability for effluent disinfection and the facility is currently under consent decree to install an effluent disinfection system.

1.2 Milton Street WWTP

The Milton Street WWTP services the City of Elmira, the Town of Elmira and portions of the Town of Southport. The collection network encompasses some 4,300 acres and services approximately 45,000 people. The facility, which went on-line in 1987, has a DAF of 12.0 MGD and a DMF of 24 MGD. A site plan of the facility is included in Exhibit C.

The CCSD operates the WWTP under SPDES Permit No. NY0035742, which permits discharge to the Chemung River. SPDES permits are renewed every five years, and the current permit has an expiration date of August 31, 2019. A copy of the Milton Street WWTP permit is included in Appendix A. The plant discharge must not exceed the permit effluent limits identified in Table 2.

The Milton Street WWTP process consists of an influent lift station and headworks building with Archimedes screw pumps, influent bar screens and grit removal, a flow diversion basin, primary clarifiers, secondary treatment consisting of trickling filters and secondary clarifiers, chlorine contact tanks, and post aeration. Ancillary systems for waste solids handling include an anaerobic primary digester, an anaerobic secondary digester, and two belt filter presses. The dewatered sludge cake is hauled from the site and disposed of at an approved facility. The Milton Street WWTP does not currently disinfect prior to discharge. Previously installed chlorine dosing equipment has been removed. The Milton WWTP is not currently under a consent order to install disinfection but the Executive Director has negotiated an alternative of installing new disinfection at the Milton Street Plant for compliance with the consent order if a consolidation plan is approved.

TABLE 2: Milton Street WWTP Effluent Limits, SPDES No.NY0035742

Parameter	Monthly Average	Weekly Average	Daily Maximum	Units
$CBOD_5$	25	40	--	mg/L
	2,502	4,003	--	lbs/d
UOD	4,660	--	--	lbs/d
Suspended Solids	30	45	--	mg/L
	3,002	4,504	--	lbs/d
Dissolved Oxygen	Shall not be less than 6 mg/L			
Ph	Shall be in the range of 6 to 9 standard units			
Ammonia Nitrogen (as N)				
June – October	313	--	--	lbs/d
	Monitor	--	--	mg/L
November – May	Monitor	--	--	lbs/d
	Monitor	--	--	mg/L
Aluminum, Total	Monitor	--	11.2	lbs/d
Antimony, Total	Monitor	--	1.0	lbs/d
Cadmium, Total	Monitor	--	0.18	lbs/d
Lead, Total	Monitor	--	0.65	lbs/d
Thallium, Total	Monitor	--	2.4	lbs/d
Cyanide	Monitor	--	6.0	lbs/d
Phenols, Total	0.8	--	Monitor	lbs/d
TetrachloroethenePhenols,	Monitor0.8	----	0.6Monitor	lbs/dlbs/d
TolueneTetrachloroethene	1.4Monitor	----	Monitor0.6	lbs/dlbs/d
Mercury, TotalToluene	--1.4	----	50Monitor	ng/Llbs/d
Mercury, Total	--	--	50	ng/L

2.0 OPERATION AND REGULATORY ASSESSMENT

2.1 Summary of Operating Data

In order to evaluate the current CCSD Wastewater Treatment facilities relative to the anticipated 2025 mass limits for total nitrogen and phosphorous, CEE reviewed and evaluated the influent and effluent data for the two CCSD facilities. For the Milton Street facility, CEE reviewed data for the period of January 1, 2013, through August 31, 2017. For the Lake Street facility, CEE reviewed data for the period of February 1, 2015, through August 31, 2017. The purpose of the review and evaluation was:

- To estimate the influent loadings for each facility, as this represents the design basis for any potential upgrades.
- To evaluate the current treatment performance of each facility relative to nitrogen and phosphorous removal;
- To estimate the current effluent nitrogen and phosphorous loadings for each facility; and
- To evaluate the speciation of the nitrogen in the effluent from each facility, as the speciation of the nitrogen dictates the treatment options for achieving total nitrogen removal;

2.2 Influent Data

The average influent characteristics for each facility during the evaluation periods are provided in Table 3. Figure 1 is a chronological plot of the monthly average flow for each facility. Figure 2 is a chronological plot of the monthly average influent loading of 5-day biochemical oxygen demand (BOD5) for each facility. BOD5 represents the relative organic loading to a treatment plant. Figure 3 is a chronological plot of the monthly average influent loading of total Kjeldahl nitrogen (TKN) for each facility. Note that because total nitrogen is defined as the sum of TKN, nitrate and nitrite, the influent TKN and total nitrogen are effectively the same as there should be no nitrate or nitrite in the influent wastewater. Figure 4 is a chronological plot of the monthly average influent loading of ammonia nitrogen for each facility. Figure 5 is a chronological plot of the monthly average influent loading of phosphorous for each facility.

TABLE 3: Average Influent Characteristics

	Lake Street	Milton Street
Flow (MGD)	6.70	5.72
5-Day Biochemical Oxygen Demand (lbs/day)	5,416	5,787
Organic Nitrogen (lbs/day)	394	907
Ammonia Nitrogen (lbs/day)	307	532
Total Nitrogen (lbs/day)	692	1,434
Phosphorous (lbs/day)	108	411

The average flow and organic loadings are similar for the two facilities; however, the typical nitrogen and phosphorous loadings to the Milton Street facility are about double that of Lake Street. The following additional observations were based on the available data for the two facilities and may warrant additional investigation:

- The influent nitrogen and phosphorous loadings at the Milton Street facility were significantly above normal levels during the period of April through September 2015;
- The flow data for the Milton Street facility is slightly different than the values on the provided discharge monitoring reports (DMRs) and calculated based on the nitrogen and phosphorus concentrations and loadings; and
- The flow through the Lake Street facility significantly increased during April and May 2017. The repeated values of 20.0 MGD recorded indicate that the actual flows likely exceeded the maximum range of the monitoring device.

2.3 Effluent Data

The average effluent characteristics for each facility during the evaluation periods provided in Table 4. Figure 6 is a chronological plot of the monthly average effluent loading of BOD5 for each facility. Figure 7 is a chronological plot of the monthly average effluent loading of total nitrogen for each facility. Figure 8 is a chronological plot of the monthly average effluent loading of ammonia nitrogen for each facility. Figure 9 is a chronological plot of the monthly average effluent loading of nitrate and nitrite nitrogen for each facility. Figure 10 is a chronological plot of the monthly average effluent loading of phosphorous for each facility.

TABLE 4: Average Effluent Characteristics

	Lake Street	Milton Street
5-Day Biochemical Oxygen Demand (lbs/day)	747	156
Organic Nitrogen (lbs/day)	161	88.1
Ammonia Nitrogen (lbs/day)	256	52.8
Nitrate + Nitrite Nitrogen (lbs/day)	132	694
Total Nitrogen (lbs/day)	549	834
Total Nitrogen (mg/L)	11.1	18.3
Phosphorous (lbs/day)	64.3	76.1
Phosphorous (mg/L)	1.28	1.57

