City of Wausau
2040 Wastewater Facilities Plan | Treatment Facility

February 26, 2019

Wausau Wastewater Treatment Facility
435 Adrian Street
Wausau, WI 54401

Prepared by:

Donohue & Associates, Inc.
3311 Weeden Creek Road
Sheboygan, WI 53081

and

Becher Hoppe Associates, Inc.
330 North 4th Street
Wausau, WI 54403

WISCONSIN
MICHAEL W. GERBITZ
E-32259
SHEBOYGAN
WI
PROFESSIONAL ENGINEER

Feb 26, 2019

Donohue Project No.: 13229

TABLE OF CONTENTS

1. Executive Summary 1

1.1 Purpose 1
1.2 Safety, Reliability, and Performance 1
1.3 Capacity 1
1.4 Regulatory Compliance 1
1.5 Current Population 1
1.6 Future Population 2
1.7 Alternatives Analysis 2
1.7.1 Process Issues and concerns 2
1.7.2 Non-Process Issues and concerns 3
1.7.3 Alternative Compartments 3
1.7.4 Cost Allocation 5
1.7.5 Opinions of Cost 5
1.7.6 Residential User Cost Perspective 6
1.7.7 The Analysis of Alternatives 6
1.8 Recommended Plan 6

2. Purpose 11

2.1 Treatment Facility 11
2.2 Collection system 11
2.3 Purpose 11
2.3.1 Safety, Reliability, and Performance 12
2.3.2 Capacity 12
2.3.3 Regulatory Compliance 12

3. Existing Conditions | Treatment Facility 14

3.1 Service Area 14
3.2 The Facility 14
3.3 Population 15
3.4 Flows 15
3.4.1 Inflow 22
3.4.2 Infiltration 24
3.4.3 Inflow and Infiltration Reduction 24
3.5 Loadings 26
3.6 Solids Production 32
3.7 Permit 33
3.7.1 BOD WLA 33

3.7.2 Phosphorus TMDL 35
3.8 Performance 36
3.8.1 BOD 36
3.8.2 TSS 36
3.8.3 TP 44
3.8.4 Fecal Colifirm 47
3.8.5 pH 47
3.9 Conditions 48
3.9.1 Raw Wastewater Screening 49
3.9.2 Raw Wastewater Pumping 50
3.9.3 Grit Removal and Influent Flow Measurement 51
3.9.4 Primary Settling 52
3.9.5 Activated Sludge System 53
3.9.6 Secondary Settling 54
3.9.7 Effluent Filtration 55
3.9.8 Disinfection 56
3.9.9 Chemical Phosphorus Removal 57
3.9.10 Pre-Digestion Thickening 58
3.9.11 Anaerobic Digestion 59
3.9.12 Post-Digestion Dewatering 60
3.9.13 Biosolids Cake Storage 61
3.9.14 Ancillary Systems 62
3.9.15 Buildings 63
3.10 NFPA 820 64
4. Future Conditions | Treatment Facility 66
4.1 Service Area 66
4.2 Population 66
4.3 Flows 67
4.4 Loadings 67
4.5 Solids Production 68
4.6 The permit 68
4.7 The regulatory landscape 68
4.7.1 Nutrients 68
4.7.2 Micropollutants 69
4.7.3 Biosolids 70
4.7.4 CMOM Program 72
5. Alternatives Analysis | Treatment Facility 73
5.1 Process Issues and concerns 73

5.2 Non-Process Issues and concerns 73
5.3 Alternative Compartments 75
5.4 Cost Allocation 75
5.5 Opinions of Cost 75
5.6 Residential User Cost Perspective 77
5.7 Evaluation 77
5.7.1 Preliminary treatment 77
5.7.2 Primary Settling 78
5.7.3 Activated Sludge 79
5.7.4 Secondary Settling 80
5.7.5 Phosphorus and Filtration 81
5.7.6 Disinfection 90
5.7.7 Anaerobic Digestion 91
5.7.8 Solids Processing 91
5.7.9 Site Features 101
5.7.10 Administration-Maintenance-Storage 102
6. Recommended Plan | Treatment Facility 104

LIST OF TABLES

Table 1-1 Existing Service Area Populations 2
Table 1-2 Design Period Service Area Populations 2
Table 1-3 Issue Categories 3
Table 1-4 Summary of Existing Unit Process Issues and Concerns 4
Table 1-5 Alternative Compartments 5
Table 1-6 Cost Allocation to Issue Categories 6
Table 3-1 Existing Liquid Train Processes 15
Table 3-2 Existing Solids Train Processes 15
Table 3-3 Existing Service Area Populations 16
Table 3-4 Recent Historical Flows 16
Table 3-5 Recent Historical Loadings 26
Table 3-6 Present-Day Solids Production Values 33
Table 3-7 Effluent Limits in WPDES Permit WI-0025739-08 33
Table 3-8 Effluent Limits in WPDES Permit WI-0025739-09 34
Table 4-1 Design Period Service Area Populations 67
Table 4-2 Design Basis Flows 67
Table 4-3 Design Basis Loadings 68
Table 4-4 Design Basis Solids Production Values 68
Table 4-5 Biosolids Metals Restrictions 70
Table 4-6 Class B Site Criteria by Land Application Method 71
Table 5-1 Issue Categories 73
Table 5-2 Summary of Existing Unit Process Issues and Concerns 74
Table 5-3 Alternative Compartments 76
Table 5-4 Cost Allocation to Issue Categories 76
Table 5-5 Opinion of Monthly Residential Rate Increases 77
Table 5-6 Capital and Associated User Costs for Preliminary Treatment Alternative PRT-1 78
Table 5-7 Capital and Associated User Costs for Preliminary Treatment Alternative PRT-2 78
Table 5-8 Costs for the Preliminary Treatment Recommendation 78
Table 5-9 Costs for the Primary Settling Recommendation 79
Table 5-10 Costs for the Activated Sludge System Recommendation 80
Table 5-11 Costs for the Secondary Settling Recommendation 81
Table 5-12 Capital and Associated User Costs for Phosphorus and Filtration Alternative PFL-1 89
Table 5-13 Capital and Associated User Costs for Phosphorus and Filtration Alternative PFL-2 90
Table 5-14 Costs for the Phosphorus and Filtration Recommendation 90
Table 5-15 Costs for the Disinfection Recommendation 90
Table 5-16 Costs for the Anaerobic Digestion Recommendation 91
Table 5-17 Capital and Associated User Costs for Alternative SOL-1 97