FIGURE 1. CHRONOLOGICAL PLOT OF MONTHLY AVERAGE FLOW

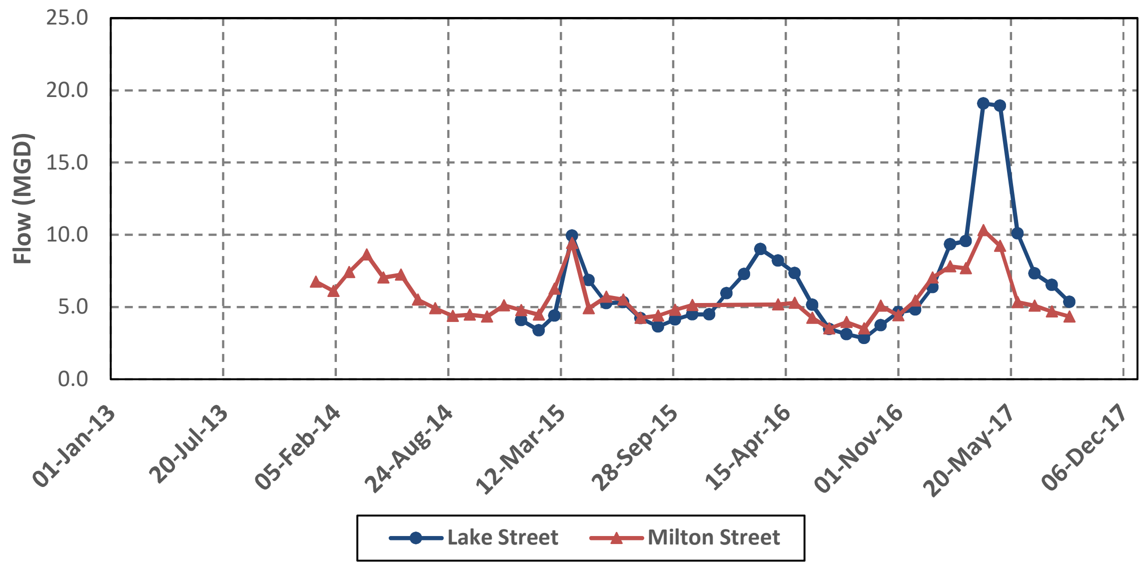


FIGURE 2. PLOT OF MONTHLY AVERAGE INFLUENT BOD_5

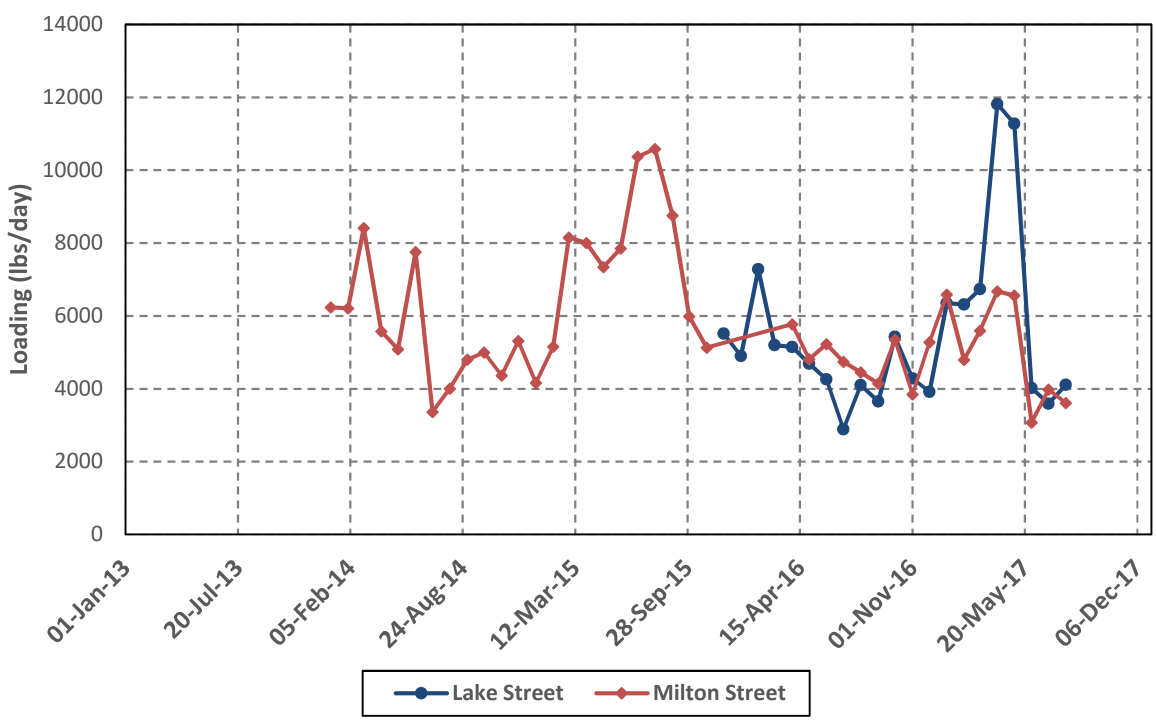


FIGURE 3. PLOT OF MONTHLY AVERAGE INFLUENT TKN

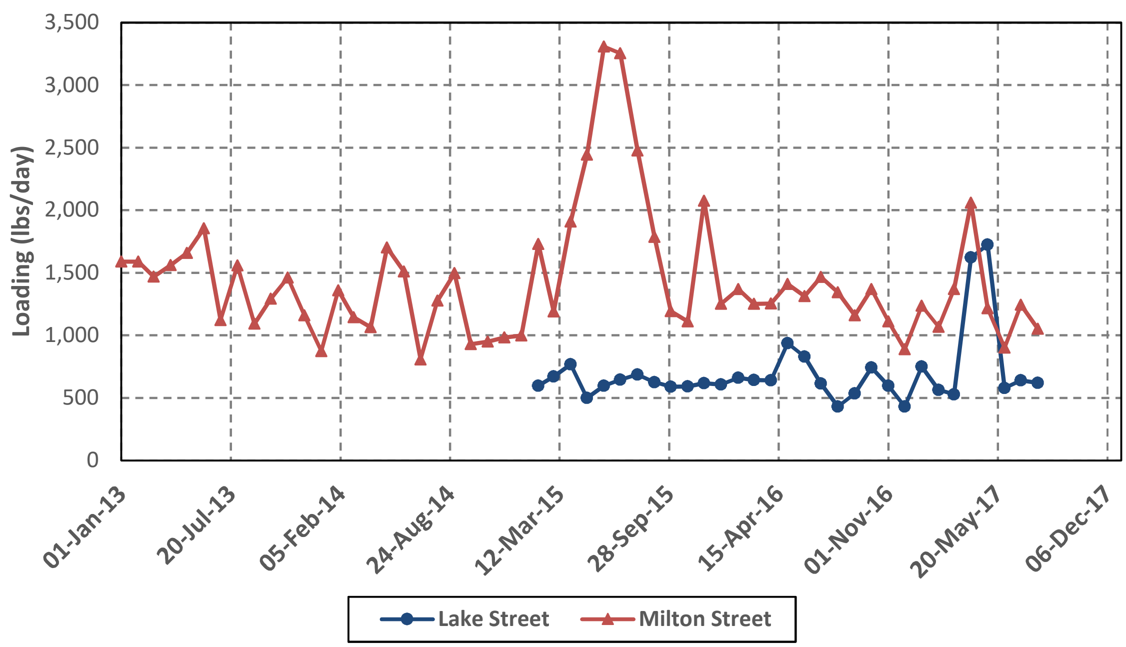


FIGURE 4. PLOT OF MONTHLY AVERAGE INFLUENT AMMONIA

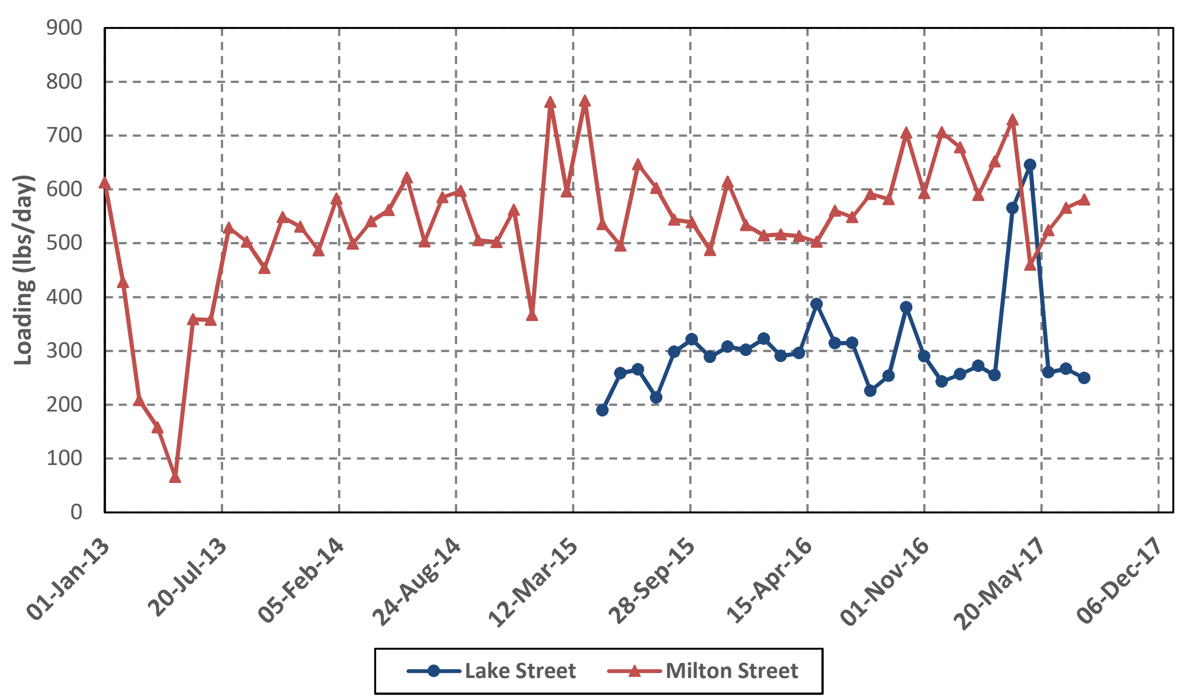


FIGURE 5. PLOT OF MONTHLY AVERAGE INFLUENT PHOSPHOROUS

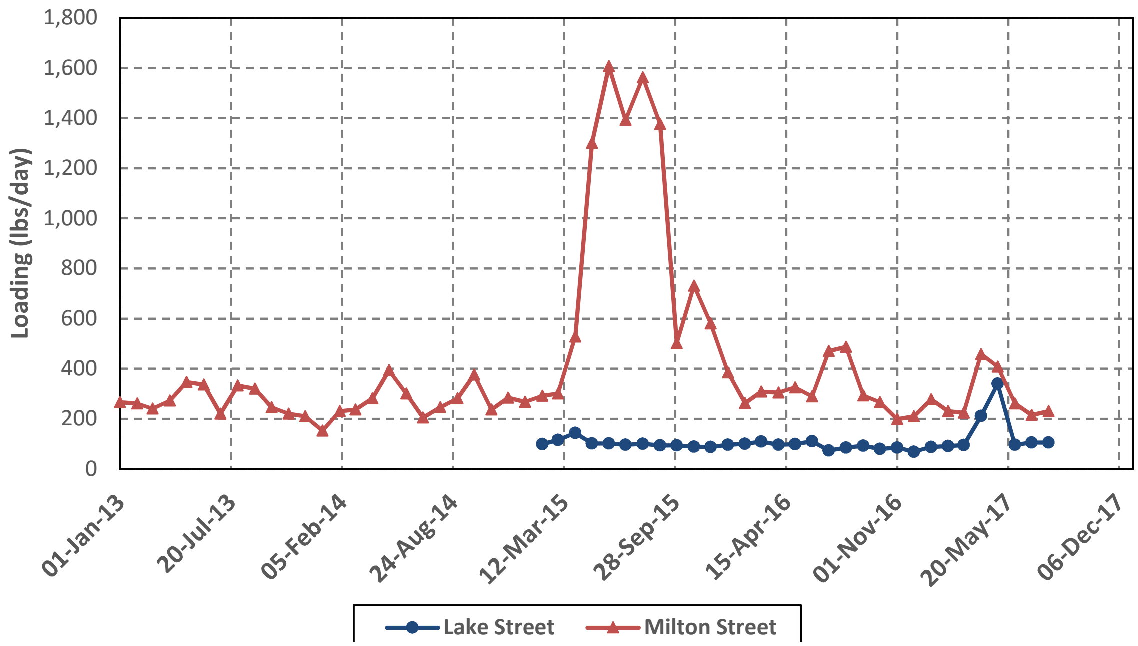


FIGURE 6. PLOT OF MONTHLY AVERAGE EFFLUENT BOD_5

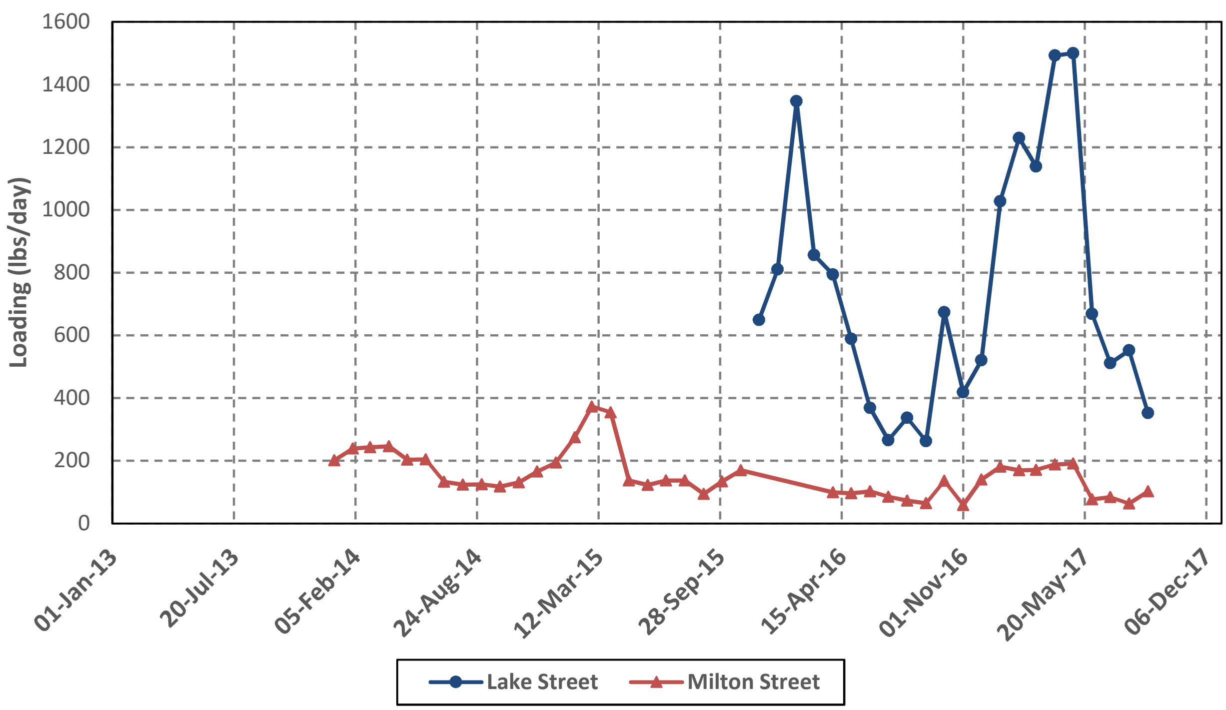


FIGURE 7. PLOT OF MONTHLY AVERAGE EFFLUENT TOTAL NITROGEN

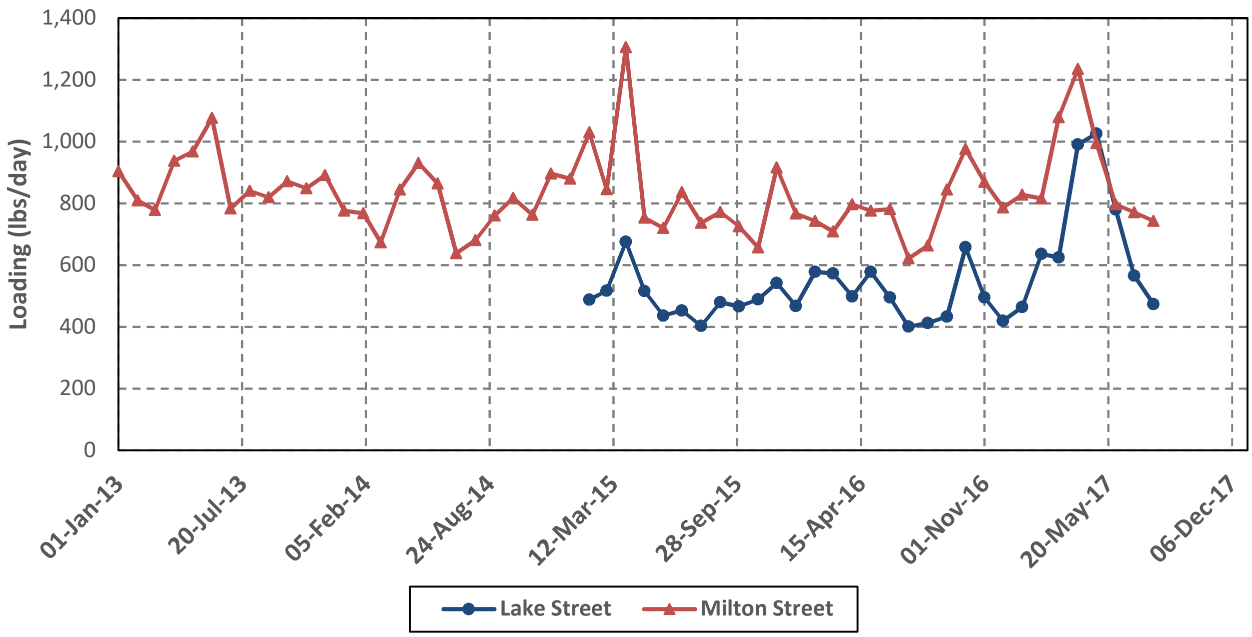


FIGURE 8. PLOT OF MONTHLY AVERAGE EFFLUENT AMMONIA

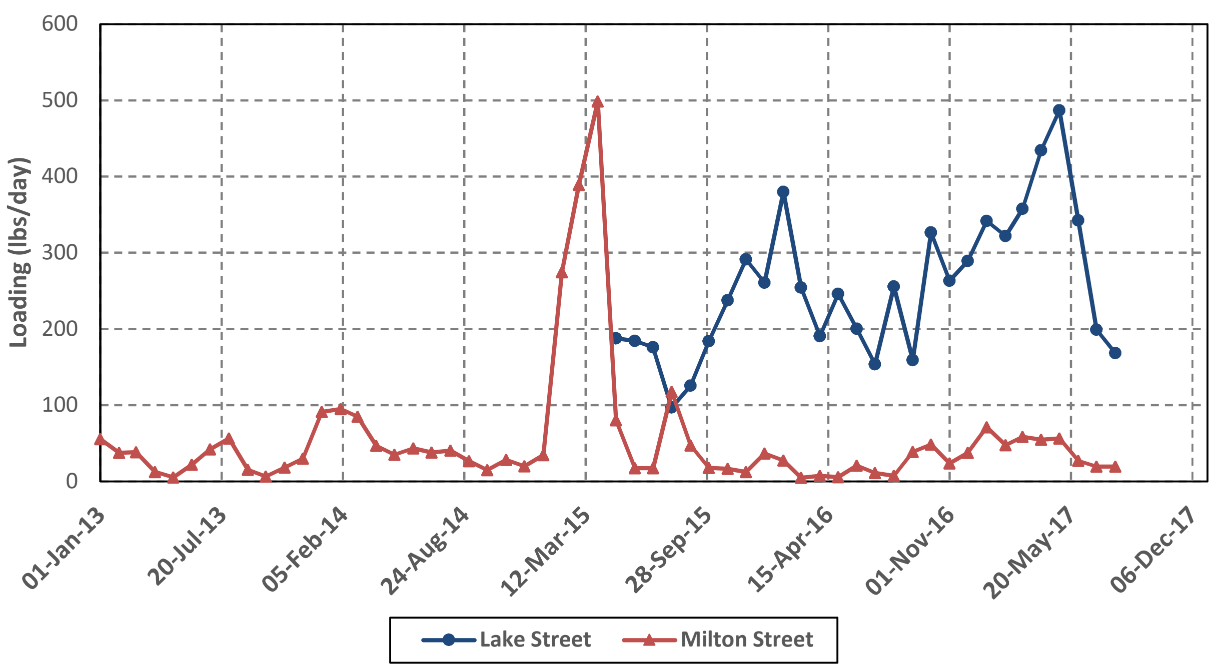


FIGURE 9. PLOT OF MONTHLY AVERAGE EFFLUENT NO_2+NO_3-N

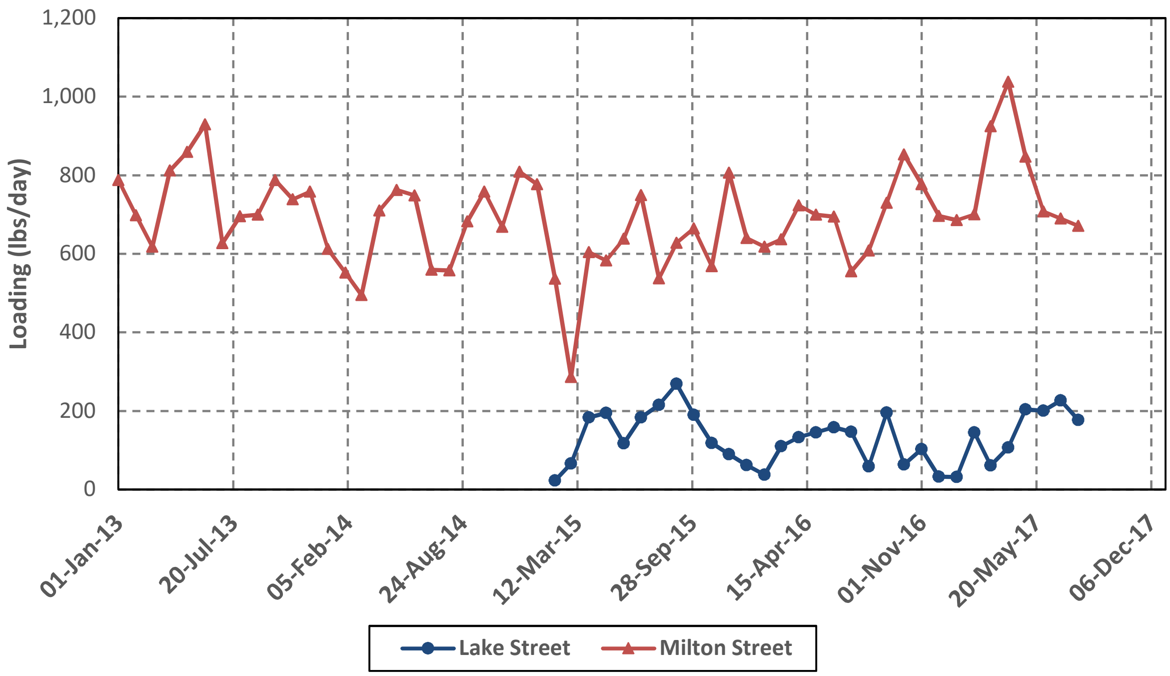
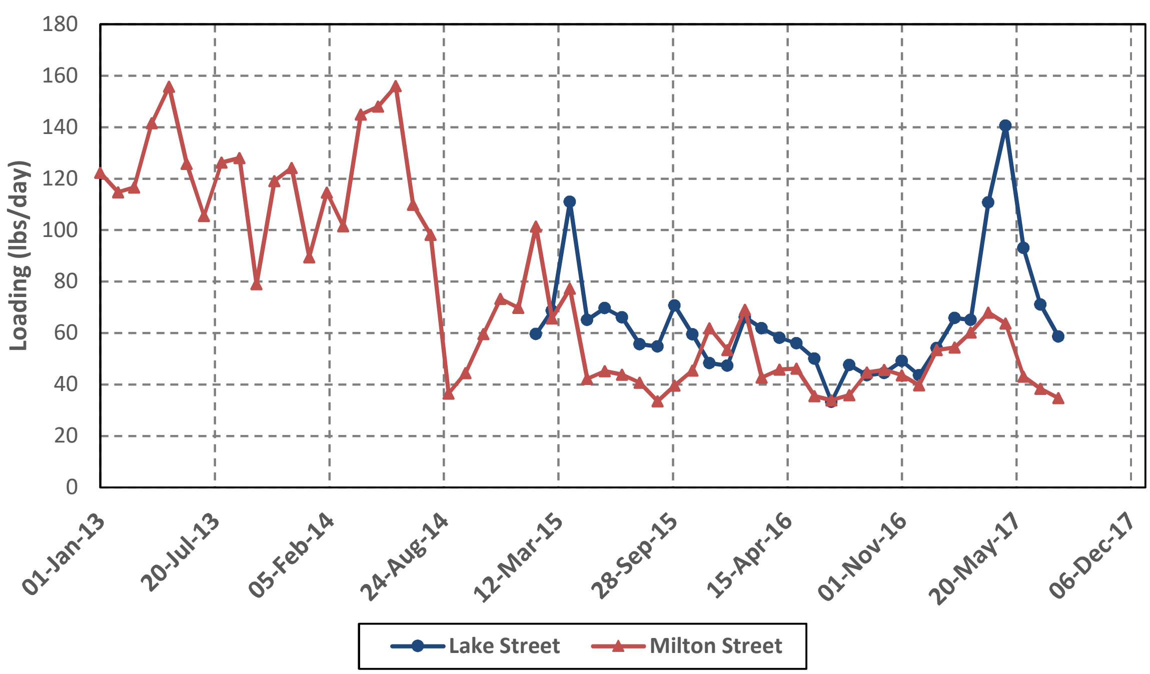


FIGURE 10. PLOT OF MONTHLY AVERAGE EFFLUENT PHOSPHOROUS



2.4 Assessment of Milton Street WWTP Operation

For conventional parameters such as flow, $CBOD_5$, ammonia nitrogen, and suspended solids the Milton Street Facility achieved effluent that was consistently in compliance and does not appear to be in jeopardy of exceeding established limits. The Milton Street facility is a consistently good performing treatment system, averaging 97 percent BOD_5 removal and nitrifying on a year-round basis. Based on the review period, 83 percent of the total nitrogen in the Milton Street effluent was nitrate and nitrite. Of note, ammonia (concentration and load) did spike in the effluent during February of 2015 and continued to be at elevated levels through April. However, since these elevated levels appeared between November 1st and May 31st, no exceedance occurred. The review of the UOD data did not present compliance concerns, as the facility typically operates below half of its allowable discharge limit for UOD.

Mercury, antimony, lead, and thallium were well below their respective established limits. Cadmium was above the permitted discharge loading during two events; however, the levels were typically less than half of the limit with some elevated levels occurring during 2016. Aluminum levels were above the permitted level four times with several more samples that were close to the limit. These exceedances did not appear to be related to changes in flow and were spread intermittently across the data set. As with the aluminum exceedances at the Lake Street plant, CCSD is currently investigating the elevated aluminum as a potential laboratory analytical issue. Cyanide, tetrachloroethene, and toluene were consistently below their respective discharge. While phenol levels did not exceed the discharge threshold, they were elevated during 2015 and early 2016, but appeared to settle into lower levels during 2016 and 2017.

Overall, the Milton Street Facility appears to be providing adequate treatment for its existing loading.

2.5 Assessment of Lake Street WWTP Operation

The Lake Street plant is significantly less efficient at removing conventional pollutants (i.e. CBOD5 and ammonia) and, as a result, discharges significantly higher amounts of the conventional pollutants than the Milton Street plant, despite having a roughly similar influent CBOD5 loading and significantly low influent ammonia loading. In contrast to the Milton Street facility, the Lake Street facility only achieved an average 86 percent BOD5 removal and the facility does not consistently nitrify. Based on the review period for the Lake Street facility, the speciation of the nitrogen in the Lake Street effluent was 24 percent nitrate and nitrite, 29 percent organic nitrogen, and 47 percent ammonia. There are two likely factors contributing to the superior performance at Milton Street, despite Milton Street being the higher loaded of the two facilities: 1) the trickling filter media used at the Milton Street facility, and 2) the trickling filter design Lake Street promotes short-circuiting of the primary effluent directly to the secondary clarifiers. For both facilities, the effluent phosphorous is roughly similar.

Based on the evaluated data (May 2015 through September 2017), the Lake Street facility achieved consistent compliance for the conventional parameters of CBOD5 and suspended solids, but the facility exceeded its monthly average ammonia mass limit in June 2017. The elevated effluent ammonia level also contributed to an exceedance of the monthly average UOD for June 2017. During April of 2017 flows began increasing sharply and stayed elevated for nearly two months. It is understood that this was due to flow backing up in the influent Parshall flume flow meter.

While the facility generally achieves compliance with the limits for the conventional parameters, it typically operates much closer to the limits than the Milton Street plant. As an example, during April and May 2017, the Lake Street plant was discharging at roughly 60 percent of the effluent CBOD5 mass limit, while the closest that the Milton Street plant has come to its effluent CBOD5 mass limit has been about 15 percent of the limit based on the period of January 2104 through September 2017.

Mercury, antimony, lead, and cadmium were well below their respective established limits. Thallium was above the permitted discharge loading on three events, but was typically less than half of the limit. Aluminum levels were above the permitted level five times with several more samples that were close to the limit. CCSD has tested the influent aluminum levels and is currently investigating the elevated aluminum as a potential laboratory analytical issue. Cyanide and phenol were above their respective permitted discharge levels for two events, but were typically less than half of the limit.

2.6 NPDES Permit Status

The Lake Street and Milton Street WWTP SPDES Permit expires in 2019. The new requirements for Nitrogen and Phosphorus removal are set to take effect on January 1, 2025.

TABLE 5: Key Compliance Dates

WWTP	SPDES Permit Expiration	Compliance Date	
		Nitrogen	Phosphorus
Lake Street	August 31, 2019	January 1, 2025	January 1, 2025
Milton Street	August 31, 2019	January 1, 2025	January 1, 2025

The Chesapeake Bay Total Maximum Daily Load (TMDL) is a plan to reduce nutrient inputs (nitrogen and phosphorous) in the Chesapeake Bay watershed. The TMDL sets Bay watershed limits, which equate to a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus and 20 percent reduction in sediment, based on a 2009 baseline year.

The state of New York submitted its final Phase II Watershed Implementation Plan (WIP) in January 2013. This plan proposed 2025 waste load allocations for significant wastewater treatment plants that are primarily based on design flow times a target concentration of 0.5 mg/L for phosphorus and design flow times a target concentration of 8 mg/L for total nitrogen. The Phase II WIP includes the proposed 2025 waste load allocations (WLA) of 18,265 pounds of phosphorous per year and 292,234 pounds of nitrogen per year for each of the Chemung County facilities, based on the design flow of 12 million gallons per day (MGD) at each facility.

The TMDLs are implemented as a 12-month rolling mass, where the monthly-average daily loadings for each month are multiplied by the number of days in the month to determine the monthly mass, which is then added to the cumulative mass for the preceding 11 months. For the total nitrogen WLA, the permittee is allowed to adjust their reported 12-month nitrogen loading, if they have met their permitted 12-month phosphorus load limit by subtracting the difference between the phosphorous WLA and the actual 12-month phosphorus load, multiplied by a facility specific nitrogen to phosphorous ratio. The facility specific nitrogen to phosphorous ratio for both of the Chemung County facilities is 5.2.

Figure 11 is a chronological plot of the phosphorus and adjusted total nitrogen for the Lake Street facility, compared to the 2025 limits. Figure 12 is a chronological plot of the phosphorus and adjusted total nitrogen for the Milton Street facility, compared to the 2025 limits. Based on the data, both facilities will need to implement phosphorous removal, however, only the Milton Street facility would exceed the total nitrogen limits at the current influent flows and loadings. Note that Chemung County could potentially trade nitrogen credits between the two facilities such no additional nitrogen removal is needed.

Both facilities are currently using an aluminum-based coagulant to precipitate excess phosphorous upstream of the secondary clarifiers. Precipitation of phosphorous in secondary clarifiers using either aluminum or ferric salts, typically produces an effluent quality of around 1 mg/L phosphorus, which is consistent with the current average effluent concentration at both facilities; however, assuring consistent compliance with the future limits will require effluent filtration to further reduce the effluent phosphorous concentrations.

For compliance with the 2025 total nitrogen limit at the Milton Street facility, the facility will need to denitrify. CEE recommends using effluent denitrification filters, which would consist of an organic substrate addition (typically methanol), upstream of a granular media filter. Filter media provides surface area for growing fixed film bacteria, in similar fashion as the trickling filters. The methanol addition would be metered based on achieving a target effluent nitrate concentration. Note that the denitrification filters would also serve as the effluent filters needed for phosphorous removal.

Note that, for both the denitrification and phosphorous removal, the purpose of the filters are to meet annual mass loadings, and, therefore, the filters would not need to be designed to accommodate hydraulic peaks above the design flows. During hydraulic peak events, when the wastewater is typically relatively dilute, flows exceeding the filter design would be bypassed around the filters. Additionally, as previously mentioned, the usage of methanol for denitrification and iron (or aluminum) for phosphorus removal will be metered based on the desired target effluent quality. However, if Chemung County were to operate one or both facilities to exceed their removal targets, there is a potential opportunity that they could trade/sell their excess nitrogen and phosphorous removal credits to other dischargers in the New York “Bubble Permit” that are unable to meet their target nitrogen or phosphorous loadings. As an example of the potential value of nutrient credits, the 2016 - 2017 public auction pricing for nitrogen credits on the Pennvest Nutrient Credit Trading Program ranged from $2.25 to $2.81 per pound.

FIGURE 11. LAKE STREET TMDLs COMPARED TO EXPECTED 2025 LIMITS

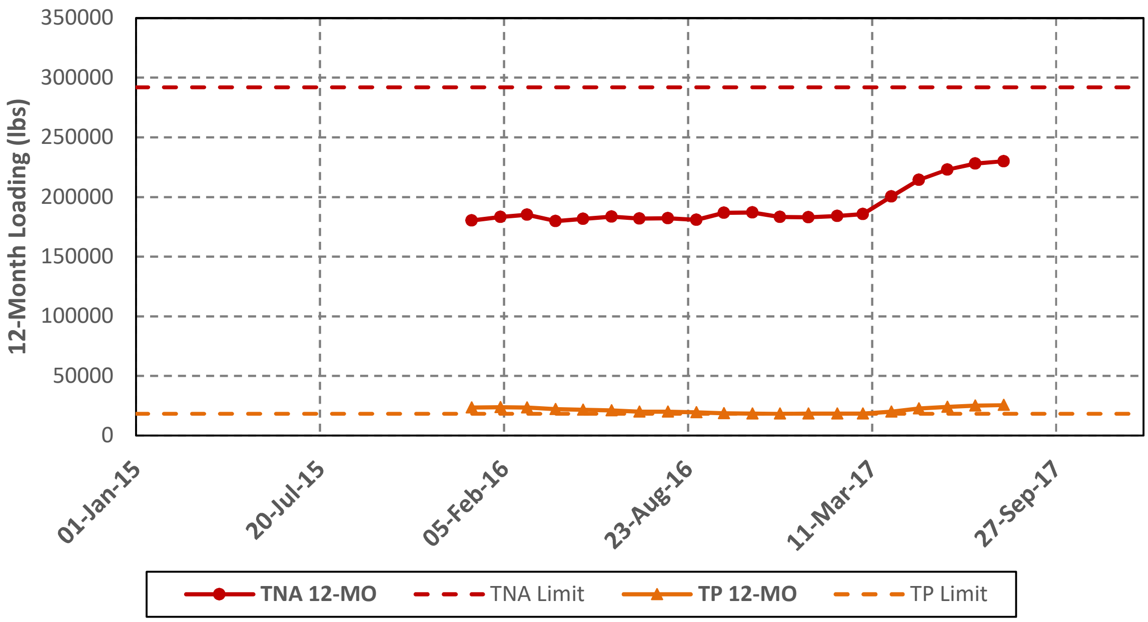
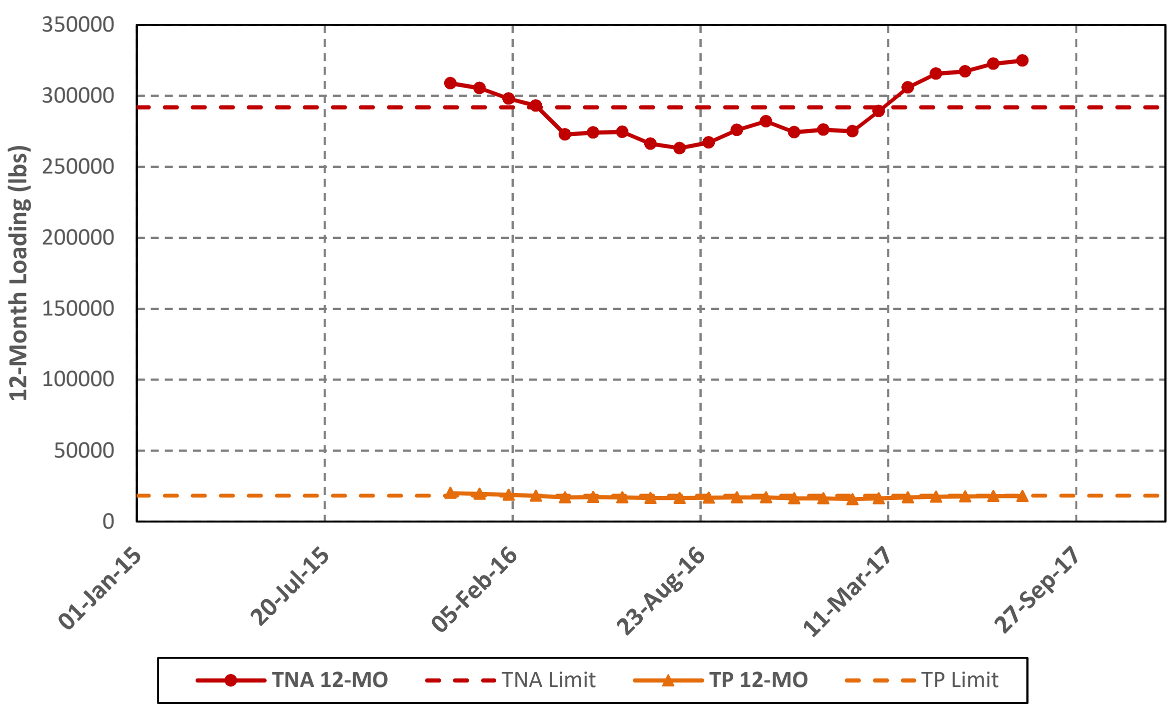


FIGURE 12. MILTON STREET TMDLs COMPARED TO EXPECTED 2025 LIMITS



3.0 LAKE STREET WWTP ASSESSMENT

The physical condition of the treatment plant equipment at the Lake Street WWTP was assessed to develop conclusions on whether the components are capable of performing on a long-term ongoing basis. The assessments were developed through on-site inspections, discussions with CCSD staff, and review of record documents. The WWTP typically meets effluent limits; however, effluent reduction limits for nitrogen and phosphorus are set to increase in the year 2025, which also needs to be considered when evaluating the existing WWTP equipment. The major operational concerns are equipment failure due to age.

3.1 Equipment Conditions

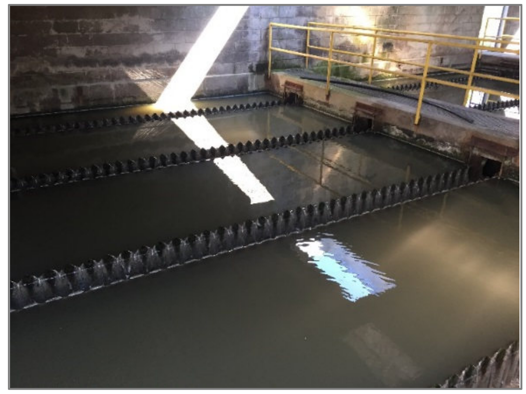
The condition of major process components of the Lake Street WWTP are summarized in the following sections.

Electrical – The electrical service to the Lake Street WWTP is 600 volt 3-phase transformed to 480 volt 3-phase with grounding. The facility includes a generator for backup power. Current electrical systems remain adequate to operate the facility as intended. Improvements to the existing electrical system may be required with proposed changes to the treatment process. The majority of the electrical components are antiquated and replacement of outdated components are necessary.

Influent Headworks and Pump Station – The Influent Headworks and Pump Station accepts flow from the Chemung County Sewer District No. 1. The raw sewage enters the facility through a 42" RCP inlet and flows through passing through two communitors followed by a Parshall flume influent flowmeter and an aerated grit chamber. The purpose of the communitors is to shred rags and other large solids that could clog pumps and otherwise interfere with the downstream treatment equipment. The accumulated material in the grit chamber is mechanically removed and deposited in a dumpster for offsite disposal. . The overall structure is beyond its 20 to 30 year life expectancy and is concluded to be in fair to poor condition. As a result, the Influent Headworks should be replaced or refurbished.

Following the influent Headworks, the flow drops into the influent wet well, from which it is pumped to the primary clarifiers using a combination of three vertical centrifugal pumps (6200 GPM, 4600 GPM, 3300 GPM) that pump into a 24" header. The pumps, which are situated in a dry well configuration, are shaft driven with the motors located one level up, directly above each pump. The raw sewage influent pump station is out dated and in need of replacement or refurbishing.

Primary Clarifiers – The Lake Street WWTP includes three, 19.5-foot wide by 100-foot long rectangular primary clarifiers that were constructed in 1962. The clarifiers have an 8-ft side water depth, which is less than the recommended minimum 10-foot depth specified by the 10-States Standards. The clarifiers provide a surface overflow rate (SOR) of 2,085 gallons per day per square foot (gpd/ft2) at the design flow of 12.2 MGD, which exceeds the recommended (maximum) SOR of 1,000 gpd/ft2 for primary clarifiers specified in the 10-States Standards. At the measured peak flow of 20 MGD, the clarifiers provide an SOR of 3,418 gpd/ft2, which also exceeds the requirements set forth in 10-States Standards.



The primary clarifier components include a chain-and-flight sludge collector mechanism, a sludge hopper with a screw conveyor for sludge removal, manual scum pipes for removal of floating material, and effluent weirs. The clarifier drive and scraper equipment has been updated and replaced at periodic intervals. The primary clarifiers are covered with concrete slab covers in the areas outside of the building for odor control.

At the time of the CEE visit, clarifier No. 3 was drained and being equipped with new chains and flights, allowing for inspection of the system internals. The effluent weir troughs and scum pipes show excessive amount of deterioration and are in need of replacement. However, the concrete tank walls and floors of the primary clarifier structures look to be in good shape and may be rehabilitated for reuse in preparing alternatives for the consolidation study.

The clarified primary effluent flows to trickling filters and the settled sludge is pumped to the digesters. CEE concludes that the primary clarifiers will need to be upgraded or replaced for compliance with the 10-States Standards.

Trickling Filters – The Lake Street WWTP includes two, 135-foot diameter trickling filters for secondary treatment. The trickling filters are in-ground concrete tanks that are approximately 9 foot deep. Each filter is fitted with a block style under drain supporting approximately 6 feet of rock filter media. Influent wastewater is continuously applied to the top of the rock media using a distributor mechanism, which is fed primary settled wastewater flow through the center pier by means of a distribution pump located in the re-circulation building.

The trickling filters show major signs of wear, deterioration, and failures. The distribution arms show signs of short-circuiting of flow for uneven distribution across the filter media. Additionally, the seal packing at the center pier for proper sealing of flow during rotation show signs of major leaking.

CEE understands that the trickling filter center columns and distributor arms were replaced as part of the 1986 facility upgrades, and that the current distributors do not utilize mercury seals. The 1986 upgrades also included fitting the above portion of the trickling filter tanks with a concrete façade in order to cover the deteriorated portion of the tanks that exist above ground. The rock filter media and underdrains have never been replaced.

Additionally, the original underdrains are still being utilized and the condition of the overall structure below the ground surface is believed to be in poor condition. A more in depth structural evaluation will be necessary to evaluate the degree of rehabilitation needed.

CEE concludes that the trickling filters will need to be replaced for continued long-term operation of the WWTP.

Trickling Filter Recirculation Station - The Lake Street WWTP trickling filters are provided constant flow by means of a tri-plex fitted recirculation pump station. The exterior wet well receives flow from the primary clarifiers as well as return flow from both trickling filters. The design of the wet well, which was modified in 1986, is such that all of the effluent from both filters discharges to the wet well, which then overflows the blend of primary effluent and trickling filter effluent to the secondary clarifiers. As such, there is a significant mechanism for primary effluent to bypass secondary treatment at the Lake Street facility. A complete replacement of the trickling filter pump station is recommended by CEE to eliminate the bypassing of the secondary treatment system.

Piping improvements will be necessary as part of the overall improvement recommendations. The recirculation pumps are dry pit mounted vertical centrifugal pumps capable of pumping 12.8 MGD at a TDH of 18 feet. The three pumps pump into an 18" header pipe that can distribute flow to either of the two trickling filters.

Final Clarifiers – The Lake Street WWTP includes three 38-foot wide by 132-foot long rectangular secondary clarifiers. The clarifiers have an 8.5-ft side water depth, which is less than the recommended minimum 10-foot depth specified by the 10-States Standards for secondary clarifiers following an attached growth biological reactor. The clarifiers provide an SOR of 1,403 gpd/ft^2 at the measured peak flow of 20 MGD, which exceeds the recommended maximum SOR of 1,200 gpd/ft^2 for secondary clarifiers servicing trickling filters specified in the 10-States Standards. The clarified secondary effluent overflows to the post aeration tank.

The secondary clarifiers include chain-and-flight sludge collector mechanisms and submerged effluent weirs. CEE understands that the clarifier drive and scraper equipment have been updated and replaced at periodic intervals. During the CEE visit, some minor structural issues were noted regarding the walkways and supports on the clarifiers.

CEE concludes that the secondary clarifiers will need to be upgraded or replaced to achieve compliance with the 10-States Standards.

Waste Solids Handling – The Lake Street WWTP includes two, 60-foot diameter anaerobic digesters for solids stabilization of the waste primary and secondary solids. CEE understands that the digested sludge from the anaerobic digesters are dewatered for off-site disposal using a belt filter press; however, CEE did not evaluate the press during the site visit.

CEE understands that there are a number of issues with the floating roofs on the anaerobic digesters at the Lake Street facility. The roofs are reportedly unbalanced and the personnel have placed barrels on the roof in an attempt to balance the roof. CCSD personnel also reported sludge leaks onto the top of the roof and can cause the roof to stick during the wintertime when it freezes. The digested sludge from the anaerobic digesters are dewatered for off-site disposal using one belt filter press. The belt filter press is antiquated and lack of readily available parts for repairs or replacement. CEE recommends that CCSD replace the press with new modern equipment that has full manufacturer support.

WWTP Buildings, Laboratories, and Garage Facilities - The buildings within the WWTP site were constructed during the original 1962 project. The buildings are outdated and provide reduced functionality for modern treatment related activities. The doors and frames to the building are in need of upgrades. General Building improvements should be considered as part of the improvements including but not limited to the exterior brickwork, roof repairs, painting the interior, new lighting systems, electrical upgrades, heating and ventilation upgrades, and miscellaneous. CEE understands that the majority of the analytical testing for the Lake Street WWTP is currently performed by the laboratory at the Milton Street WWTP.

SCADA – The Lake Street WWTP does not currently have a SCADA system. The need for a SCADA system will be considered and included as appropriate for the recommended improvements.

Site – The Lake Street site overall is in good condition. The site paving should be considered for repair or replacement, but the overall site access and layout require minimal changes or improvements.

Non-Potable Water System – The non-potable water system should be considered for basic upgrades including new piping, pumps, and yard hydrants.

3.2 Upgrades to Achieve Regulatory Compliance

In addition to the upgrades recommended in Section 3.1, the WWTP will need to be upgraded to meet future regulatory requirements. This includes adding equipment to allow achievement of the reduced Nitrogen and Phosphorus effluent limits, and equipment to provide effluent disinfection.

4.0 MILTON STREET WWTP ASSESSMENT

The physical condition of the treatment plant equipment at the Milton Street WWTP was assessed to identify deficiencies and project costs for upgrades. The assessments were developed through on-site inspections, discussions with CCSD staff, and review of record documents. The WWTP typically meets effluent limits. However, effluent reduction limits for nitrogen and phosphorus are set it increase in the year 2025. The major operational concerns are equipment failure due to age. The electrical components are over 30 years old and are in many cases beyond their expected operational life and should be evaluated and upgraded as necessary.

A portion of the wastewater flow to the Milton Street WWTP originates from the area north of the Chemung River within the Elmira Sewer District and crosses the Chemung River via the Sullivan Street inverted siphon structure. Once the flow crosses the river it reverts to a gravity flow condition for approximately 6,000 feet until it reaches the Milton Street WWTP. That area of the gravity collections system is located within the limits of the constructed flood levee. The Army Corps of Engineers (ACOE) has expressed concerns about the location of the 48" gravity line and manholes being within the flood levee embankment and have requested that those portions be relocated outside of the levee zone.

The condition of major process components of the Milton Street WWTP are summarized in the following sections.

4.1 Equipment Conditions

Influent Lift Station and Headworks – The Influent Lift Station and Headworks at the Milton Street facility include three Archimedes' screw pumps, three automated bar screens, and two aerated grit chambers. The building structure and concrete appear to be structurally sound. The screw pumps lift the raw influent up to second level of the headworks building where the influent bar screens are located. CEE understands that one screw pump is sufficient to process the normal dry weather flow, two pumps are used during peak flow conditions, and the third pump is installed as a spare. CEE also understands that the screw pumps are capable of processing more flow than can be processed through the headworks building. The screw pumps appear corroded and there are some deformations of the screw fins. Based on discussions with a manufacturer of Archimedes' screw pumps, the typical service life of operated in continuous service is at least 30 years. As the current Milton Street plant is roughly 30 years old, CEE recommends that CCSD replace all three existing screw pumps.

In the upper level of the headwork's building the raw influent flows via channels from the screw pumps through the bar screens. The purpose of the bar screens is to remove rags and other large solids that could clog pumps and otherwise interfere with the downstream treatment equipment. The original design included two bar screens; however, a third screen was later added in order to address occasional overflow conditions the screening room during high flows or when the screens are dirty. CEE understands that overflows can still occur, and that upgrading to new screen with continuous rakes would help to alleviate the chances for overflowing. The screens are automatically cleaned based on the measured head loss across each screen. The captured material from the screens is deposited on a conveyer, which transfers the material to a dumpster. Aside from the need for improved / more frequent cleaning and overall age, CEE is not aware of any performance issues with the screens and they appear to be free of any noticeable corrosion; however, the structures are in need of painting and major mechanical rehabilitation; therefore, CEE recommends that the screening system should be replaced with a more modern continuous rake style system.

After the screens, the wastewater flows to two aerated grit chambers. The grit chambers consist of two concrete tanks that are aerated in order to induce a rolling current that promotes the deposit of dense solids on the tank bottom. The purpose of the grit chambers is to remove abrasive material that could erode downstream treatment equipment, such as the primary clarifier rake mechanisms and sludge pumps. Each grit chamber is equipped with a pump to periodically remove the accumulated grit. The air is provided using positive displacement blowers. CEE is not aware of any mechanical issues with the associated equipment for the grit chambers. The concrete tanks and overflow weirs appear in good condition.

Upstream of the grit chambers, the flow from the bar screens to the grit chambers is merged into a 48 inch diameter pipe which then reduces to 36 inch upstream of a 36 inch pipe tee that splits the flow between the two parallel grit chambers. CCSD personnel believe that the reducer may restrict flow and may contribute to overflows. CEE recommends during the detailed design process the performance of a hydraulic evaluation to evaluate whether the reducer represents an actual bottleneck in the treatment capacity. Note that there is some evidence of corrosion on the underside of the reducer, which may be indicative of an eventual leak.

Just outside and downstream of headworks building, the overflow from the grit chambers flows through a channel alongside of the 1.6 million gallon Equalization Basin. On the upstream end of the channel is an overflow weir. On the downstream end of the channel is the Parshall flume influent flowmeter. CEE understands that the plant headworks is designed for a maximum flow of 32 million gallons per day (MGD), while the peak flow for the rest of the plant is 18 MGD. The overflow weir is designed such that, when the flow exceeds 18 MGD, the excess flow is diverted to the Equalization Basin. The Equalization Basin includes two mixers, with air spargers to mix and aerate the diverted wastewater. If the influent flow exceeds the 18 MGD for sufficient time as to fill the Equalization Basin, the basin includes an overflow structure with flow measurement that discharges the excess water to the river. During these overflows the Equalization Basin is not mixed, in order to provide equivalent primary treatment. When the peak flow event is concluded, the diverted wastewater is gradually drained back to the headworks. Downstream of the influent flowmeter, the raw wastewater flows underground to the primary clarifiers.

Primary Clarifiers – The Milton Street WWTP includes two, 95-foot diameter primary clarifiers, each consisting of an in-ground concrete tank and a rake mechanism for sludge removal. The clarifiers have a surface overflow rate (SOR) of 846 gallons per day per square foot (gpd/ft^2) at the design flow of 12 MGD, which is well under the recommended (maximum) SOR of 1,000 gpd/ft^2 for primary clarifiers provided in the 10-States Standards. At an SOR of less than 1,000 gpd/ft^2, primary clarification of domestic wastewater typically removes about one third of the influent organic matter as measured by 5-day biochemical oxygen demand (BOD_5). At the peak hourly flow of 18 MGD, the clarifiers provide an SOR of 1,270 gpd/ft^2, which also complies with the requirements set forth in the 10-States Standards. The influent flow to the primary clarifiers is distributed between the two clarifiers using a splitter box. The clarified primary effluent flows to trickling filters and the settled sludge is pumped to the primary digester.

CEE understands that the effluent weirs and launders on the primary clarifiers are in need of replacement, as are the clarifier drive mechanisms. In addition to these repairs, CEE recommends taking each clarifier down for inspection of the clarifier internals for potential corrosion issues.

Trickling Filters – The WWTP includes two, 130-foot diameter trickling filters for secondary treatment. The trickling filters are above-ground tanks with shells construction using prefabricated concrete sections. Each trickling filter has an underdrain system and a 13-foot deep bed of structured PVC media. Influent wastewater is continuously applied to the top of the media using a distributor mechanism.

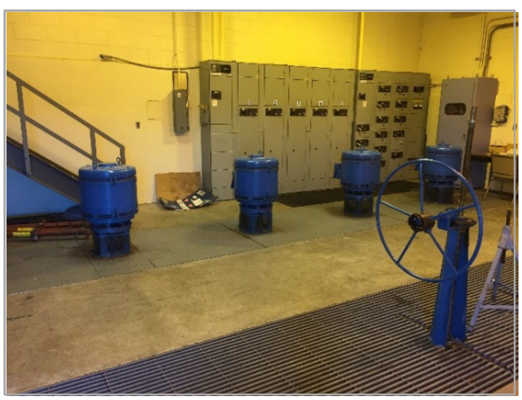
Based on evaluation of the facility operating data, the trickling filters are performing well and are nitrifying year round. During the CEE site visit, several items were observed: 1) there appears to be a significant amount of leakage from the center of the distributor mechanisms; 2) there has been some amount of creep by several of the side-wall sections; and, 3) the majority of the bottom air blowers appeared to be inoperable.