Table 5-18 Capital and Associated User Costs for Alternative SOL-2 97
Table 5-19 Capital and Associated User Costs for Alternative SOL-3 97
Table 5-20 Solids Processing Present Worth Conditions and Assumptions 98
Table 5-21 Solids Processing Present Worth and User Costs 99
Table 5-22 Costs for the Solids Processing Recommendation 100
Table 5-23 Capital and Associated User Costs for Alternative STE-1 101
Table 5-24 Capital and Associated User Costs for Alternative STE-2 101
Table 5-25 Capital and Associated User Costs for Alternative STE-2 102
Table 5-26 Costs for the Site Features Recommendation 102
Table 5-27 Costs for Administration-Maintenance-Storage Alternative AMS-1 103
Table 5-28 Costs for Administration-Maintenance-Storage Alternative AMS-2 103
Table 5-29 Costs for the Administration-Maintenance-Storage Recommendation 103
Table 6-1 Capital Costs and User Rate Perspectives for the Recommended Treatment Facility Plan 104
Table 6-2 Comparison of Planning Phase and Preliminary Layout Design Cost Opinions 108

LIST OF FIGURES

Figure 1-1 Existing Unit Process Capacities Relative to Required Capacities 4
Figure 1-2 Capital Cost Distribution by Unit Process or Facility Function 7
Figure 1-3 Capital Cost Distribution by Train or Facility Function 8
Figure 1-4 Capital Cost Distribution by Condition Category 9
Figure 1-5 Proposed Implementation Schedule for the Recommended Plan | WWTF 10
Figure 2-1 Location Map 11
Figure 2-2 Year Facility Structures Constructed 13
Figure 3-4 Facility Process Schematic 14
Figure 3-1 Sanitary Sewer Service Area ..... Follows 14
Figure 3-2 Treatment Facility Aerial View ..... Follows 14
Figure 3-3 Treatment Facility Property Boundary ..... Follows 14
Figure 3-5 Ratio of Historical Measured Influent and Effluent Flows 17
Figure 3-6 Historical Effluent Flows 18
Figure 3-7 Effluent Flow Probability Distribution 19
Figure 3-8 Historical Precipitation 20
Figure 3-9 Precipitation Before, During, and After the September 4, 2014 Event 21
Figure 3-10 Maximum Facility Flow during the Five-Year Period 22
Figure 3-11 Historical Precipitation and Facility Flows 23
Figure 3-12 Precipitation and Facility Flows Related August 2014 and March 2016 Events 24
Figure 3-13 Historical Precipitation and 7-Dry-Day Facility Flows 25
Figure 3-14 Historical BOD Loadings 27
Figure 3-15 Historical BOD Probability Distribution 28
Figure 3-16 Historical TSS Loadings 29
Figure 3-17A Historical TSS Probability Distribution 30
Figure 3-17B Historical TKN Loadings 31
Figure 3-18 Historical TP Loadings 32
Figure 3-19 Maximum Allowable Effluent BOD Concentrations for Historical WLA Scenarios 34
Figure 3-20 Effluent TP Concentration Requirements Associated with Potential TMDL Scenarios 35
Figure 3-21 Historical Monthly Average Effluent BOD Concentration 37
Figure 3-22 Historical 30-d Running Average Effluent BOD Concentrations 38
Figure 3-23 Historical 30-d Running Average Effluent BOD Concentrations 39
Figure 3-24 Historical Daily Effluent BOD Loadings and WLA BOD Limits 40
Figure 3-25 Historical Daily Effluent BOD Loadings and Minimum WLA Limits 41
Figure 3-26 Historical Monthly Average Effluent TSS Concentrations 42
Figure 3-27 Historical 30-d Running Average Effluent TSS Concentrations 43
Figure 3-28 Historical 7-d Running Average Effluent TSS Concentrations 44
Figure 3-29 Historical Monthly Average Effluent TP Concentrations 45

Figure 3-30 Historical 30-d Running Average Effluent TP Concentrations 46
Figure 3-31 Historical 30-d Geometric Mean Effluent Fecal Coliform Values 47
Figure 3-32 Historical Effluent pH Values 48
Figure 4-1 Regional Location Map Showing Brokaw and Maine Relative to Wausau 66
Figure 5-1 Existing Unit Process Capacities Relative to Required Capacities 74
Figure 5-2 Phosphorus Forms 82
Figure 5-3 Residuals Soluble Phosphorus as a Function of Mixing Intensity in Rapid-Mix Zone 82
Figure 5-4 Low-Level Phosphorus Compliance Strategy Using Cloth-Media Filtration 83
Figure 5-5 Low-Level Phosphorus Compliance Strategy Using Tertiary Settling and Sand Filtration 84
Figure 5-6 Low-Level Phosphorus Compliance Using Ballasted Sedimentation 84
Figure 5-7 Cloth-Media Filtration 85
Figure 5-8 Overview of ABNR Process 86
Figure 5-9 Schematic of and Potential Effluent Quality from an ABNR System 87
Figure 5-10 Overview of Several Struvite Recovery Systems and Manufacturers 88
Figure 5-11 Example of Struvite Recovery Flow Schematic 88
Figure 5-12 Planning-Level Layout of a Cloth-Media Filtration System (PFL-1) 89
Figure 5-13 Medium-Temperature Belt-Dryer System Schematics 94
Figure 5-14 Medium-Temperature Belt Dryer Configuration Drawing 95
Figure 5-15 Example Biosolids Product from Medium-Temperature Belt Dryer 95
Figure 5-16 20-Year Total Present Worth Cost Opinions for Solids Processing Alternative Scenarios 99
Figure 5-17 Opinion of Monthly Residential User Costs for Solids Processing Alternative Scenarios 100
Figure 6-1 Capital Cost Distribution by Unit Process or Facility Function 105
Figure 6-2 Capital Cost Distribution by Train or Facility Function 106
Figure 6-3 Capital Cost Distribution by Condition Category 107
Figure 6-4 Hydraulic Profile 1 ..... Follows 107
Figure 6-5 Hydraulic Profile 2 ..... Follows 107
Figure 6-6 Liquids Treatment Train ..... Follows 107
Figure 6-7 Solids Treatment Train ..... Follows 107
Figure 6-8 Proposed Site Plan ..... Follows 107
Figure 6-9 Simple Rendering of Recommended Plan ..... Follows 107
Figure 6-10 Treatment Facility Property Boundary ..... Follows 107
Figure 6-11 Proposed Implementation Schedule for the Recommended Plan | WWTF 109

APPENDICES

Appendix A – WPDES Permit Effective Prior to January 2019

Appendix B – WPDES Permit Effective January 2019

Appendix C – Data from Two-Week Special Sampling Period

Appendix D – Detailed Planning Level Alternative Cost Opinions

Appendix E – Preliminary Design Basis and Operational Strategies

Appendix F – Public Hearing Materials

Appendix G – 2040 Wastewater Facilities Plan Resolution

ABBREVIATIONS

7-d	Seven-day
30-d	Thirty-day
AA	Annual Average
ABNR	Advanced Biological Nutrient Recovery
ac	acres
ACH	Air Changers per Hour
BOD	5-day Biochemical Oxygen Demand
BFP	Belt Filter Press
CID1	Class I, Division 1
CID2	Class 1, Division 2
CFR	Code of Federal Regulations
City	City of Wausau
CWFP	Clean Water Fund Program
CMOM	Capacity, Management, Operation, and Maintenance
cy	cubic yards
cyh	cubic yards per hour
d	day
DOA	Department of Administration
DSD	Digested Sludge
DT	dry tons
EPA	United States Environmental Protection Agency
EQ	Exceptional Quality (biosolids)
Facility	Facility
F:M	food-to-microorganism ratio

ft	feet
GBT	Gravity Belt Thickener
gpcd	gallons per capita per day
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
H2S	Hydrogen Sulfide
hp	horsepower
hr/d	hours per day
HVAC	Heating, Ventilation, and Air Conditioning
in	inches
in/hr	inches per hour
kcf	thousand cubic feet
Kg	kilogram
kWh	kilowatt hours
lbs	pounds
M	millions
MCC	Motor Control Center
MD	Maximum Day
mg	milligram
mg/L	milligrams per liter
mgal	million gallons
mgd	million gallons per day
ML	mixed liquor
MM	Maximum Month
mo	month

MPN	most probable number
MW	Maximum Week
NCWRPC	North Central Wisconsin Regional Planning Commission
NFPA	National Fire Protection Agency
NR	Natural Resources
Permit	WPDES Permit
P	phosphorus
PP	particulate phosphorus
ppcd	pounds per capita per day
ppd	pounds per day
ppy	pounds per year
ng/L	nanograms per liter
Q	refers to flow
RAS	Return Activated Sludge
RWW	Raw Wastewater
scfm	Standard Cubic Feet per Minute
sf	square feet
SNRP	soluble non-reactive phosphorus
SP	soluble phosphorus
SRP	soluble reactive phosphorus
SRT	Solids Retention Time or sludge age
SSES	Sewer System Evaluation Survey
SSO	Sanitary Sewer Overflow
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load

TN	Total Nitrogen
TP	Total Phosphorus
TPAD	Temperature Phased Anaerobic Digestion
TS	Total Solids
TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge
USEPA	United States Environmental Protection Agency
VS	Volatile Solids
VSS	Volatile Suspended Solids
WAC	Wisconsin Administrative Code
WAS	Waste Activated Sludge
WDNR	Wisconsin Department of Natural Resources
WLA	Waste Load Allocation
WPDES	Wisconsin Pollution Discharge Elimination System
WWTF	Wastewater Treatment Facility
yr	year

1. EXECUTIVE SUMMARY

1.1 PURPOSE

This Report documents Wastewater Treatment Facility Planning. This Planning effort, which was initiated in 2017, produced a comprehensive Recommended Plan (Plan): a capital improvement program to provide the City a safe, reliable, cost-effective, and Permit-compliant wastewater treatment system for the nominal 20-year planning period. The Plan addresses concerns as categorized below. The final year of the nominal 20-year planning period is Year 2040.

1. Safety, reliability, and performance
2. Capacity
3. Regulatory compliance

1.2 SAFETY, RELIABILITY, AND PERFORMANCE

The Recommended Plan addresses safety, reliability, and performance concerns. The Facility was constructed in three phases: Phase 1 in 1939, Phase 2 in 1967, and Phase 3 in 1988. Much of the infrastructure and equipment is at least 30 years old. Infrastructure constructed as part of Phases 1 and 2 is 80 and 50 years old, respectively. A significant fraction of the equipment has reached or is rapidly approaching the end of its reliable service life and aging infrastructure needs upgrading.

The National Fire Protection Association (NFPA) has adopted an important Standard since the last major Facility upgrade. NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities outlines important design standards that guard against the unique hazards wastewater treatment and collection systems pose. The Facility, all of which was designed and constructed before NFPA 820 was adopted, does not comply with this Standard.

The Facility is well operated and maintained; however, some of the unit processes in the liquid and solids treatment trains lack adequate reliability, flexibility, redundancy, and control. These shortcomings degrade the potential performance of the Facility and jeopardize consistent, reliable compliance.

1.3 CAPACITY

Some Facility components lack adequate capacity today or are anticipated to lack capacity during the 20-year planning period. The Recommended Plan addresses capacity concerns.

1.4 REGULATORY COMPLIANCE

The Recommended Plan addresses compliance concerns. Recommendations aimed at maintaining compliance with present-day regulatory requirements are categorized as Safety, Reliability, and Performance recommendations. The Regulatory Compliance recommendations are aimed at impending regulations, namely a lower effluent phosphorus limit as defined by a Total Maximum Daily Limit (TMDL).