During the CEE site visit, the trickling filter distributor mechanisms were rotating smoothly and appeared to be doing a good job of distributing water across the top of the filter media. There was some evidence of corrosion on the mechanism on the center and the arms, but the extent could not be easily evaluated as the sprinkler arms were heavily coated with guano. Although the distributor mechanisms appeared to be working relatively well, there was a significant amount of leakage around the center column in both units. Due to the amount of leakage and the age of the units, CEE recommends that CCSD replace both distributor mechanisms. It should be noted that older trickling filters typically used elemental mercury seals to prevent the influent wastewater from leaking into the bearings. The use of mercury seals was phased out during the 1980's, about the same time that the current Milton Street plant was constructed; however, CEE understands that the trickling filter distributors at Milton Street do not utilize mercury seals.

Options for addressing the observed wall creep consist of either banding the outside of the tank with steel cables or pouring a new concrete shell around the existing tank shell. CEE recommends banding the tank and then re-caulking the joints between the wall panels.

With regards to the aeration blowers, based on the facility's performance data and the fact that forced aeration is relatively uncommon for trickling filters, CEE does not foresee any need for restoring the operation of the blowers at this time.

The PVC media in the trickling filters appears to be in fair condition; however, CCSD personnel report that they routinely find pieces of the plastic media in the trickling filter effluent, indicating that the media is degraded. CEE recommends replacing the trickling filter media because of its degraded condition.



Trickling Filter Pump Station – The trickling filter pump station consists of a wet well / dry well configuration, with a building located above the dry well. The station includes five vertical centrifugal pumps. There are two pumps dedicated to each trickling filter and the fifth pump is a common spare. The pumps are shaft driven with the motors located at ground level in the building directly above each pump.

The building also houses the motor control center (MCC) for the trickling filter pumps and associated equipment. The trickling filter pump station appears to be well maintained and in good condition. CEE was not made aware of any issues with the pump station. Basic facility upgrades will be recommended for the pump station.

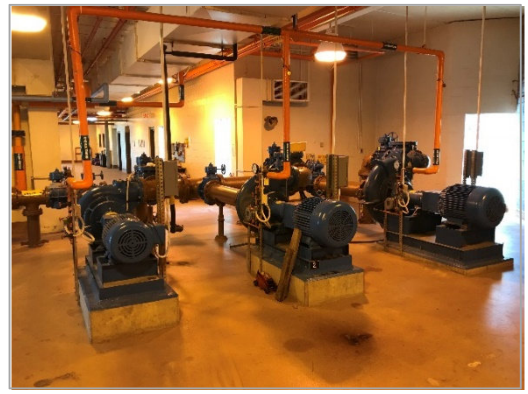
Secondary Clarifiers – The Milton Street WWTP includes two, 110-foot diameter Tow-Bro style secondary clarifiers, each consisting of an in-ground concrete tank, a center flocculation zone, and a Tow-Bro style rake mechanism for sludge removal. The clarifiers have a SOR of 947 gallons per day per square foot (gpd/ft^2) at the design peak hourly flow of 18 MGD for secondary treatment, which is well under the recommended maximum SOR of 1,200 gpd/ft^2 for secondary clarifiers servicing trickling filters provided in the 10-States Standards. Based on the average effluent TSS concentration of 5.5 mg/L and maximum of 36 mg/L (January 1, 2013 through August 31, 2017), the secondary clarifiers are well performing despite being slightly undersized based on current (2014) guidance.

The influent flow to the secondary clarifiers is distributed between the two clarifiers using a splitter box. The clarified secondary effluent flows to chlorine contact chambers. A portion of the effluent is piped back to the trickling filter recycle valve vault, which recycles treated effluent during low flow conditions, as needed, to keep the trickling filter sprinklers rotating. The settled sludge is recycled to the upstream Extended Aeration Tank, with a portion being pumped to the head of the plant, upstream of the primary clarifiers, from which the settled sludge is sent to the primary thickener. The Extended Aeration Tank is apparently designed for contact stabilization; however, contact stabilization is typically used as either an alternative to activated sludge or a modification of activated sludge, wherein, the starved recycle sludge is added to the raw wastewater in order to bio-adsorb soluble and particulate BOD_5. The CCSD reports that BOD removal has been recorded as high as 98 to 99 percent in the effluent.

The use of contact stabilization on biologically treated effluent is unusual; however, the CCSD personnel have found that the process helps to improve settling in the secondary clarifiers and reduces the secondary effluent TSS. The clarifier includes a 35-foot diameter flocculation zone with 4 mechanical mixers, which are currently not in use. Based on the effluent TSS data, non-use of the mechanical mixers is not adversely affecting performance. The clarifiers have been modified, using plastic piping to provide a continuous drip dilute chlorine bleach from the end of the skimmer mechanism onto the effluent weirs in order to control algal growth.

The secondary clarifiers appear to be in good condition; however, as with the primary clarifiers, CEE understands that the effluent weirs and launders, and the clarifier drive mechanisms are in need of replacement. As with the primary clarifiers, CEE recommends taking each clarifier down for inspection of the clarifier internals for potential corrosion issues.

Waste Solids Handling – The Milton Street WWTP includes a 30-foot diameter sludge thickener and two, 65-foot diameter anaerobic digesters for solids stabilization of the waste primary and secondary solids. The digesters are operated in series with the primary digester followed by the secondary. A portion of the biogas generated in the digesters is utilized in a boiler to make hot water and the remainder is flared. CEE was not made aware of any issues with the digesters.



CCSD currently receives hauled septic from local haulers at the Milton Street facility. CEE understands that there have been concerns over the fact that the large trucks need to pass through a residential neighborhood with narrow streets in order to access the facility. CEE is proposing to re-locate the septage receiving to the Lake Street WWTP as part of the recommended upgrades, as the Lake Street facility and access is not located in a residential area.

The digested sludge from the anaerobic digesters are dewatered for off-site disposal using two, 1.5-meter wide belt filter presses. The presses were manufactured by Roediger AG, which is now a subsidiary of Aqseptence Group. Roediger no longer manufactures belt filter presses and replacement / repair parts for the presses now require custom fabrication. Due to the age of the presses and the lack of readily available parts, CEE recommends that CCSD replace the presses. CEE also recommends either replacing or modifying the existing polymer addition system with a new system that can feed polymer to both presses simultaneously such that both presses can be operated simultaneously, if needed.

Administration Building, Laboratory, and Garage - The administrative and laboratory facilities at the WWTP were not assessed as part of this project. Basic facility upgrades will be recommended for the administration building, laboratory, and garage facilities.

SCADA – The SCADA system at the WWTP was not assessed as part of this project but will be included in the total cost for upgrades and evaluated during the detailed design phase.

Site – The Milton Street site overall is in good condition. Repair or replacement of the site paving should be considered for upgrades but the overall site access and layout require minimal changes or improvements.

Non-Potable Water System – The non-potable water system should be considered for basic upgrades including new piping, pumps, and yard hydrants.

4.2 Upgrades to Achieve Regulatory Compliance

In addition to the upgrades recommended in Section 4.1, the WWTP will need to be upgraded to meet future regulatory requirements. This includes adding equipment to allow achievement of the reduced Nitrogen and Phosphorus effluent limits, and equipment to provide effluent disinfection. Finally, as described in the beginning of this section, the 48-inch gravity line located within the levee zone will need to be relocated.

5.0 DEVELOPMENT OF FEASIBLE ALTERNATIVES

The development of the alternatives focused on the evaluations of the Lake Street and Milton Street WWTP's treatment performance, operational condition, design life, and long term ability to meet future regulatory requirements. The Lake Street WWTP currently consists of a head works building containing communitors, followed by a Parshall flume influent flowmeter, an aerated grit chamber and a lift station, primary clarifiers, secondary treatment consisting of trickling filters, secondary clarifiers, and post aeration. Additional ancillary systems for waste solids handling include two anaerobic sludge digesters and a belt filter press with sludge management facility. The Milton Street WWTP consists of an influent lift station and head works building consisting of Archimedes screw pumps, influent bar screens and grit removal, a flow diversion basin, primary clarifiers, secondary treatment consisting of trickling filters, a solids contact tank and secondary clarifiers, chlorine contact tanks, and post aeration. Additional ancillary systems for waste solids handling include a sludge thickener, two anaerobic primary digesters, and two belt filter presses for sludge management.

The alternatives presented in this section describe the necessary infrastructure improvements to maintain each individual WWTP in its current operating location (Alternative #1), as well as, an option to consolidate the treatment of the wastewater flow from the Lake Street facility at the Milton Street Facility (Alternative #2). The equipment upgrades identified in the following section may not be all inclusive and may be modified during the design phase.

5.1 Alternative #1 – Infrastructure and Treatment Improvements at Lake Street & Milton Street WWTPs

Alternative #1 includes the ongoing use of both the Lake Street and Milton Street WWTPs to separately treat their current contributing flows. As a result, both WWTPs will be upgraded to allow reliable long-term operation, meet the future effluent limits for Nitrogen and Phosphorus, and include disinfection to satisfy the requirements of the Consent Decree.

5.1.1 Lake Street Improvements (Alternative #1)

Alternative #1 proposes that CCSD continue to operate and maintain the Lake Street WWTP by upgrading and rehabilitating both of the WWTP's treatment infrastructure. The capital improvements necessary at the Lake Street WWTP includes an overall rehabilitation or replacement of the majority of the WWTP's equipment and process control.

The major treatment components to be upgraded includes a proposed headworks system with a new bar screen and new aerated grit chamber upstream of the existing influent pumping station. The new grit removal system is proposed to be adjacent to the existing pump building. Additionally, a proposed new septic receiving station will be constructed in front of the existing influent pumping building. This new septic receiving station will allow for the elimination of the septic receiving at the existing Milton Street WWTP.

The additional improvements at the Lake Street WWTP would include the rehabilitation of the existing influent pumping station and the replacement of the three existing 19.5 feet by 100 feet clarifiers for primary treatment of the wastewater to meet current standards. The process would include the wastewater flow entering into the proposed new pumping building before being pumped to two proposed new trickling filters using five proposed vertically mounted tangential discharge non-clog centrifugal pumps, four operating (two per trickling filter) and one standby. Each pump is proposed to be sized for an average flow of 1,200 gpm and a maximum flow of 3,500 gpm each.

After primary treatment, two new 130 ft diameter concrete trickling filters are proposed to replace the existing trickling filters. Each trickling filter would include a hydraulically-driven mast type rotary distributor mechanism. The proposed filter media depth is 14 ft with total media volume in both basins of 375,500 ft3. The wastewater from each of the new trickling filters would then flow to the effluent chamber where it combines and flows to the existing secondary clarifier distribution chamber. The flow from the distribution chamber will be redirected to the proposed secondary clarifier system. This alternative includes the replacement of the existing secondary clarifiers with a new secondary clarifier structure to meet current treatment standards. Wastewater will be recycled as necessary from the new secondary clarifier effluent chamber to the new proposed trickling filter recycle vault.

The clarified water from the new secondary clarifiers will combine in an effluent chamber and flow to a proposed new 20 ft by 20 ft by 10 ft deep denitrification feed tank. The denitrification feed pumps are proposed to be installed in the denitrification feed tank. The wastewater will be pumped in a 36-inch DIP using five submersible pumps, four operating and one standby to the denitrification system. Each pump is proposed to be sized for an average flow of 1,200 gpm and a maximum flow of 3,500 gpm each. The denitrification system is proposed to be a 12 MGD Dynasand system with seven filter cells and six modules per cell. The total filtration surface area is 2,100 ft2 with an 80 inch filter bed depth and a hydraulic loading rate (max design) of 3.97 gpm/ft2. The effluent from the denitrification filters flows to the denitrification tank in a 36-inch DIP where it then discharges through the existing post aeration tank and the existing plant outfall pipe.

A new methanol tank and pumps is proposed to feed methanol into the feed line to the denitrification system as required. The existing polyaluminum chloride (PAC) addition system will be retained for phosphorous removal. The existing sludge treatment system will be used to treat sludge. Additionally, as per the current consent order, a new ultraviolet disinfection system will be installed as part of the proposed improvements.

The following is a general list of improvements or upgrades proposed as part of Alternative #1 Lake Street WWTP improvements:

- New headworks building with septage receiving station
- Rehabilitate existing influent pump station
- Abandon/remove communitors
- Abandon/remove existing grit chamber
- New mechanical bar screens
- New aerated grit chambers
- New Parshall Flume
- Demo existing primary clarifiers
- Demo existing secondary clarifiers
- 2 New 98-foot Primary Clarifiers
- 2 New 110-foot Secondary Clarifiers
- Demo existing trickling filters pump station in place
- Install two new 130-foot above-ground trickling filters
- New trickling filter pumping station
- New trickling filter recycle valve vault
- Demo existing trickling filters in place
- Re-pipe primary effluent to new trickling filter pump station.
- New Sand filter pumping station with overflow
- New Sand filter feed pumps
- New continuous-backwash effluent sand filters
- New PAC storage and dosing system
- New methanol storage and dosing system
- New UV disinfection system per consent decree
- New UV disinfection tank per consent decree
- General Building Infrastructure Improvements
- New SCADA & Telemetry System
- Additional belt filter press and building addition

Note: List may not be all inclusive and may be adjusted during detail design phase.

5.1.2 Milton Street Improvements (Alternative #1)

Alternative #1 also includes providing capital improvements to the Milton Street WWTP. These capital improvements include upgrades or replacement of several major treatment components and the addition of a proposed denitrification system. The denitrification feed pumps are proposed to be installed in the denitrification/post aeration tank.

The denitrification process will include the wastewater being pumped through a 36-inch DIP using five submersible pumps, four operating and one standby to the denitrification system. Each pump will be proposed to be sized for an average flow of 1,200 gpm and a maximum flow of 3,500 gpm each. The denitrification system is proposed to be a 12 MGD Dynasand system with seven filter cells and six modules per cell. The total filtration surface area is 2,100 ft^2 with an 80 inch filter bed depth and a hydraulic loading rate (max design) of 3.97 gpm/ft^2. The effluent from the denitrification filters flows to the disinfection/post aeration in a 36-inch DIP where it then discharges through the existing 60-inch RDP plant outfall pipe.

A new methanol tank and pumps is proposed to feed methanol into the feed line to the denitrification system as required. The existing PAC addition system will be retained for phosphorous removal. The existing sludge treatment system will be used to treat sludge with replacement of both belt filter presses. Other improvements will include general improvements to the WWTP's building infrastructure, SCADA and Telemetry system, and the replacement of the 48" gravity sewer line that is currently located within the limits of the flood levee structure. Additionally, it is proposed that a new ultraviolet disinfection system be constructed at the Milton Street facility to meet the current consent decree agreement.

The following is general list of improvements or upgrades proposed as part of the Alternative #1

Milton Street WWTP improvements:

- Three new Archimedes' screw pumps
- New mechanical bar screens
- Replace the primary clarifier drive units, launders and weirs
- Replace trickling filter distributors and PVC media
- Repair trickling filter tank walls
- Replace the secondary clarifier drive units, launders and weirs
- New effluent filter pumping station with overflow
- New sand filter feed pumps
- New continuous-backwash effluent sand filters
- New methanol storage and dosing system
- Two new belt filter presses
- New belt press polymer blending/addition system
- New UV disinfection system with tank modifications per consent decree
- General Electrical Improvements
- General Building Infrastructure Improvements
- General SCADA & Telemetry Improvements

- Installation of New 5000 LF of New 48" Gravity Sewer Line

Note: List may not be all inclusive and may be adjusted during detail design phase.

5.1.3 Engineers Estimate of Probable Costs (Alternative #1)

The engineer's opinion of the probable cost for equipment rehabilitation and/or replacement at both the Lake Street and Milton Street WWTPs is presented in the following table. Note that the cost estimate includes improvements required for treatment to achieve the 2025 effluent limits. The estimated cost to rehabilitate the two WWTPs is approximately $96.5 million.

CHEMUNG COUNTY SEWER DISTRICT
ALTERNATIVE 1: REHABILITATION OF EXISTING WWTP's
PRELIMINARY OPINION OF PROBABLE COSTS
1 of 2

DESCRIPTION	UNITS	QUANTITY	UNIT COST	TOTAL COST
PIPING				
Lake Street				
6" Ductile Iron Pipe	LF	380	$75	$28,500
8" Ductile Iron Pipe	LF	500	$85	$42,500
14" Ductile Iron Pipe	LF	380	$125	$47,500
24" Ductile Iron Pipe	LF	2,000	$175	$350,000
36" Ductile Iron Pipe	LF	2,000	$375	$750,000
42" Ductile Iron Pipe	LF	100	$500	$50,000
48" Ductile Iron Pipe	LF	1000	$700	$700,000
42" RCP Modifications	LS	1	$18,000	$18,000
PAC System Piping	LS	1	$20,000	$20,000
Methanol Piping	LS	1	$20,000	$20,000
Milton Street				
8" Ductile Iron Pipe	LF	625	$85	$53,125
36" Ductile Iron Pipe	LF	550	$375	$206,250
48" Concrete Pipe (Relocating Outside of Levy)	LF	5000	$600	$3,000,000
6' Diameter Concrete Manholes with Watertight Castings	EA	15	$5,000	$75,000
PAC System Piping	LS	1	$20,000	$20,000
Methanol Piping	LS	1	$20,000	$20,000
			PIPING SUBTOTAL	**$5,400,875**
SYSTEM IMPROVEMENTS				
Lake Street				
Lake Street Headworks, Bar Screen, & Grit Chamber	LS	1	$2,500,000	$2,500,000
Rehabilitate Existing Influent Pump Station	LS	1	$500,000	$500,000
Abandon / Remove Existing Equipment	LS	1	$100,000	$100,000
Primary Clarifiers (2)	LS	1	$3,000,000	$3,000,000
Trickling Filter Pump Station and (5) New Pumps	LS	1	$600,000	$600,000
Trickling Filters and Effluent Chamber (2)	LS	1	$5,000,000	$5,000,000
Effluent Recycle Vault	LS	1	$30,000	$30,000
Secondary Clarifiers (2)	LS	1	$4,000,000	$4,000,000
Distribution Chamber	LS	1	$20,000	$20,000
Secondary Clarifier wet well	LS	1	$20,000	$20,000
Effluent Chamber	LS	1	$20,000	$20,000
Denitrification Filters	LS	1	$2,500,000	$2,500,000
PAC System Tank and Pumps	LS	1	$35,000	$35,000
Methanol Tank and Pumps	LS	1	$65,000	$65,000
Parshall Flume	LS	1	$5,000	$5,000
Septic Receiving Station	LS	1	$35,000	$35,000
UV Disinfection System and Tank Rehabilitation	LS	1	$8,500,000	$8,500,000
Electrical Modifications	LS	1	$5,556,000	$5,556,000
New SCADA System and Process Control	LS	1	$300,000	$300,000
New Belt Filter Presses (2)	LS	1	$1,500,000	$1,500,000
Demolition of Abandoned Structures	LS	1	$250,000	$250,000
Milton Street				
Milton Street Headworks Bar Screen Replacement (3)	LS	1	$300,000	$300,000
New Effluent Pumping Station with Overflow	LS	1	$150,000	$150,000
Denitrification Filters and Modification to Existing Chlorine Chamber	LS	1	$1,500,000	$1,500,000
(3) Archimedes Screw Pump Replacement	LS	1	$450,000	$450,000
PAC System Tank and Pumps	LS	1	$35,000	$35,000
Methanol Tank and Pumps	LS	1	$65,000	$65,000
Repair Trickling Filters Structural, Mechanical & Media (2)	LS	1	$2,000,000	$2,000,000

CHEMUNG COUNTY SEWER DISTRICT
ALTERNATIVE 1: REHABILITATION OF EXISTING WWTP's
PRELIMINARY OPINION OF PROBABLE COSTS
2 of 2

New Belt Filter Presses (2)	LS	1	$1,000,000	$1,000,000
New UV Disinfection System and Tank	LS	1	$4,000,000	$4,000,000
Electrical modifications	LS	1	$2,381,000	$2,381,000
			SYSTEM IMPROVEMENTS SUBTOTAL	**$46,417,000**
			TOTAL INSTALLED COST	**$51,817,875**
MISCELLANEOUS ITEMS				
Instrumentation	%	3%		$1,554,536
Earthwork and Excavation	%	2%		$1,036,358
Mechanical and HVAC	%	2%		$1,036,357.50
Structrual Improvements	%	1%		$518,178.75
			SUBTOTAL DIRECT COSTS (Rounded)	**$55,963,000**
Project Indirect Costs	%	20%		$11,192,600
			SUBTOTAL CONSTRUCTION COST	**$67,155,600**
Treatment System Design Engineering	%	7%		$4,700,892
Construction Oversight	%	6%		$4,029,336
Treatment System Start-up and Commissioning	%	2%		$1,343,112
			TOTAL PROJECT COST (No Contingency)	**$77,228,940**
Contingency	%	25%		$19,307,235.00
TOTAL BUDGET PLANNING CAPITAL AND PROFESSIONAL SERVICES COST				**$96,536,175**

Note 1: This estimate is based on preliminary planning and conceptual layout per compliance with the 2025 SPDES TMDL requirements. Unit costs were developed using R.S. Means, discussion with equipment & processing manufacturers, recent bid results for similar projects, and past experience with projects of this nature. Quantities and costs may vary significantly as the project progresses through final design. Allowance for inflation is included in the 25% contingency.