1.5 CURRENT POPULATION

Existing service area populations are provided in Table 1-1. The service area serves the entire residential populations of Wausau and Schofield. It also serves an industrial park within the Village of Weston, but

none of the Weston residential population. The Year 2020 population assumes the addition of Brokaw and Maine; however, these communities may be added to the service at a later date.

Table 1-1 Existing Service Area Populations

Community	Existing	Year 2020
Wausau	40,460	40,460
Schofield	2,205	2,205
Weston	0	0
Brokaw	0	270
Maine	0	705
Total Service Area	42,665	43,640

1.6 FUTURE POPULATION

The future Service Area includes the City of Wausau, the City of Schofield, the Weston industrial park, the Village of Brokaw, and a portion of the Village of Maine. Populations predicted for the Design Year (2040) and preceding years are shown in Table 1-2. The maximum estimated Service Area population occurs in Year 2030.

Table 1-2 Design Period Service Area Populations

Community	2020	2025	2030	2035	2040
Wausau	40,460	41,100	41,490	41,450	41,070
Schofield	2,205	2,210	2,205	2,180	2,135
Brokaw	270	280	300	315	325
Maine	705	718	725	726	721
Total Service Area	43,640	44,308	44,720	44,671	44,251

1.7 ALTERNATIVES ANALYSIS

The Recommended Plan is a product of an evaluation of alternatives that address present-day and design-year issues and concerns. The alternatives that address these shortcomings have been grouped into the three categories listed and defined in Table 1-3. Many of the alternatives, particularly those that address safety-, condition-, and/or performance-related issues, do not have a competing alternative or alternatives. Alternatives that do not have a competing alternative remedy shortcomings in a straightforward and cost-effective manner consistent with the present-day Facility configuration, leveraging to the maximum extent possible previous infrastructure investments.

1.7.1 PROCESS ISSUES AND CONCERNS

Process issues and concerns are pervasive throughout the aging Facility. These are delineated in Chapters 3 and 4 and are summarized Table 1-4. Figure 1-1 shows required unit process capacities relative to the current capacities. Bars that exceed the horizontal 100% line lack adequate capacity.

Table 1-3 Issue Categories

Issue Categories	Definition
Safety, Reliability, and Performance	Some of these alternatives remedy safety-, condition-, or age-related deficiencies associated with process equipment, equipment ancillary to processes, process-related infrastructure, and Facility-related infrastructure. Other alternatives enhance the performance, stability, reliability, and/or efficiency of a particular unit process.
Capacity	These alternatives enhance the capacity of a particular unit process to adequately and efficiently accommodate projected Design Year flows and loadings.
Regulations	These alternatives enhance existing unit processes, replace existing unit processes, or add unit processes to comply with more stringent future regulations. For this Plan, these alternatives were aimed exclusively at phosphorus compliance. The Facility discharges to a stretch of the Wisconsin River that is part of a phosphorus TMDL. The WDNR and USEPA have not completed the TMDL; however, the draft TMDL suggests the Facility will likely be assigned a maximum daily phosphorus mass limit that requires effluent phosphorus in a range of 0.2 – 0.4 mg-TP/L.

1.7.2 NON-PROCESS ISSUES AND CONCERNS

Non-process issues and concerns are pervasive throughout the aging Facility. These are delineated in Chapters 3 and 4. In general, non-process issues and concerns are related to aging Buildings, aging Site features and infrastructure, and changed or more restrictive safety Standards, building Codes, and workplace requirements.

1.7.3 ALTERNATIVE COMPARTMENTS

Alternatives were grouped in the Alternative Compartments listed below. Table 1-5 shows how unit processes are assigned to the Alternative Compartments.

1. Preliminary Treatment
2. Primary Settling
3. Activated Sludge System
4. Secondary Settling
5. Phosphorus and Filtration
6. Disinfection
7. Anaerobic Digestion
8. Solids Processing
9. Site Features
10. Administration-Maintenance-Storage

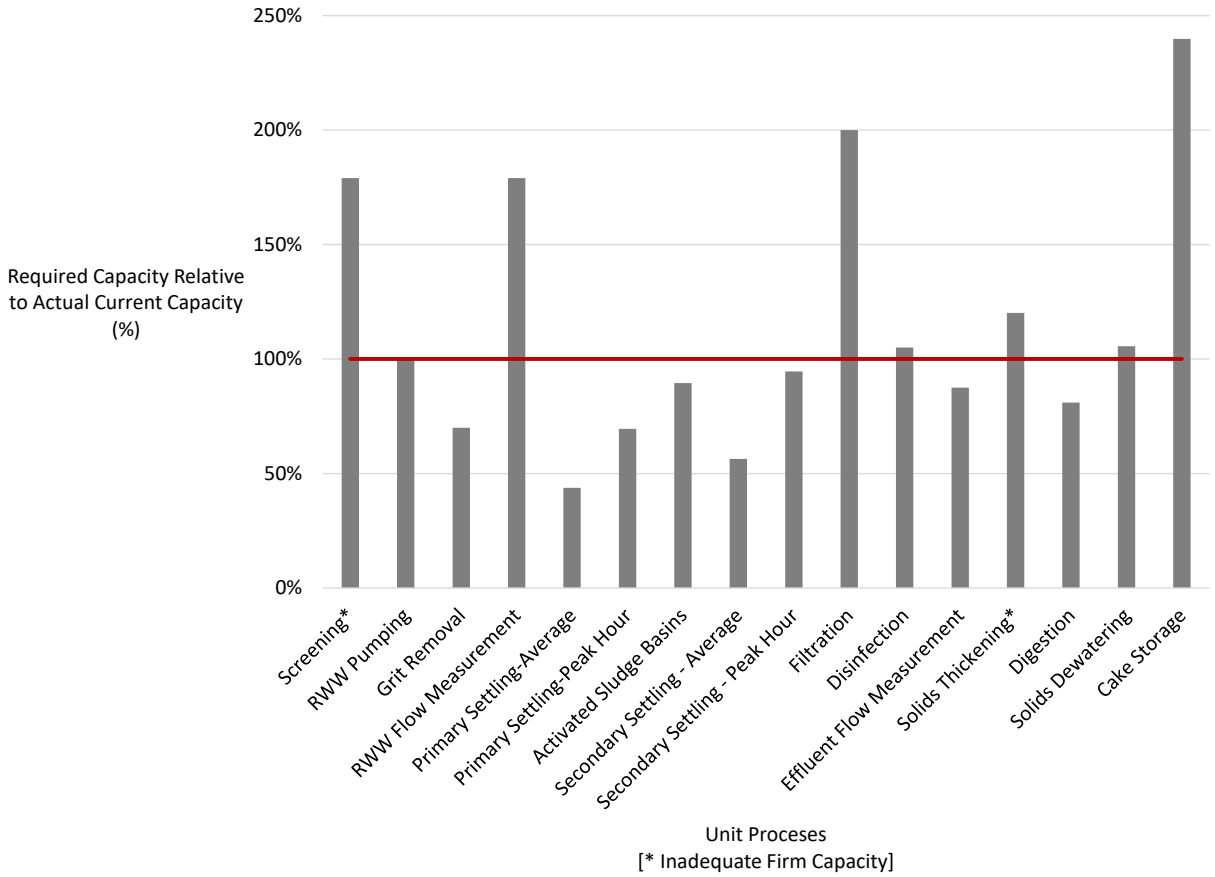


Figure 1-1 Existing Unit Process Capacities Relative to Required Capacities

Table 1-4 Summary of Existing Unit Process Issues and Concerns

Unit Process	Safety, Reliability, Performance	Capacity	Regulations
Raw Wastewater Screening	■	■	
Raw Wastewater Pumping	■		
Grit Removal and Influent Flow Measurement	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Effluent Filtration	■	■	■
Disinfection	■	■	
Chemical Phosphorus Removal	■	■	■
Pre-Digestion Thickening	■	■	
Anaerobic Digestion	■		
Post-Digestion Dewatering	■	■	
Biosolids Cake Storage	■	■	●

● Denotes does not meet the regulatory required 180-d of storage. This is an existing regulation, not a new one. The existing cake storage capacity does not provide a robust and reliable 180-d of storage; however, 180-d of storage is woefully inadequate for the Wausau situation.

Table 1-5 Alternative Compartments

Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Raw Wastewater Screening	■	■	
Raw Wastewater Pumping	■		
Grit Removal and Influent Flow Measurement	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Chemical Phosphorus Removal	■	■	■
Effluent Filtration	■	■	■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Pre-Digestion Thickening	■	■	
Post-Digestion Dewatering	■	■	
Biosolids Cake Storage	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Denotes Alternative Compartment

● Denotes does not meet the regulatory required 180-d of storage. This is an existing regulation, not a new one. The existing cake storage capacity does not provide a robust and reliable 180-d of storage; however, 180-d of storage is woefully inadequate for the Wausau situation.

1.7.4 COST ALLOCATION

Elected officials and the rate paying community deserve a clear and succinct explanation of the issues and concerns proposed capital improvements address. Table 1-6 allocates costs to the issues it addresses.

1.7.5 OPINIONS OF COST

Detailed planning phase capital cost opinions are included in Appendix D. Annual cost opinions were developed when two competing alternatives have different annual operating costs. The annual costs are converted to a 20-year present worth cost. The 20-year present worth represents the current dollars required to construct the improvements and operate them for 20 years.

Table 1-6 Cost Allocation to Issue Categories

Alternative Compartments	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	80%	20%	
Primary Settling	100%		
Activated Sludge System	80%	20%	
Secondary Settling	100%		
Phosphorus and Filtration			100%
Disinfection	20%	80%	
Anaerobic Digestion	100%		
Solids Processing	60%	40%	
Site Features	100%		
Administration, Maintenance, and Storage	100%		

1.7.6 RESIDENTIAL USER COST PERSPECTIVE

In addition to considering capital, annual, and total present worth costs, the Plan was developed considering typical residential rate increases. Two scenarios are considered: financing the project using the Clean Water Fund (CWF) over a 20-year term (1.87% annual interest rate) and over a 30-year term (2.07% annual interest rate).

1.7.7 THE ANALYSIS OF ALTERNATIVES

The details of the Alternatives Analysis are beyond the scope of an Executive Summary. The rationale used to recommend or select specific alternatives are documented in Chapter 5.

1.8 RECOMMENDED PLAN

The Recommended Plan is the collection of individual recommendations for the various unit processes and Facility functions. Figures 1-2 through 1-4 show how costs are distributed around the Facility and between the condition categories. The total capital cost is $80M. Typical residential user rates will increase approximately $12.16/month if the Project is financed using a 30-year Wisconsin Clean Water Fund Program low-interest loan or $16.24/month using a 20-year low-interest loan.