5.2 Alternative #2 – Consolidating Treatment at the Milton Street WWTP

Alternative #2 proposes that CCSD consolidate the treatment of the wastewater entering the Lake Street WWTP by transferring it to the Milton Street WWTP after appropriate upgrades and improvements are constructed at the Milton Street facility. As a result, upgrades needed to provide reliable long-term treatment meet the future Nitrogen and Phosphorus effluent limits, and provide disinfected effluent will be made primarily to the Milton Street WWTP.

5.2.1 Lake Street Improvements (Alternative #2)

The Lake Street WWTP discharges to the Chemung River approximately a mile north of Milton Street WWTP. The existing 42-inch RCP effluent discharge pipe is proposed to be extended to the Milton Street WWTP. The wastewater flow will be redirected utilizing the secondary bypass after the wastewater flow is treated through the proposed new primary settling tanks. The transfer of the wastewater from the Lake Street WWTP to the Milton Street WWTP will be made by extending the existing 42-inch RCP effluent discharge piping to a location just across the Chemung River from the Milton Street facility. At that location a proposed inverted siphon will be utilized to transfer the wastewater under the river, which will consist of two 24-inch and one 30-inch ductile iron pipes to deliver the wastewater to the influent lift station and siphon reception structure on the Milton Street WWTP side. The proposed new Milton Street Archimedes screw lift station for Lake Street facility flow would lift the wastewater flow for gravity feed to a distribution chamber and then ultimately to the primary clarifiers.

The other major treatment components to be upgraded at the Lake Street WWTP includes a proposed new headwork's system with a new bar screen and new aerated grit chamber upstream of the influent pumping station. The new grit removal system is proposed to be adjacent to the existing pump building. Additionally, a proposed new septic receiving station will be constructed in front of the existing influent pumping building. This new septic receiving station will allow for the elimination of the septic receiving at the existing Milton Street WWTP, alleviating concerns over the fact that the large trucks need to pass through the narrow roads within a residential neighborhood in order to access the Milton Street facility. Other improvements will include general improvements to the WWTP's building infrastructure.

The following is general list of improvements or upgrades proposed as part of the Alternative #2 Lake Street WWTP improvements:

- New headworks building with septage receiving station
- New mechanical bar screens
- New aerated grit chambers
- New Parshall Flume
- Abandon / remove communitors
- Abandon / remove existing grit chamber

- Demo existing primary clarifiers
- Demo existing trickling filters in place
- Demo existing trickling filters pump station in place
- Re-pipe primary influent to effluent discharge piping
- Demo existing secondary clarifiers
- Demo existing disinfection chamber
- General Building Infrastructure Improvements of necessary operational facilities
- New SCADA & Telemetry Improvements

Note: List may not be all inclusive and may be adjusted during detail design phase.

5.2.2 Milton Street Improvements (Alternative #2)

The existing Milton Street WWTP does not have adequate capacity or appropriate treatment process to adequately treat the additional wastewater flow from the Lake Street WWTP. For this option new equipment is proposed to be constructed at the Milton Street WWTP to allow for treatment of wastewater flow from the Lake Street facility. The recommended improvements to the Milton Street WWTP would be to add new treatment components including a new lift station, pump station, primary clarifiers, trickling filters, effluent chamber, distribution chamber, secondary clarifiers, effluent chamber, modified denitrification/post aeration tank, denitrification filters, and disinfection system. Improvements to Milton Street shall include connection to existing treatment components for the ability to operate all components (new and existing) together or separate for operational flexibility and maintenance.

A lift station and siphon reception is proposed to transfer the Lake Street Wastewater. The influent wastewater will be combined with the recycled water in the wet well. Three 10 MGD Archimedes screw pumps are proposed for the lift station to transfer the wastewater through a 48-inch DIP to two new primary clarifiers. The effluent from the new clarifiers will flow to the new trickling filter pump station building. The addition of a new pump station building is proposed to be beside the existing pump building. The wastewater will be pumped through a 36-inch DIP from the wet well to each trickling filter using five proposed vertically mounted tangential discharge non-clog centrifugal pumps, four operating (two per trickling filter) and one standby. Each pump is proposed to be sized for an average flow of 1,200 gpm and a maximum flow of 3,500 gpm each.

After primary treatment, two additional new 130 ft diameter concrete trickling filters are proposed. The trickling filters will have a four-arm motor-driven mast type rotary distributor mechanism. The proposed filter media depth is 14 ft with total media volume in both basins of 375,500 ft3. The wastewater from each trickling filter will flow to the effluent chamber where it will combine and flow to the secondary clarifier distribution chamber in a 48-in DIP. The distribution chamber will feed the two secondary clarifiers equally with two 36-in DIP. Wastewater can be recycled as necessary from the secondary clarifier effluent chamber to the trickling filter recycle vault.

Two additional new 110 ft diameter concrete secondary clarifiers are proposed with two full radius rake arms with spiral rake blades and two skimmer arms with skimmer mechanism and scum box. The clarified water from the two secondary clarifiers will be combined in an effluent chamber where it can flow to the existing disinfection/post aeration tank and combine with the treated Milton Street wastewater. The denitrification feed pumps are proposed to be installed in the denitrification/post aeration tank.

The wastewater is pumped in a 36-inch DIP using five submersible pumps, four operating and one standby to the denitrification system. Each pump is proposed to be sized for an average flow of 1,200 gpm and a maximum flow of 3,500 gpm each. The denitrification system is proposed to be a 20 MGD Dynasand system with nine filter cells and eight modules per cell. The total filtration surface area is 3,600 ft2 with an 80 inch filter bed depth and a hydraulic loading rate (max design) of 3.86 gpm/ft2. The effluent from the denitrification filters flows to the disinfection/post aeration in a 36-inch DIP where it then discharges through the existing 60-inch RCP plant outfall pipe.

A new methanol tank and pumps is proposed to feed methanol into the feed line to the denitrification system as required. The existing PAC addition system will be retained for phosphorous removal. Additionally, it is proposed that a new ultraviolet disinfection system be constructed at the Milton Street facility to meet the current consent decree agreement.

The existing sludge treatment system at the Milton Street WWTP will be used to treat sludge produced from the treatment of wastewater from both Lake Street and Milton Street WWTP's, with the addition of a second gravity sludge thickener and a third sludge digester. The Milton Street belt filter presses will be proposed to be replaced with new more modern presses.

The following is general list of improvements or upgrades proposed as part of the Alternative #2 Milton Street WWTP improvements:

- Three new Archimedes' screw pumps on existing structure (Replacement)
- New mechanical bar screens
- Replace trickling filter distributors and PVC media
- Replace trickling filter pumps
- Repair trickling filter tank walls
- Extend Lake Street outfall pipe
- New siphon under river
- New influent lift station
- Three new Archimedes' screw pumps for Lake St. Flow
- Two new 98-foot primary clarifiers
- New trickling filter pumping station
- One new aerated solids contact chamber
- Two new 130-foot above-ground trickling filters

- Two new 110-foot diameter secondary clarifiers
- New trickling filter recycle valve vault
- New secondary clarifier wetwell
- New return sludge wetwell
- New primary digester
- New gravity thickener
- New extended aeration tank
- New effluent filter pumping station with overflow
- New Sand filter feed pumps
- New continuous-backwash effluent sand filters
- New methanol storage and dosing system
- New PAC storage and dosing system
- One new sludge thickener
- One new anaerobic sludge digester
- Two new belt filter presses
- New belt press polymer blending / addition system
- New UV disinfection system with tank modifications per consent decree
- Installation of New 5,000 LF of New 48" Gravity Sewer Line
- General Building Infrastructure Improvements of necessary operational facilities
- General SCADA & Telemetry Improvements

Note: List may not be all inclusive and may be adjusted during detail design phase.

5.2.3 Engineers Estimate of Probable Costs (Alternative #2)

The engineer's estimate of the probable cost to implement Alternative #2 is presented on the following table. Note that the cost estimate includes provisions required for treatment to achieve the 2025 effluent limits. The estimated cost to implement Alternative #2 is about $80.8 million.

CHEMUNG COUNTY SEWER DISTRICT
ALTERNATIVE 2: CONSOLIDATED REGIONAL MILTON STREET WWTP
PRELIMINARY OPINION OF PROBABLE COSTS
1 of 2

DESCRIPTION	UNITS	QUANTITY	UNIT COST	TOTAL COST
PIPING				
Lake Street				
Lake Street Pipe Modifications	LS	1	$20,000	$20,000
24" Ductile Iron Pipe	LF	400	$175	$70,000
Lake Street Sewer Pipe Extension from Outfall to Siphon Structure	LF	4,500	$600	$2,700,000
Lake Street Siphon Pipe Under River 24"	LF	2,000	$575	$1,150,000
Lake Street Siphon Pipe Under River 30"	LF	2,000	$700	$1,400,000
6' Diameter Concrete Manholes with Watertight Castings	EA	10	$5,000	$50,000
Milton Street				
6" Ductile Iron Pipe	LF	580	$75	$43,500
8" Ductile Iron Pipe	LF	900	$85	$76,500
14" Ductile Iron Pipe	LF	600	$125	$75,000
24" Ductile Iron Pipe	LF	650	$175	$113,750
36" Ductile Iron Pipe	LF	2,000	$375	$750,000
42" Ductile Iron Pipe	LF	340	$500	$170,000
48" Ductile Iron Pipe	LF	1300	$700	$910,000
48" Concrete Pipe	LF	5000	$600	$3,000,000
6' Diameter Concrete Manholes with Watertight Castings	EA	20	$5,000	$100,000
PAC System Piping	LS	1	$20,000	$20,000
Methanol Piping	LS	1	$20,000	$20,000
			PIPING SUBTOTAL	**$10,668,750**
SYSTEM IMPROVEMENTS				
Lake Street				
Lake Street Headworks, Bar Screen, & Grit Chamber	LS	1	$2,500,000	$2,500,000
Rehabilitate Existing Influent Pump Station	LS	1	$500,000	$500,000
Septic Receiving Station at Lake Street	LS	1	$35,000	$35,000
New Parshall Flume and Flow Measurement at Lake Street	LS	1	$20,000	$20,000
Abandon / Remove Existing Equipment	LS	1	$100,000	$100,000
Electrical Modifications	LS	1	$500,000	$500,000
New SCADA System and Process Control	LS	1	$75,000	$75,000
Demolition of Abandoned Structures	LS	1	$500,000	$500,000
Milton Street				
Milton Street Headworks Bar Screen Replacement (3)	LS	1	$300,000	$300,000
Inverted Siphon Concrete Structures	LS	1	$300,000	$300,000
New Archimedes Screw Lift Station with 3 Screw Pumps (Replacements)	LS	1	$1,500,000	$1,500,000
Primary Clarifiers (2)	LS	1	$3,000,000	$3,000,000
Trickling Filter Pump Station and (5) New Pumps	LS	1	$600,000	$600,000
New Trickling Filters and Effluent Chamber (2)	LS	1	$5,000,000	$5,000,000
Effluent Recycle Vault	LS	1	$30,000	$30,000
Secondary Clarifiers (2)	LS	1	$4,000,000	$4,000,000
Distribution Chambers	LS	1	$200,000	$200,000
New Extended Aeration Tank	LS	1	$200,000	$200,000
Secondary Clarifier wet well	LS	1	$20,000	$20,000
New Primary Digester	LS	1	$200,000	$200,000
New Gravity Thickner	LS	1	$100,000	$100,000
Return Sludge Wet Well	LS	1	$20,000	$20,000
Effluent Chamber	LS	1	$20,000	$20,000
Denitrification Filters and Modification to Existing Chlorine Chamber	LS	1	$3,250,000	$3,250,000
PAC System Tank and Pumps	LS	1	$35,000	$35,000

CHEMUNG COUNTY SEWER DISTRICT
ALTERNATIVE 2: CONSOLIDATED REGIONAL MILTON STREET WWTP
PRELIMINARY OPINION OF PROBABLE COSTS

2 of 2

Methanol Tank and Pumps	LS	1	$65,000	$65,000
(3) Archimedes Screw Pump Replacement	LS	1	$450,000	$450,000
New UV Disinfection System with Tank Rehabilitation	LS	1	$4,500,000	$4,500,000
Repair Existing Trickling Filter Walls & Equipment	LS	1	$200,000	$200,000
New Belt Filter Presses (2)	LS	1	$1,000,000	$1,000,000
Electrical modifications	LS	1	$2,302,000	$2,302,000
SYSTEM IMPROVEMENTS SUBTOTAL				**$31,522,000**
TOTAL INSTALLED COST				**$42,190,750**
MISCELLANEOUS ITEMS				
Instrumentation	%	5%		$2,109,538
Earthwork and Excavation	%	2%		$843,815
Mechanical and HVAC	%	2%		$843,815
Structrual Improvements	%	2%		$843,815
SUBTOTAL DIRECT COSTS (Rounded)				**$46,832,000**
Project Indirect Costs	%	20%		$9,366,400
SUBTOTAL CONSTRUCTION COST				**$56,198,400**
Treatment System Design Engineering	%	7%		$3,933,888
Construction Oversight	%	6%		$3,371,904
Treatment System Start-up and Commissioning	%	2%		$1,123,968
TOTAL PROJECT COST (No Contingency)				**$64,628,160**
Contingency	%	25%		$16,157,040.00
TOTAL BUDGET PLANNING CAPITAL AND PROFESSIONAL SERVICES COST				**$80,785,200**

Note 1: This estimate is based on preliminary planning and conceptual layout per compliance with the 2025 SPDES TMDL requirements. Unit costs were developed using R.S. Means, discussion with equipment & processing manufacturers, recent bid results for similar projects, and past experience with projects of this nature. Quantities and costs may vary significantly as the project progresses through final design. Allowance for inflation is included in the 25% contingency.

5.3 Alternative #3 No Improvements/Non-Compliance

Non-compliance of future SPDES permit or delay of capital improvements is not a long term feasible solution nor is it recommended. The age and continued degradation of major components of each of the WWTP will continue to add to the overall cost for the necessary improvements to meet current and future discharge requirements, and lead to increasing O&M costs to maintain the aging components in operating condition.

5.4 Table of Probable Cost

Consolidating the treatment from the Lake Street WWTP to the Milton Street WWTP represents an opportunity for cost savings for overall O&M costs over time. A detailed O&M analysis was not performed as part of this consolidation study, however, the 2016 combined O&M (actual) cost for both the Milton Street and Lake Street WWTPs was utilized as the basis for estimating future O&M cost for each alternative. The 2016 actual combined O&M total was $3,256,526. For the purpose of this report and the present worth analysis, it is estimated that the O&M cost for Alternative #1 would reduce by 5% as a result of upgrades and improvements made at both treatment facilities. Likewise, for Alternative #2, it is estimated that a greater reduction in O&M will be realized with the consolidation of the treatment at the Milton Street WWTP. It is estimated for comparison purposes that Alternative #2 will provide a reduction in combined O&M cost of 10% over the 20-year period. This estimated reduction is contributed to a reduction in work force as well as overall improvement in efficiency with improvements made at the Milton Street WWTP. Less staff will be needed for operation at the Lake Street WWTP, therefore, it is expected that the remaining staff will shift to the Milton Street WWTP with a reduction in staff happening through retirement and normal attrition over a 20 year period. Other factors will contribute to the reduction of the Alternative #2 O&M cost including the reduction of maintaining two SPDES permits down to only one. The estimated O&M and total cost to complete the capital improvements for each alternative is shown below:

TABLE 6: Capital Cost Comparison of Each Alternative

	O&M Cost (Yr)	Capital Cost	Compliance Deadline
Alternative #1	$3,093,700	$ 96,536,175	2025
Alternative #2	$2,930,873	$ 80,785,200	2025
Alternative #3	$0	$0	2025

5.5 Present Worth Analysis

Alternative #1

Alternative #1 Present Worth =	CAPITAL COST + O&M (F/P, 3%, 20 Years)
Alternative #1 Present Worth =	$96,536,175 + $3,093,700(1.8061)
Alternative #1 Present Worth =	**$102,123,707**

Alternative #2

Alternative #2 Present Worth =	CAPITAL COST + O&M (F/P, 3%, 20 Years)
Alternative #2 Present Worth =	$80,785,200 + $2,930,873(1.8061)
Alternative #2 Present Worth =	**$86,078,650**

6.0 SUMMARY OF ALTERNATIVES/RECOMMENDATIONS

This section summarizes the two major alternatives developed and evaluated: (1) separately upgrading the Lake Street and Milton Street WWTPs; and (2) abandoning most of the Lake Street WWTP and consolidating all treatment at the Milton Street WWTP.

Construction of new WWTP infrastructure is needed to achieve the future effluent limits for phosphorus and nitrogen. Since the existing WWTP sites can accommodate the recommended construction of new wastewater treatment components and infrastructure, the forthcoming recommendations are based on utilizing the CCSD's current properties. It is not anticipated that any new or expanded property acquisitions will be necessary.

6.1. Alternative #1 – Infrastructure and Treatment Improvements at Lake Street and Milton Street WWTPs

Maintaining the existing 50+ year old Lake Street WWTP has significant obstacles for implementation. The Lake Street WWTP requires significant construction to upgrade or rehabilitate the deteriorating facilities. In addition, maintaining the Lake Street WWTP would require the construction of new trickling filters to replace the current trickling filters that are not currently providing adequate treatment and the construction of new primary and secondary clarification systems to meet current design standards. Additionally, the continued use of the Milton Street WWTP will also require a significant capital expenditure to upgrade both treatment components and site infrastructure. Finally, both the Lake Street and Milton Street WWTPs are under a consent order to install a new ultraviolet disinfection system at a significant capital cost.

6.2. Alternative #2 - Consolidating Treatment at the Milton Street WWTP

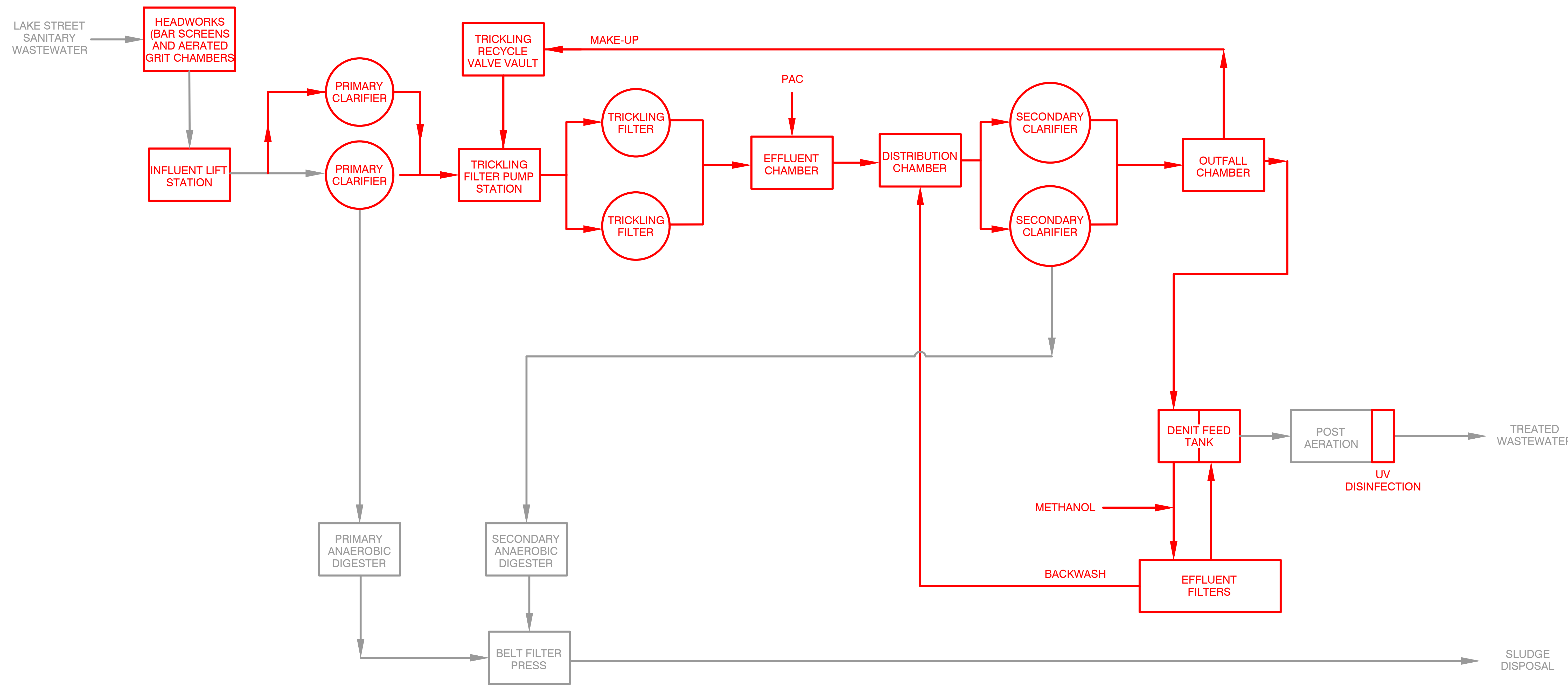
The Milton Street WWTP site has sufficient space to expand to accommodate the total flows from the Lake Street WWTP. However, The Milton Street facility does not have the current capacity or treatment components to accommodate flows from the Lake Street WWTP immediately. Therefore, for flow transfer to the Milton Street WWTP to be a permanent improvement, a new gravity sewer line, inverted siphon, and lift station would need to be constructed for flow transfer.

Consolidating the treatment of flows from the Lake Street WWTP at the Milton Street WWTP provides an opportunity for capital cost savings in the short-term and opens the door for operational costs savings in the future. As part of this recommendation, portions of the Lake Street WWTP including the trickling filters, secondary clarification, and disinfection would be abandoned and removed from the overall CCSD operation and maintenance budget.

6.3. Recommended Plan

The Milton Street WWTP does not have the ability or capacity to accept flow from the Lake Street WWTP and treat it to meet future effluent limits. Transferring the pre-treated (screened and grit removal) flow from the Lake Street WWTP requires major capital construction by extending already existing piping facilities as well as the rehabilitating existing treatment components and construction of new treatment components. However, the age and condition of the Lake Street WWTP makes the recommendation of consolidation more feasibly acceptable for the long term budgeting of treatment costs. **Based on the capital cost and Present Worth analysis, it is recommended that the consolidation of treatment at the Milton Street WWTP (Alternative #2) be the future capital improvement plan for consideration by the CCSD.**

7.0 Block Flow Diagrams



P:\2017\171-332\-CADD\Dwg\171332-WW-Block Flow Diagram.dwg{P101} LS:(6/1/2018 - tadams) - LP: 6/1/2018 3:19 PM

LEGEND

EXISTING

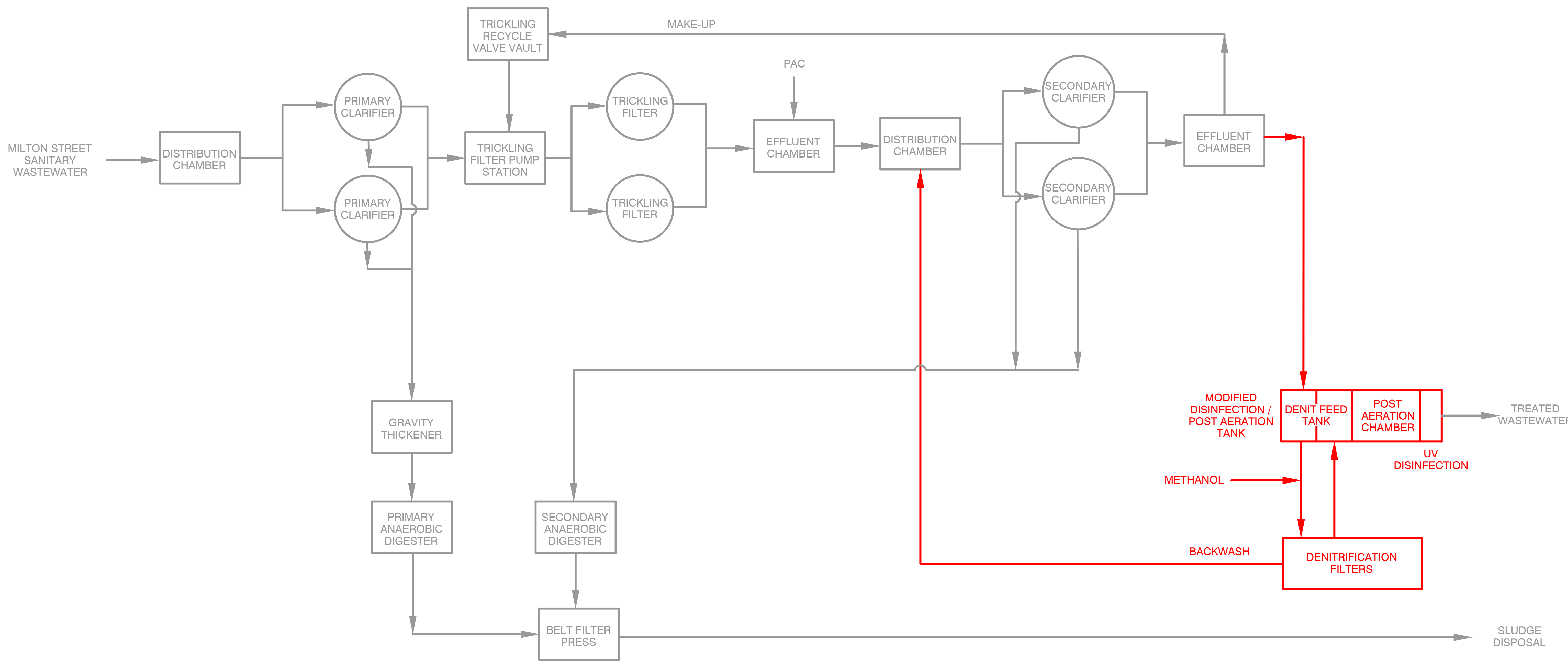
PROPOSED SYSTEM IMPROVEMENTS

Civil & Environmental Engineering, Landscape Architecture and Land Surveying PLLC
Care Of:
600 Marketplace Ave • Suite 200 • Bridgeport, WV 26330
Ph: 304.933.3119 • 855.488.9539 • Fax: 304.933.3327
www.cecinc.com

CHEMUNG COUNTY SEWER DISTRICT
CHEMUNG COUNTY, NEW YORK
ALTERNATIVE 1 - SEPARATE TREATMENT
LAKE STREET WWTP

BLOCK FLOW DIAGRAM

DRAWN BY:	KLC	CHECKED BY:	DRAFT	APPROVED BY:	DRAFT	FIGURE NO.:	A1 - LAKE
DATE:	01/09/2018	DWG SCALE:	N.T.S.	PROJECT NO:	171-332		



P:\2017\171-332\-CADD\Dwg\171332-WW-Block Flow Diagram.dwg{P102} LS:(6/1/2018 - tadams) - LP: 6/1/2018 3:19 PM

LEGEND

EXISTING

PROPOSED SYSTEM IMPROVEMENTS

Civil & Environmental Engineering, Landscape Architecture and Land Surveying PLLC
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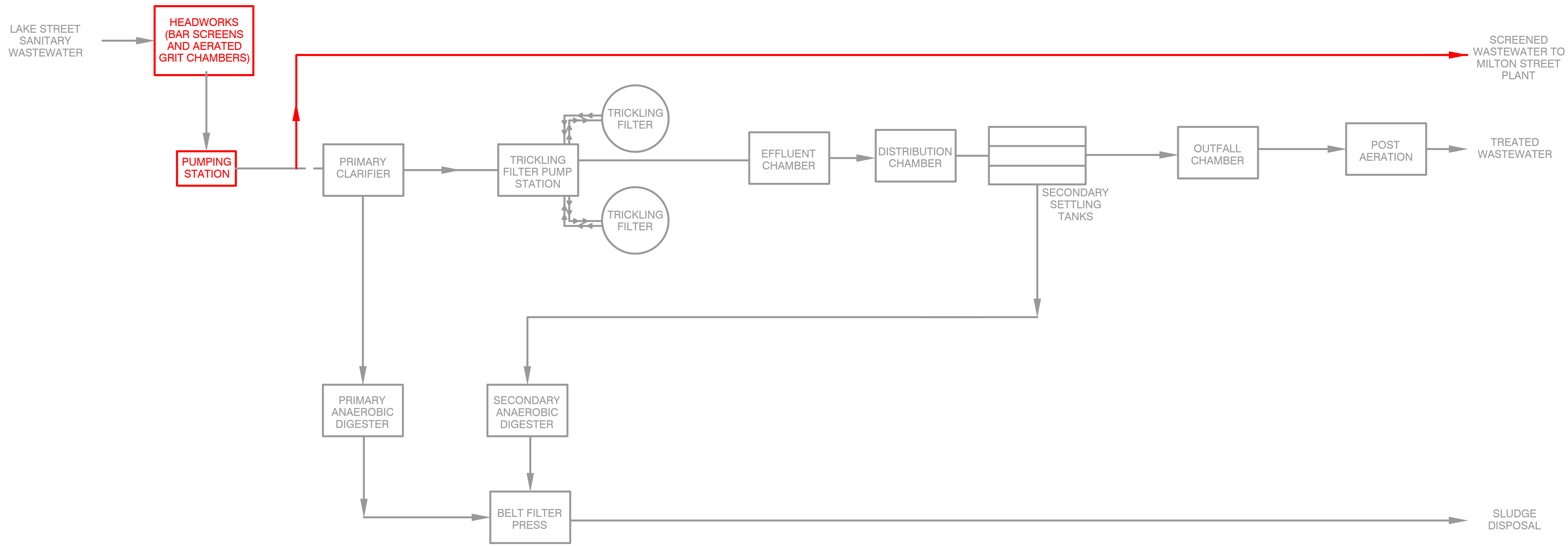
www.cecinc.com

CHEMUNG COUNTY SEWER DISTRICT
CHEMUNG COUNTY, NEW YORK
ALTERNATIVE 1 - SEPARATE TREATMENT
MILTON STREET WWTP

BLOCK FLOW DIAGRAM

DRAWN BY: KLC	CHECKED BY: DRAFT	APPROVED BY: DRAFT	FIGURE NO.: A1 - MILTON
DATE: 01/09/2018	DWG SCALE: N.T.S.	PROJECT NO: 171-332	



NOTE:
ALTERNATIVE 2 IMPROVEMENTS SHALL INCLUDE CONNECTION TO EXISTING TREATMENT COMPONENTS FOR THE ABILITY TO OPERATE ALL COMPONENTS (NEW AND EXISTING) TOGETHER OR SEPARATE FOR OPERATIONAL FLEXIBILITY AND MAINTENANCE.

LEGEND

EXISTING

PROPOSED SYSTEM IMPROVEMENTS

Civil & Environmental Engineering, Landscape Architecture and Land Surveying PLLC
Care Of:
600 Marketplace Ave • Suite 200 • Bridgeport, WV 26330
Ph: 304.933.3119 • 855.488.9539 • Fax: 304.933.3327
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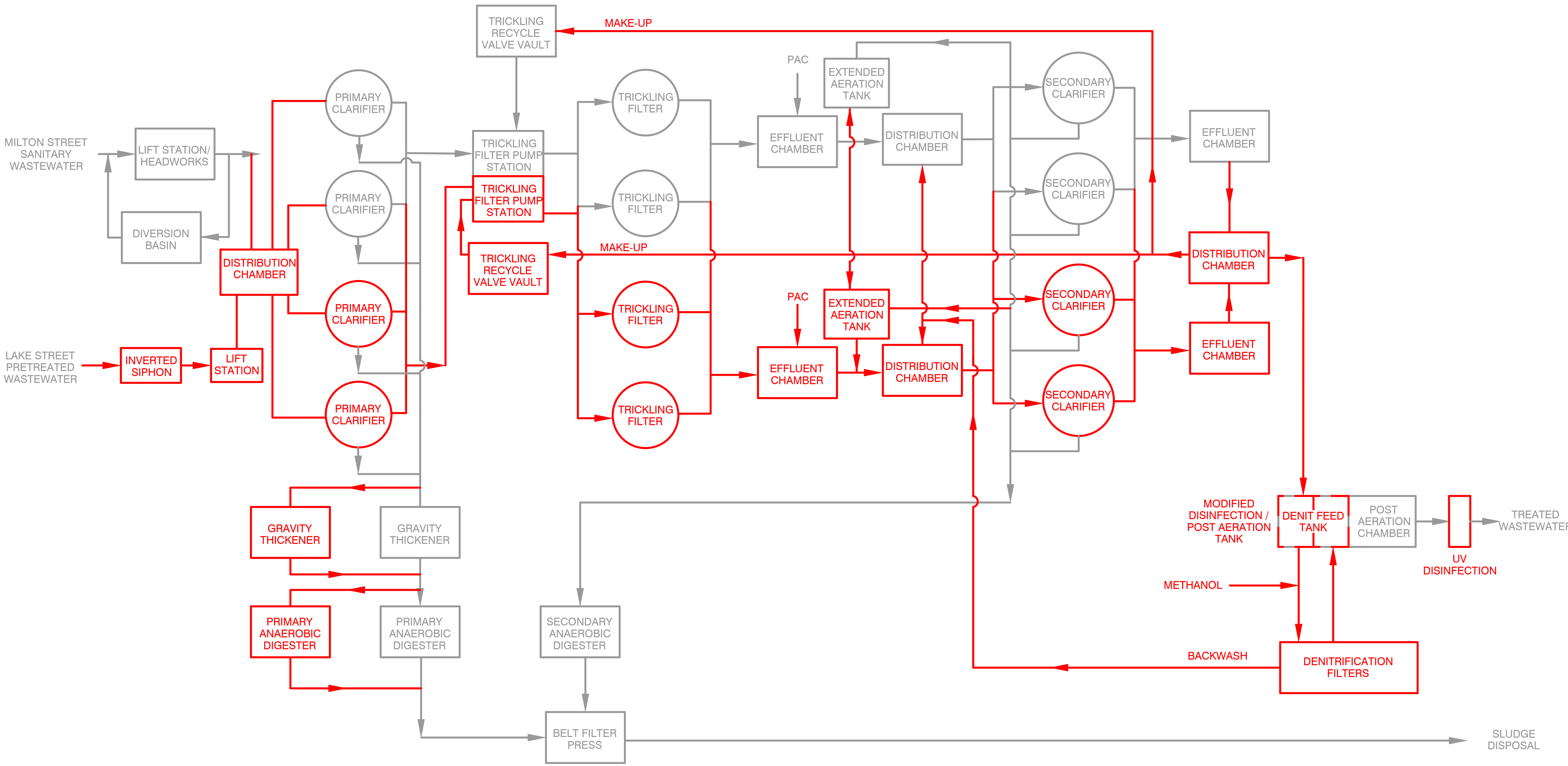
CHEMUNG COUNTY SEWER DISTRICT
CHEMUNG COUNTY, NEW YORK
ALTERNATIVE 2 - CONSOLIDATED TREATMENT
LAKE STREET WWTP

BLOCK FLOW DIAGRAM

DRAWN BY: KLC	CHECKED BY: DRAFT	APPROVED BY: DRAFT	FIGURE NO.: A2 - LAKE
DATE: 01/09/2018	DWG SCALE: N.T.S.	PROJECT NO: 171-332	

P:\2017\171-332\-CADD\Dwg\171332-WW-Block Flow Diagram.dwg{P103} LS:(6/1/2018 - tadams) - LP: 6/1/2018 3:19 PM



NOTE:
ALTERNATIVE 2 IMPROVEMENTS SHALL INCLUDE CONNECTION TO EXISTING TREATMENT COMPONENTS FOR THE ABILITY TO OPERATE ALL COMPONENTS (NEW AND EXISTING) TOGETHER OR SEPARATE FOR OPERATIONAL FLEXIBILITY AND MAINTENANCE.

LEGEND

EXISTING

PROPOSED SYSTEM IMPROVEMENTS

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CHEMUNG COUNTY SEWER DISTRICT
CHEMUNG COUNTY, NEW YORK
ALTERNATIVE 2 - CONSOLIDATING TREATMENT AT MILTON STREET WWTP

BLOCK FLOW DIAGRAM

DRAWN BY: KLC	CHECKED BY: DRAFT	APPROVED BY: DRAFT	FIGURE NO.: A2 - MILTON
DATE: 01/09/2018	DWG SCALE: N.T.S.	PROJECT NO: 171-332	

P:\2017\171-332\-CADD\Dwg\171332-WW-Block Flow Diagram.dwg{P104} LS:(6/1/2018 - tadams) - LP: 6/1/2018 3:19 PM

8.0 Alternative #1 Plan Diagrams

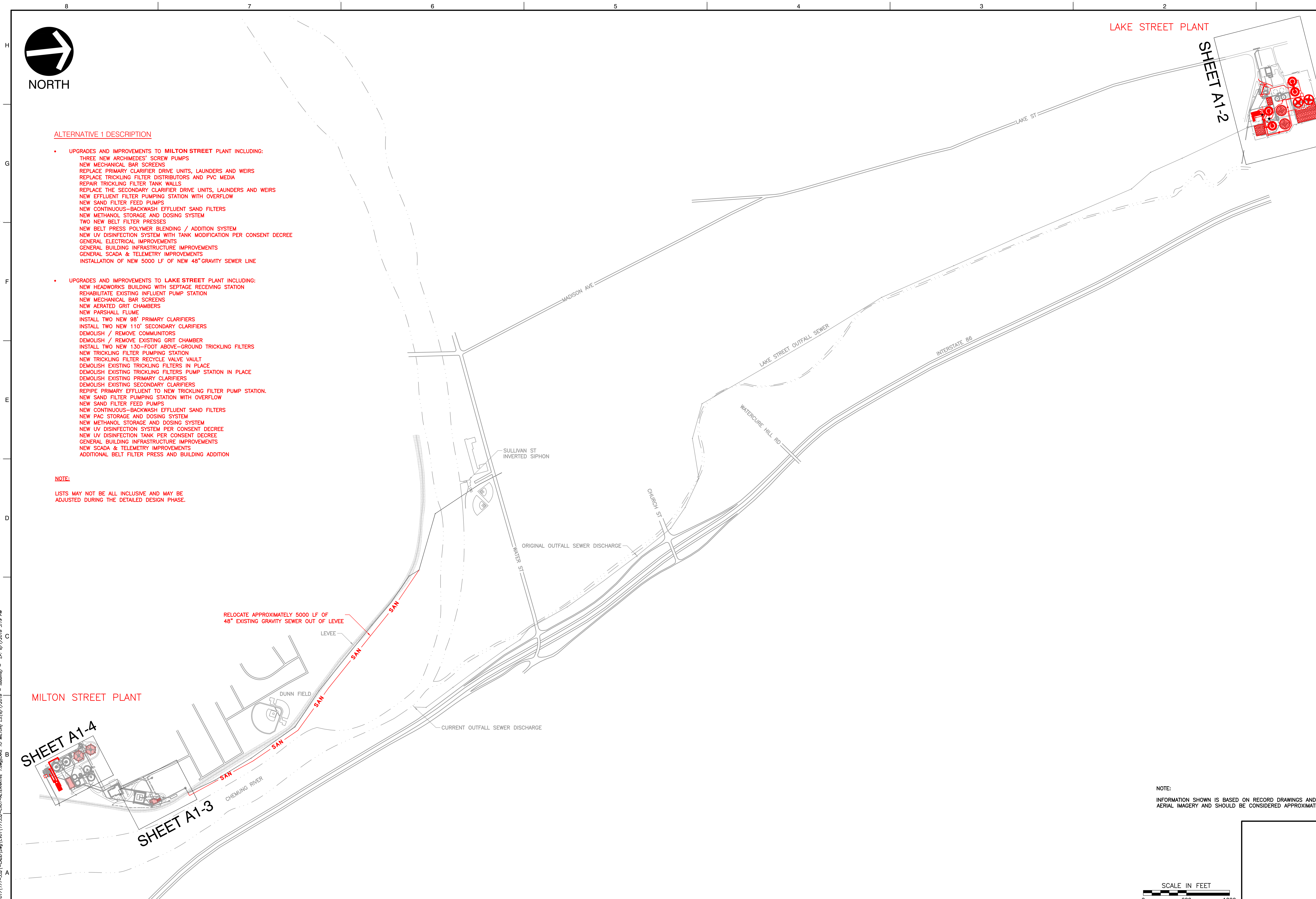
ALTERNATIVE 1 DESCRIPTION

- UPGRADES AND IMPROVEMENTS TO **MILTON STREET** PLANT INCLUDING:
  - THREE NEW ARCHIMEDES' SCREW PUMPS
  - NEW MECHANICAL BAR SCREENS
  - REPLACE PRIMARY CLARIFIER DRIVE UNITS, LAUNDERS AND WEIRS
  - REPLACE TRICKLING FILTER DISTRIBUTORS AND PVC MEDIA
  - REPAIR TRICKLING FILTER TANK WALLS
  - REPLACE THE SECONDARY CLARIFIER DRIVE UNITS, LAUNDERS AND WEIRS
  - NEW EFFLUENT FILTER PUMPING STATION WITH OVERFLOW
  - NEW SAND FILTER FEED PUMPS
  - NEW CONTINUOUS-BACKWASH EFFLUENT SAND FILTERS
  - NEW METHANOL STORAGE AND DOSING SYSTEM
  - TWO NEW BELT FILTER PRESSES
  - NEW BELT PRESS POLYMER BLENDING / ADDITION SYSTEM
  - NEW UV DISINFECTION SYSTEM WITH TANK MODIFICATION PER CONSENT DECREE
  - GENERAL ELECTRICAL IMPROVEMENTS
  - GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS
  - GENERAL SCADA & TELEMETRY IMPROVEMENTS
  - INSTALLATION OF NEW 5000 LF OF NEW 48" GRAVITY SEWER LINE

- UPGRADES AND IMPROVEMENTS TO **LAKE STREET** PLANT INCLUDING:
  - NEW HEADWORKS BUILDING WITH SEPTAGE RECEIVING STATION
  - REHABILITATE EXISTING INFLUENT PUMP STATION
  - NEW MECHANICAL BAR SCREENS
  - NEW AERATED GRIT CHAMBERS
  - NEW PARSHALL FLUME
  - INSTALL TWO NEW 98' PRIMARY CLARIFIERS
  - INSTALL TWO NEW 110' SECONDARY CLARIFIERS
  - DEMOLISH / REMOVE COMMUNITORS
  - DEMOLISH / REMOVE EXISTING GRIT CHAMBER
  - INSTALL TWO NEW 130-FOOT ABOVE-GROUND TRICKLING FILTERS
  - NEW TRICKLING FILTER PUMPING STATION
  - NEW TRICKLING FILTER RECYCLE VALVE VAULT
  - DEMOLISH EXISTING TRICKLING FILTERS IN PLACE
  - DEMOLISH EXISTING TRICKLING FILTERS PUMP STATION IN PLACE
  - DEMOLISH EXISTING PRIMARY CLARIFIERS
  - DEMOLISH EXISTING SECONDARY CLARIFIERS
  - REPIPE PRIMARY EFFLUENT TO NEW TRICKLING FILTER PUMP STATION.
  - NEW SAND FILTER PUMPING STATION WITH OVERFLOW
  - NEW SAND FILTER FEED PUMPS
  - NEW CONTINUOUS-BACKWASH EFFLUENT SAND FILTERS
  - NEW PAC STORAGE AND DOSING SYSTEM
  - NEW METHANOL STORAGE AND DOSING SYSTEM
  - NEW UV DISINFECTION SYSTEM PER CONSENT DECREE
  - NEW UV DISINFECTION TANK PER CONSENT DECREE
  - GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS
  - NEW SCADA & TELEMETRY IMPROVEMENTS
  - ADDITIONAL BELT FILTER PRESS AND BUILDING ADDITION

NOTE:

LISTS MAY NOT BE ALL INCLUSIVE AND MAY BE ADJUSTED DURING THE DETAILED DESIGN PHASE.