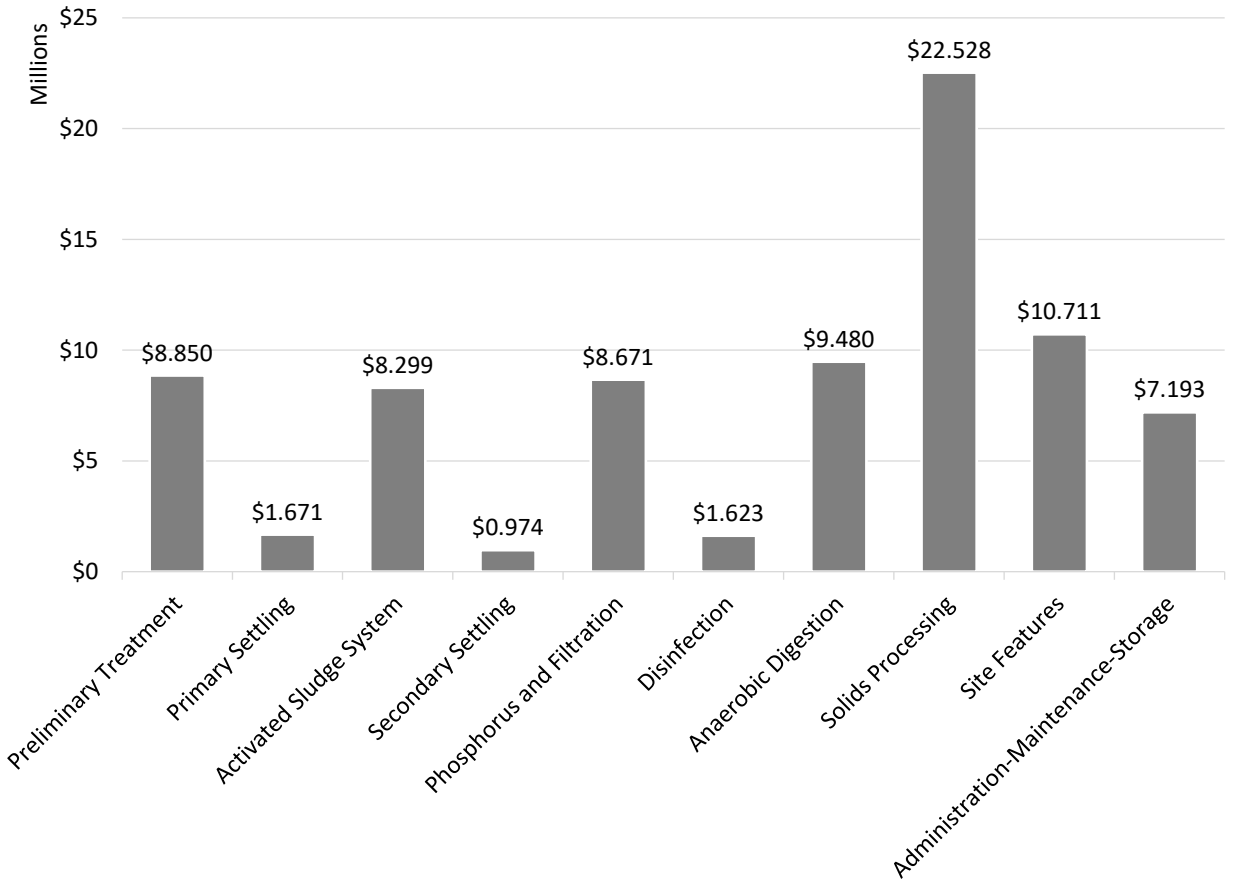


Figure 1-2 Capital Cost Distribution by Unit Process or Facility Function

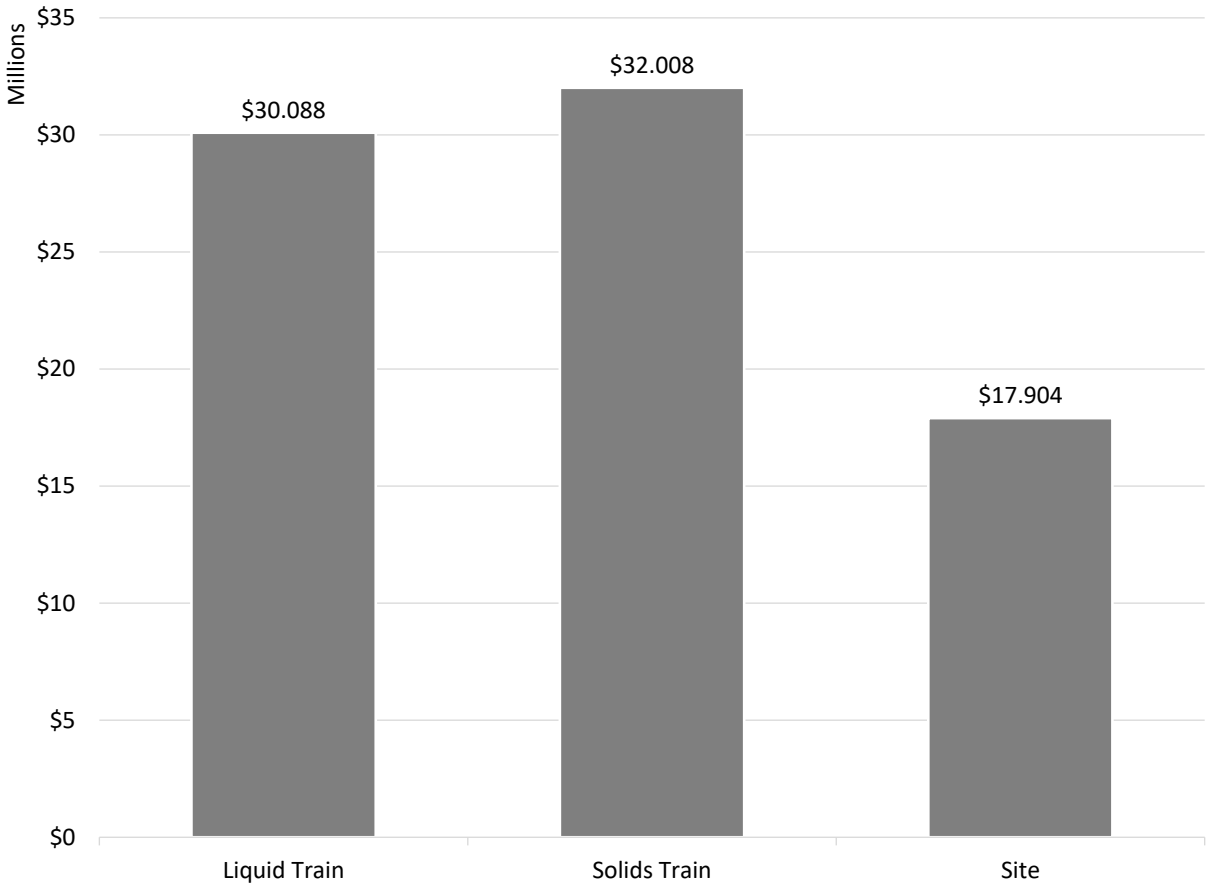


Figure 1-3 Capital Cost Distribution by Train or Facility Function

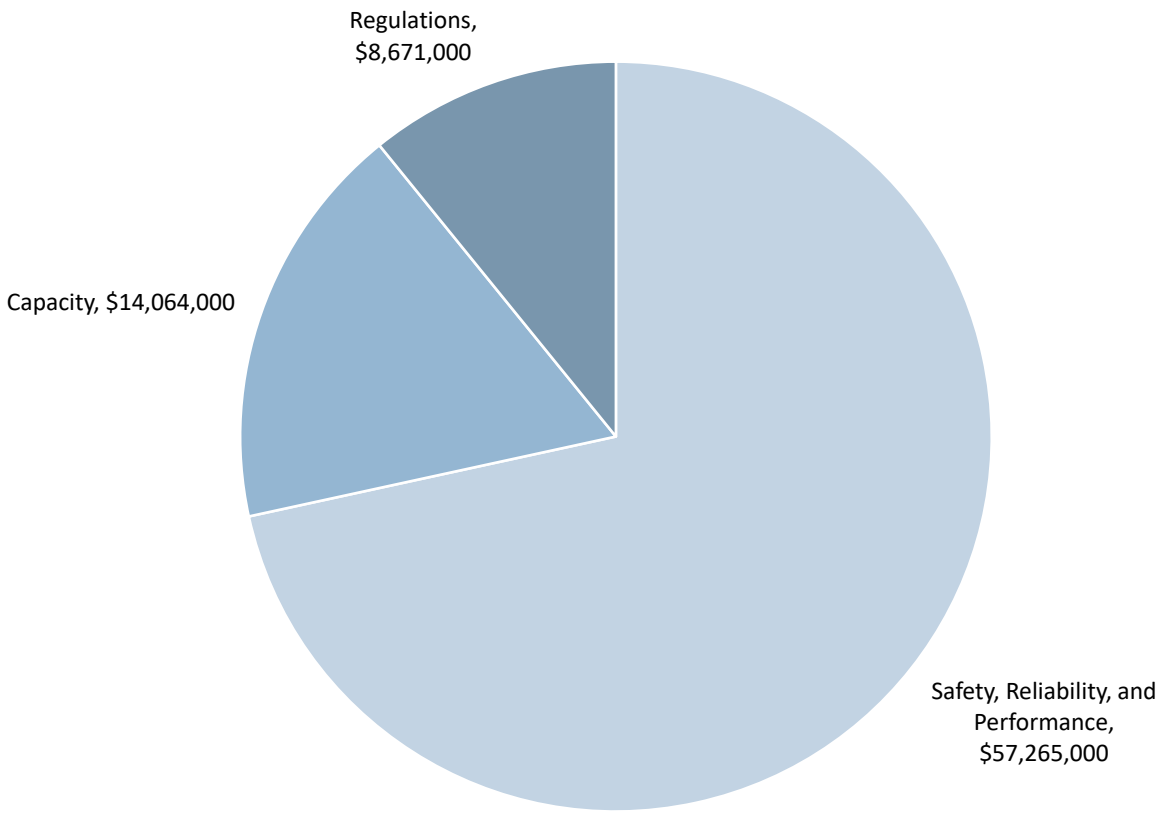


Figure 1-4 Capital Cost Distribution by Condition Category

Figure 1-4 shows that the Recommended Plan is first and foremost a capital improvement plan to address safety, reliability, and performance concerns at an aging Facility. More than 70% of the total capital cost is attributed to safety-, reliability-, and performance-related improvements. Roughly 20% of the total capital cost addresses capacity concerns for four unit processes (Preliminary Treatment, the Activated Sludge System, Disinfection, and Solids Processing) and 10% of the total capital cost is to implement a simple, reliable, and robust strategy to comply with an impending low-level effluent phosphorus limit. The low-level phosphorus strategy will also enhance the Facility's ability to comply with the current stringent daily WLA BOD limit. The Recommended Plan also includes a biosolids drying process that will produce a Class A EQ biosolids end product, eliminating the challenges inherent with the existing Class B land application program and guarding against future challenges that could significantly increase the annual cost of the current program.

The City intends to Bid the Work associated with the proposed Facility improvements in late 2019 or the first quarter of 2020. Construction is expected to require 24 months. A proposed implementation schedule is shown in Figure 1-5. In conformance with the requirements of the Wisconsin Clean Water Fund Program, reviewable plans and specifications will be submitted to the WDNR by September 30, 2019. The City recently adopted its first phased rate increase to help fund the impending Facility upgrade.