NOTE:

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CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 1 PLAN OVERVIEW

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

DRAWING NO.: A1-1

ALTERNATIVE 1 DESCRIPTION

- NEW HEADWORKS BUILDING WITH SEPTAGE RECEIVING STATION
- REHABILITATE EXISTING INFLUENT PUMP STATION
- NEW MECHANICAL BAR SCREENS
- NEW AERATED GRIT CHAMBERS
- NEW PARSHALL FLUME
- INSTALL TWO NEW 98' PRIMARY CLARIFIERS
- INSTALL TWO NEW 110' SECONDARY CLARIFIERS
- DEMOLISH / REMOVE COMMUNITORS
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- DEMOLISH EXISTING TRICKLING FILTERS IN PLACE
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- DEMOLISH EXISTING SECONDARY CLARIFIERS
- REPIPE PRIMARY EFFLUENT TO NEW TRICKLING FILTER PUMP STATION.
- NEW SAND FILTER PUMPING STATION WITH OVERFLOW
- NEW SAND FILTER FEED PUMPS
- NEW CONTINUOUS-BACKWASH EFFLUENT SAND FILTERS
- NEW PAC STORAGE AND DOSING SYSTEM
- NEW METHANOL STORAGE AND DOSING SYSTEM
- NEW UV DISINFECTION SYSTEM PER CONSENT DECREE
- NEW UV DISINFECTION TANK PER CONSENT DECREE
- GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS
- NEW SCADA & TELEMETRY IMPROVEMENTS
- ADDITIONAL BELT FILTER PRESS AND BUILDING ADDITION

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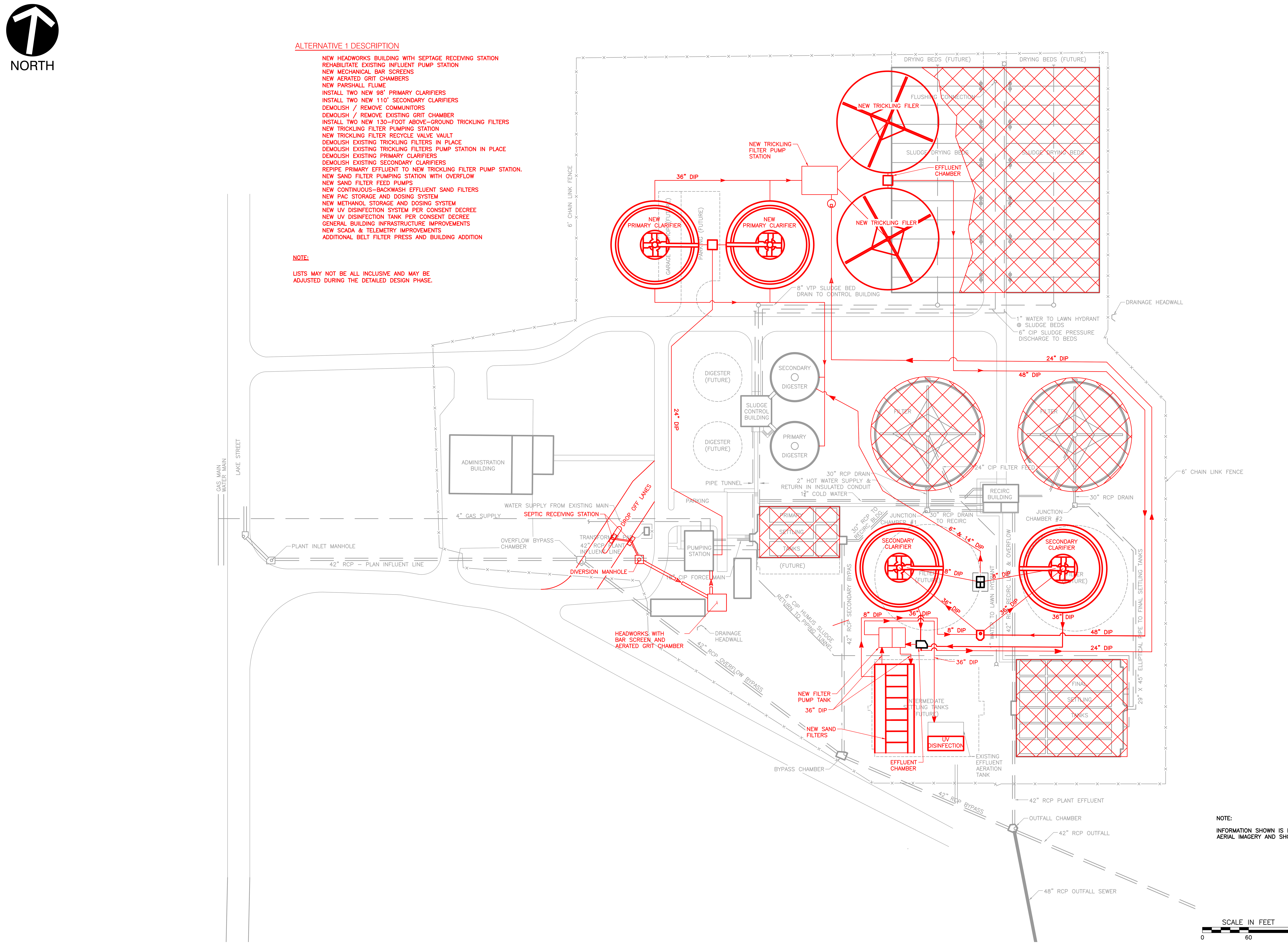

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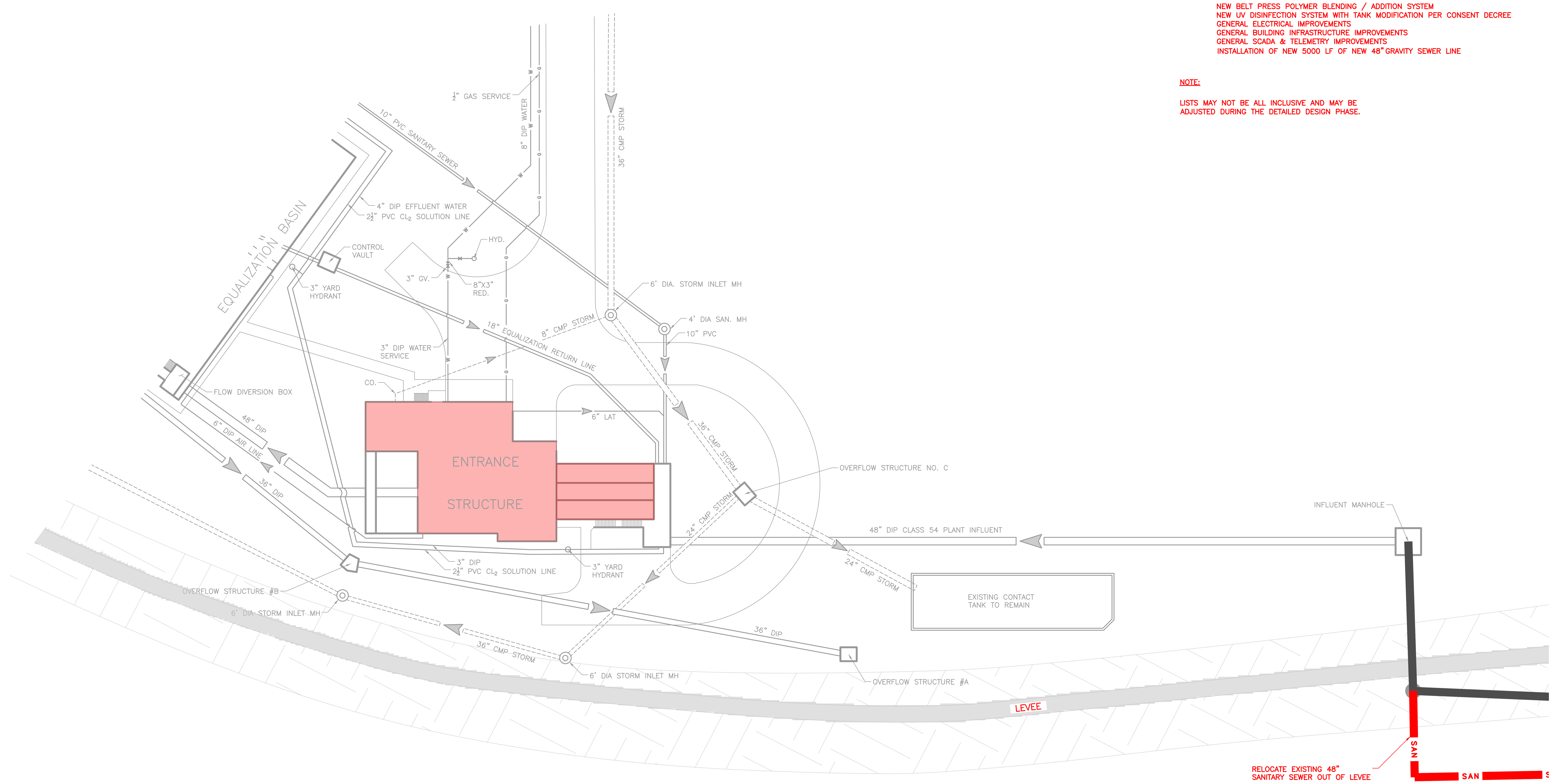
CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 1 PLAN
LAKE ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

DRAWING NO.: A1-2

NORTH



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  - NEW CONTINUOUS—BACKWASH EFFLUENT SAND FILTERS
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  - TWO NEW BELT FILTER PRESSES
  - NEW BELT PRESS POLYMER BLENDING / ADDITION SYSTEM
  - NEW UV DISINFECTION SYSTEM WITH TANK MODIFICATION PER CONSENT DECREE
  - GENERAL ELECTRICAL IMPROVEMENTS
  - GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS
  - GENERAL SCADA & TELEMETRY IMPROVEMENTS
  - INSTALLATION OF NEW 5000 LF OF NEW 48" GRAVITY SEWER LINE

NOTE:

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SCALE IN FEET
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REVISION RECORD

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CHEMUNG COUNTY
WASTEWATER TREATMENT
CONSOLIDATION STUDY
CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 1 PLAN
MILTON ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

DRAWING NO.: A1-3

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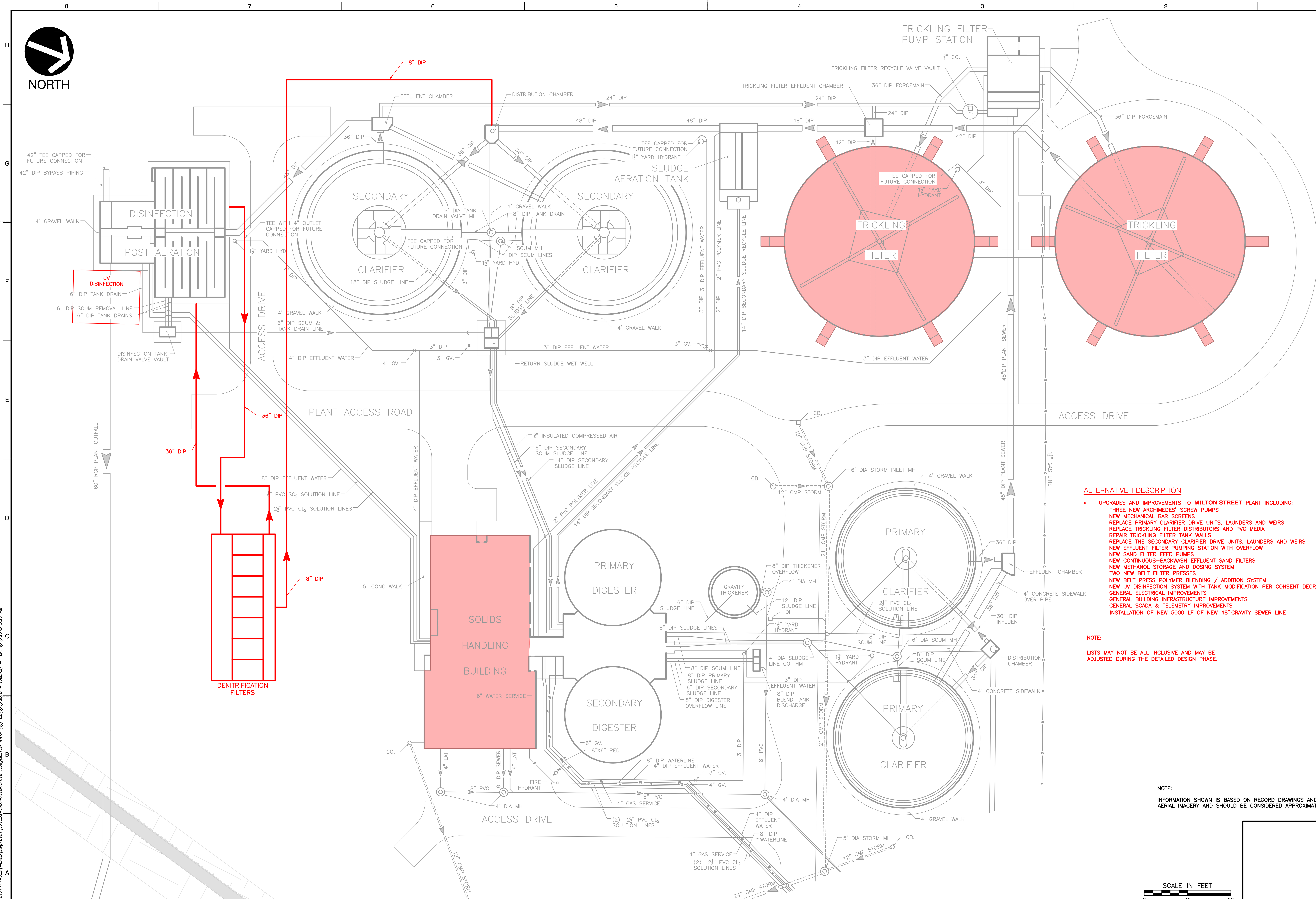

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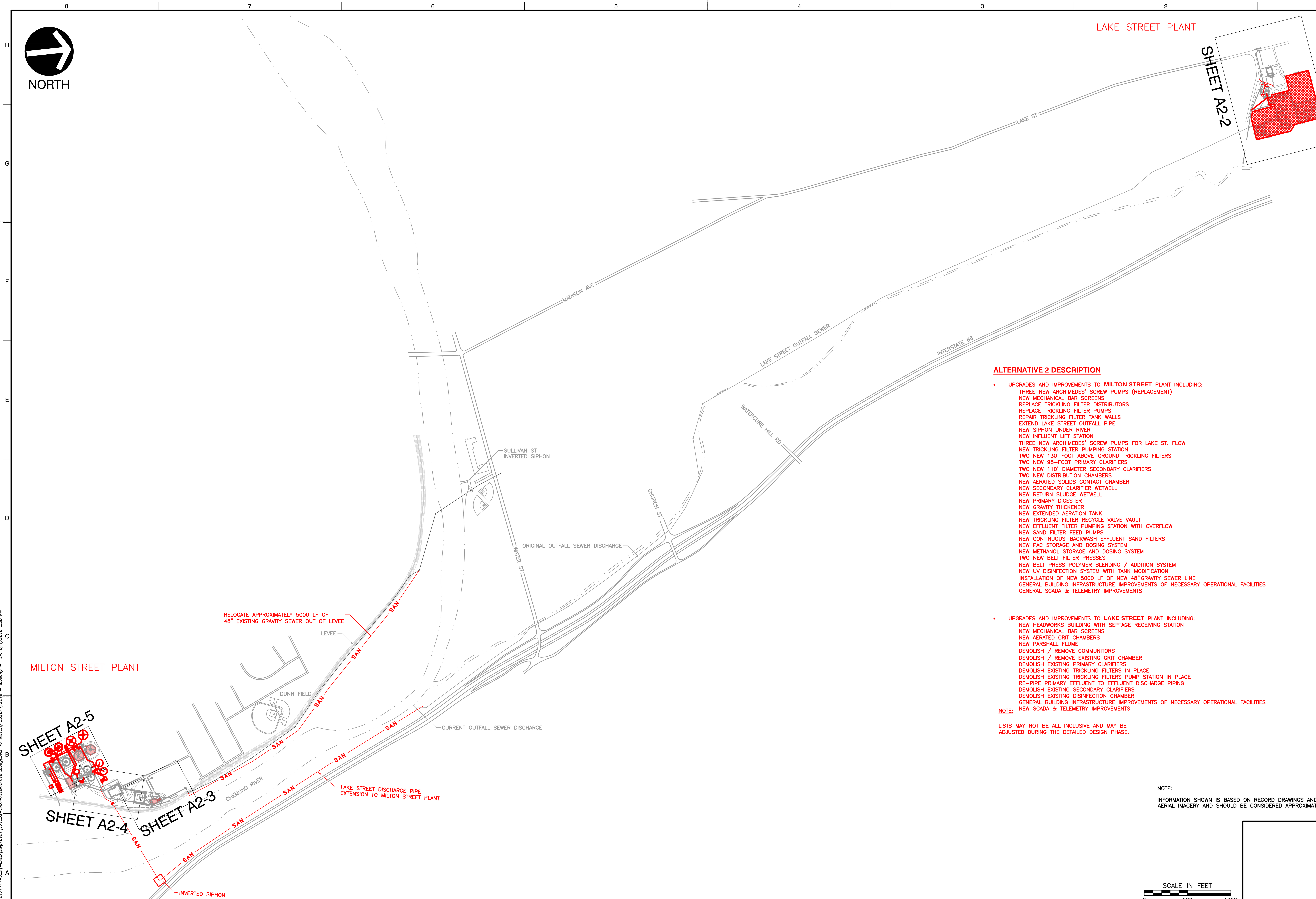
CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 1 PLAN
MILTON ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

DRAWING NO.: A1-4

9.0 Alternative #2 Plan Diagrams



ALTERNATIVE 2 DESCRIPTION

- UPGRADES AND IMPROVEMENTS TO **MILTON STREET** PLANT INCLUDING:
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  - REPLACE TRICKLING FILTER DISTRIBUTORS
  - REPLACE TRICKLING FILTER PUMPS
  - REPAIR TRICKLING FILTER TANK WALLS
  - EXTEND LAKE STREET OUTFALL PIPE
  - NEW SIPHON UNDER RIVER
  - NEW INFLUENT LIFT STATION
  - THREE NEW ARCHIMEDES' SCREW PUMPS FOR LAKE ST. FLOW
  - NEW TRICKLING FILTER PUMPING STATION
  - TWO NEW 130–FOOT ABOVE–GROUND TRICKLING FILTERS
  - TWO NEW 98–FOOT PRIMARY CLARIFIERS
  - TWO NEW 110' DIAMETER SECONDARY CLARIFIERS
  - TWO NEW DISTRIBUTION CHAMBERS
  - NEW AERATED SOLIDS CONTACT CHAMBER
  - NEW SECONDARY CLARIFIER WETWELL
  - NEW RETURN SLUDGE WETWELL
  - NEW PRIMARY DIGESTER
  - NEW GRAVITY THICKENER
  - NEW EXTENDED AERATION TANK
  - NEW TRICKLING FILTER RECYCLE VALVE VAULT
  - NEW EFFLUENT FILTER PUMPING STATION WITH OVERFLOW
  - NEW SAND FILTER FEED PUMPS
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  - GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS OF NECESSARY OPERATIONAL FACILITIES
  - GENERAL SCADA & TELEMETRY IMPROVEMENTS

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  - NEW PARSHALL FLUME
  - DEMOLISH / REMOVE COMMUNITORS
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  - DEMOLISH EXISTING PRIMARY CLARIFIERS
  - DEMOLISH EXISTING TRICKLING FILTERS IN PLACE
  - DEMOLISH EXISTING TRICKLING FILTERS PUMP STATION IN PLACE
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  - DEMOLISH EXISTING DISINFECTION CHAMBER
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CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 2 PLAN OVERVIEW

DATE:	JANUARY 2018
DRAWN BY:	LAG
DWG SCALE:	AS SHOWN
CHECKED BY:	DRAFT
PROJECT NO:	171-332
APPROVED BY:	DRAFT

DRAWING NO.: A2-1

NORTH

ALTERNATIVE 2 DESCRIPTION

- UPGRADES AND IMPROVEMENTS TO LAKE STREET PLANT INCLUDING:
  - NEW HEADWORKS BUILDING WITH SEPTAGE RECEIVING STATION
  - NEW MECHANICAL BAR SCREENS
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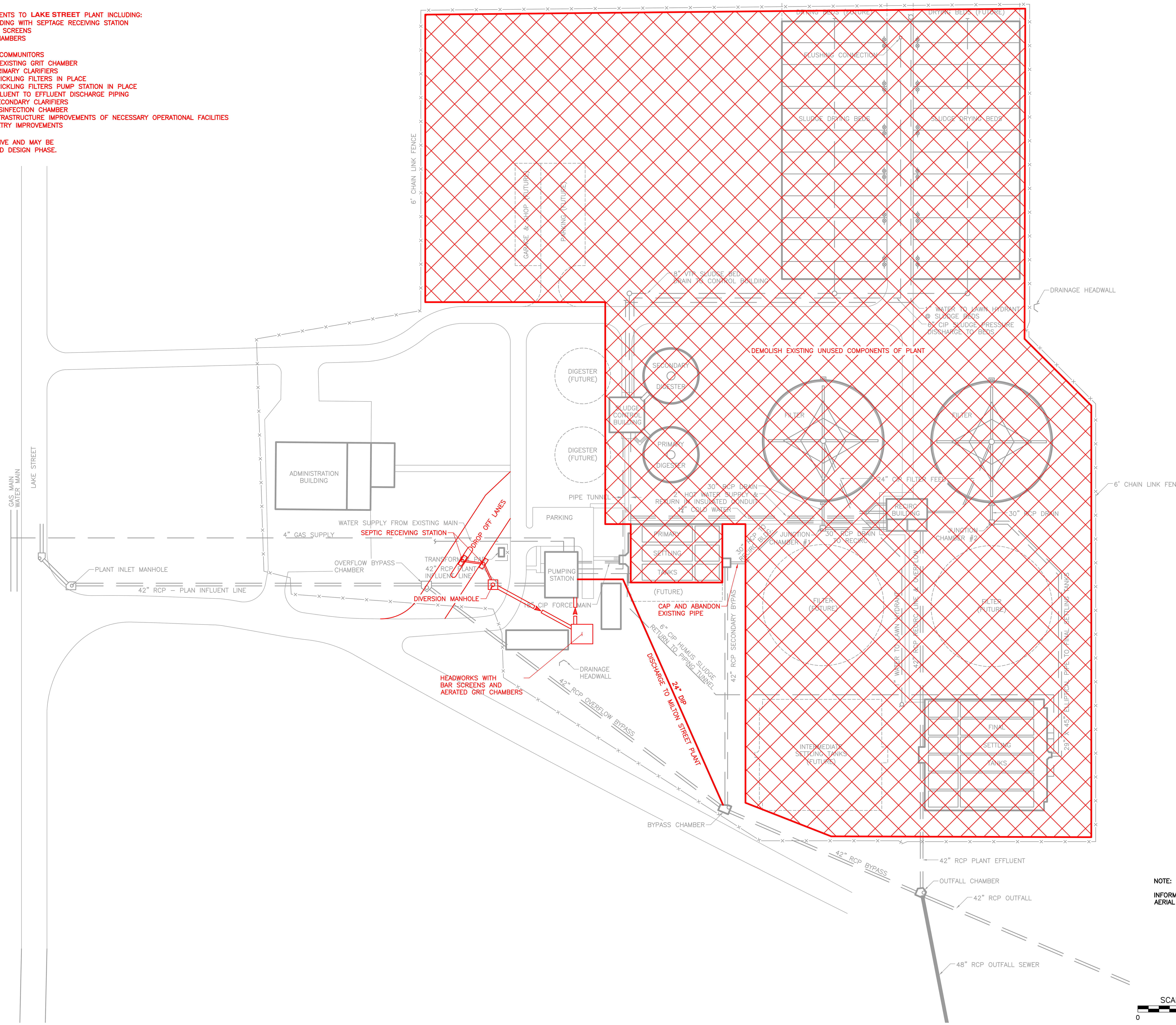

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SCALE IN FEET

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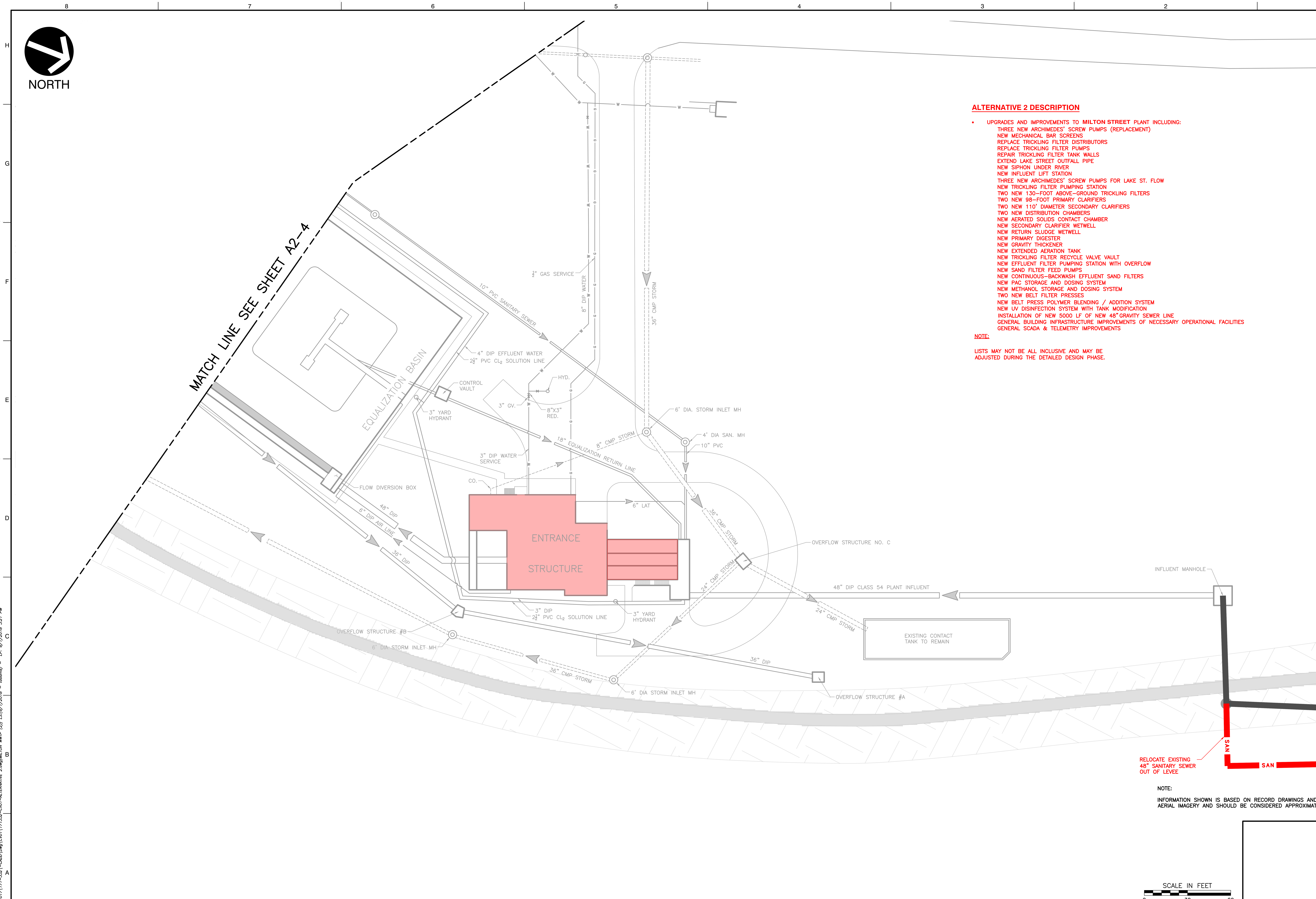
CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 2 PLAN LAKE ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

DRAWING NO.: A2-2



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  - REPAIR TRICKLING FILTER TANK WALLS
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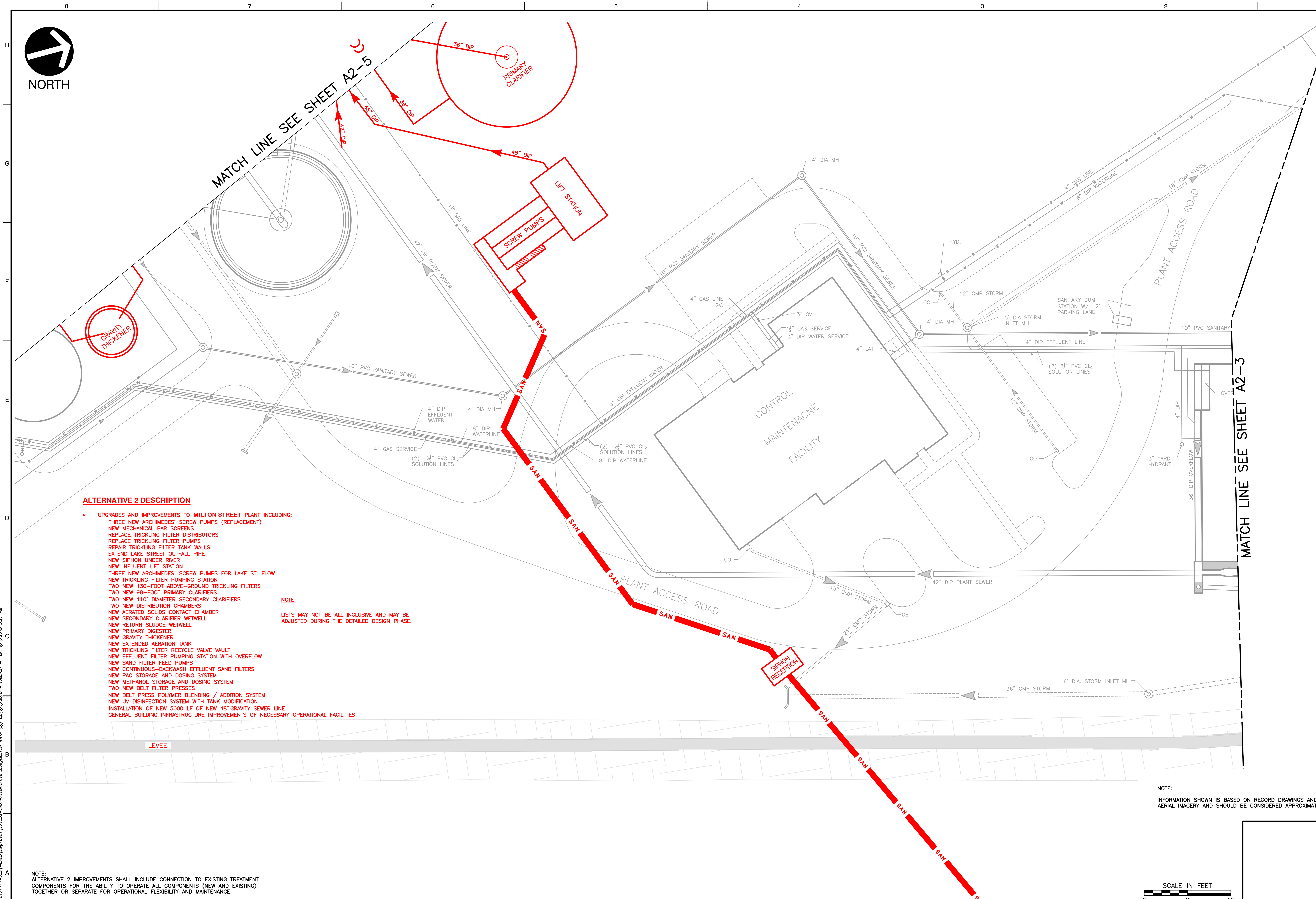
CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY
CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 2 PLAN
MILTON ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:			171-332
APPROVED BY:			DRAFT

DRAWING NO.: A2-3



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ALTERNATIVE 2 IMPROVEMENTS SHALL INCLUDE CONNECTION TO EXISTING TREATMENT COMPONENTS FOR THE ABILITY TO OPERATE ALL COMPONENTS (NEW AND EXISTING) TOGETHER OR SEPARATE FOR OPERATIONAL FLEXIBILITY AND MAINTENANCE.

NOTE:

INFORMATION SHOWN IS BASED ON RECORD DRAWINGS AND AERIAL IMAGERY AND SHOULD BE CONSIDERED APPROXIMATE.

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Engineering, Landscape Architecture and Land Surveying PLLC

Care Of:

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CHEMUNG COUNTY WASTEWATER TREATMENT CONSOLIDATION STUDY CHEMUNG COUNTY, NEW YORK

ALTERNATIVE 2 PLAN
MILTON ST WWTP

DATE:	JANUARY 2018	DRAWN BY:	LAG
DWG SCALE:	AS SHOWN	CHECKED BY:	DRAFT
PROJECT NO:	171-332		
APPROVED BY:	DRAFT		

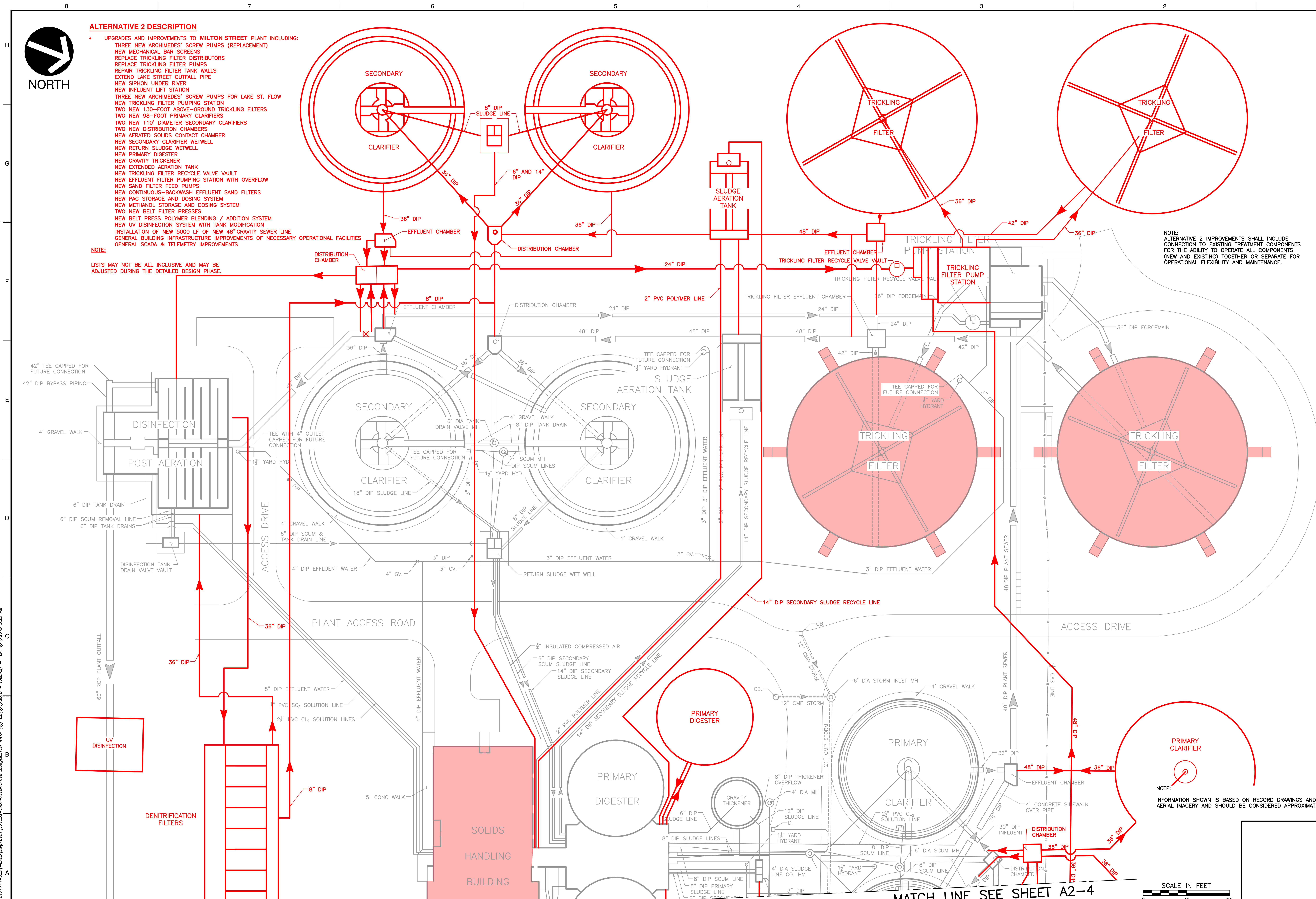
DRAWING NO.: A2-4

ALTERNATIVE 2 DESCRIPTION

- UPGRADES AND IMPROVEMENTS TO **MILTON STREET** PLANT INCLUDING:
  - THREE NEW ARCHIMEDES' SCREW PUMPS (REPLACEMENT)
  - NEW MECHANICAL BAR SCREENS
  - REPLACE TRICKLING FILTER DISTRIBUTORS
  - REPLACE TRICKLING FILTER PUMPS
  - REPAIR TRICKLING FILTER TANK WALLS
  - EXTEND LAKE STREET OUTFALL PIPE
  - NEW SIPHON UNDER RIVER
  - NEW INFLUENT LIFT STATION
  - THREE NEW ARCHIMEDES' SCREW PUMPS FOR LAKE ST. FLOW
  - NEW TRICKLING FILTER PUMPING STATION
  - TWO NEW 130-FOOT ABOVE-GROUND TRICKLING FILTERS
  - TWO NEW 98-FOOT PRIMARY CLARIFIERS
  - TWO NEW 110' DIAMETER SECONDARY CLARIFIERS
  - TWO NEW DISTRIBUTION CHAMBERS
  - NEW AERATED SOLIDS CONTACT CHAMBER
  - NEW SECONDARY CLARIFIER WETWELL
  - NEW RETURN SLUDGE WETWELL
  - NEW PRIMARY DIGESTER
  - NEW GRAVITY THICKENER
  - NEW EXTENDED AERATION TANK
  - NEW TRICKLING FILTER RECYCLE VALVE VAULT
  - NEW EFFLUENT FILTER PUMPING STATION WITH OVERFLOW
  - NEW SAND FILTER FEED PUMPS
  - NEW CONTINUOUS-BACKWASH EFFLUENT SAND FILTERS
  - NEW PAC STORAGE AND DOSING SYSTEM
  - NEW METHANOL STORAGE AND DOSING SYSTEM
  - TWO NEW BELT FILTER PRESSES
  - NEW BELT PRESS POLYMER BLENDING / ADDITION SYSTEM
  - NEW UV DISINFECTION SYSTEM WITH TANK MODIFICATION
  - INSTALLATION OF NEW 5000 LF OF NEW 48" GRAVITY SEWER LINE
  - GENERAL BUILDING INFRASTRUCTURE IMPROVEMENTS OF NECESSARY OPERATIONAL FACILITIES
  - GENERAL SCADA & TELEMETRY IMPROVEMENTS

NOTE:

LISTS MAY NOT BE ALL INCLUSIVE AND MAY BE ADJUSTED DURING THE DETAILED DESIGN PHASE.



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DRAWING NO.: A2-5