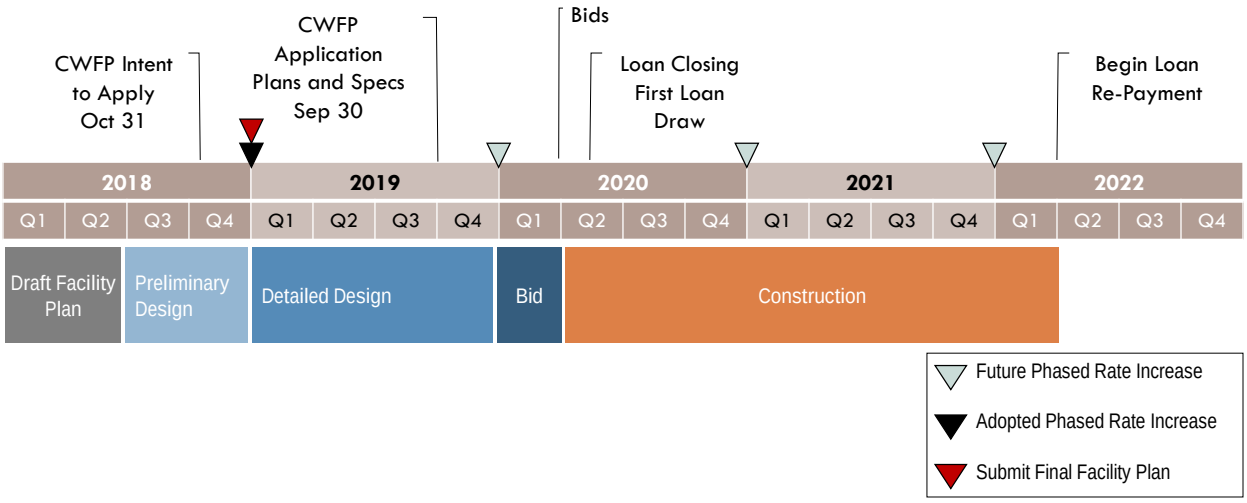


Figure 1-5 Proposed Implementation Schedule for the Recommended Plan | WWTF

2. PURPOSE

2.1 TREATMENT FACILITY

The City of Wausau, Wisconsin (City), located in Marathon County, owns, operates, and maintains the Wausau Wastewater Treatment Facility (WWTF or Facility). Figure 2-1 shows where the City of Wausau is located within the State of Wisconsin and Marathon County. The Facility treats all wastewater generated in the City of Wausau, the City of Schofield, and an industrial park in the Village of Weston. It discharges treated effluent to the Wisconsin River. This discharge is regulated or governed by a Wisconsin Pollution Discharge Elimination (WPDES) Permit. The WPDES Permit in effect during most of this Facility Planning effort is provided in Appendix A. The WPDES Permit issued in December 2018 and effective on January 1, 2019 is provided in Appendix B.

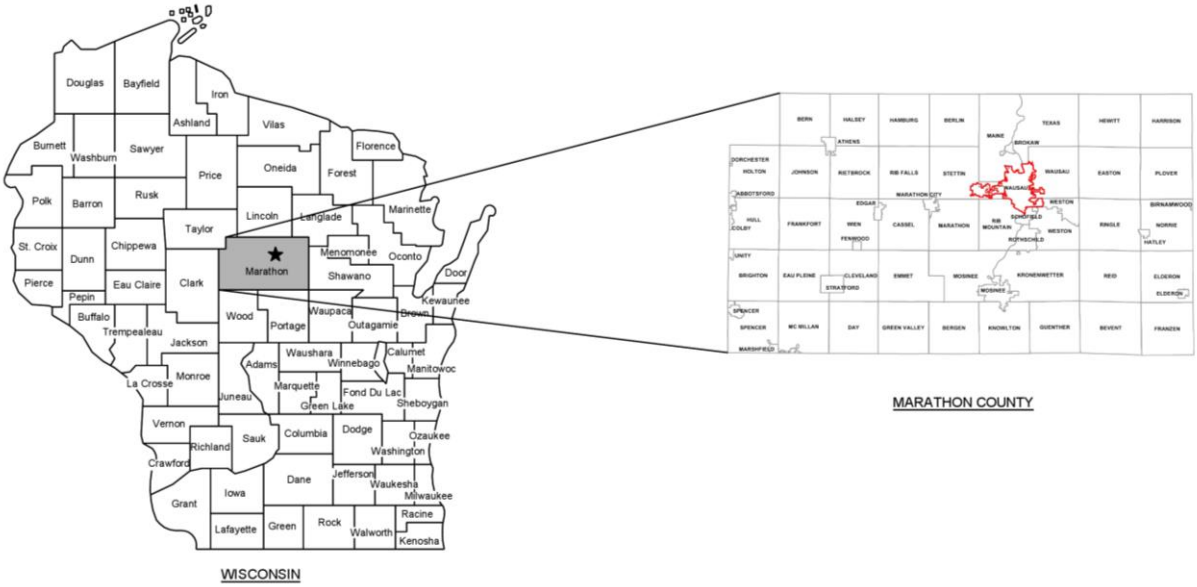


Figure 2-1 Location Map

2.2 COLLECTION SYSTEM

The City owns, operates, and maintains a wastewater collection system that conveys wastewater from the individual wastewater producers to the WWTF. The collection system includes 25 pumping stations and more than 220 miles of underground piping.

2.3 PURPOSE

This Report documents Wastewater Treatment Facility Planning. This planning effort, which was initiated in 2017, produced a comprehensive Recommended Plan (Plan): a capital improvement program to provide the City a safe, reliable, cost-effective, and Permit-compliant wastewater treatment system for the nominal 20-year planning period. The Plan addresses concerns as categorized below. The final year of the nominal 20-year planning period is Year 2040.

4. Safety, reliability, and performance
5. Capacity
6. Regulatory compliance

2.3.1 SAFETY, RELIABILITY, AND PERFORMANCE

The Recommended Plan addresses safety, reliability, and performance concerns. The Facility was constructed in three phases: Phase 1 in 1939, Phase 2 in 1967, and Phase 3 in 1988. The evolution of the Facility and the year various structures were constructed is shown in Figure 2-2. Much of the infrastructure and equipment is at least 30 years old. Infrastructure constructed as part of Phases 1 and 2 is 80 and 50 years old, respectively. A significant fraction of the equipment has reached or is rapidly approaching the end of its reliable service life and aging infrastructure needs upgrading.

The National Fire Protection Association (NFPA) has adopted an important Standard since the last major Facility upgrade. NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities outlines important design standards that guard against the unique hazards wastewater treatment and collection systems pose. The Facility, all of which was designed and constructed before NFPA 820 was adopted, does not comply with this Standard.

The Facility is well operated and maintained; however, some of the unit processes in the liquid and solids treatment trains lack adequate reliability, flexibility, redundancy, and control. These shortcomings degrade the potential performance of the Facility and jeopardize consistent, reliable compliance.

2.3.2 CAPACITY

Some Facility components lack adequate capacity today or are anticipated to lack capacity during the 20-year planning period. The Recommended Plan addresses capacity concerns.

2.3.3 REGULATORY COMPLIANCE

The Recommended Plan addresses compliance concerns. Recommendations aimed at maintaining compliance with present-day regulatory requirements are categorized as Safety, Reliability, and Performance recommendations. The Regulatory Compliance recommendations are aimed at impending regulations, namely a lower effluent phosphorus limit as defined by a Total Maximum Daily Limit (TMDL). The Wisconsin Department of Natural Resources (WDNR) and the United States Environmental Protection Agency (EPA) are developing a phosphorus TMDL for the Wisconsin River Basin. The existing WWTF cannot reliably and consistently comply with the draft phosphorus TMDL (February 2018).

Figure 2-2 Year Facility Structures Constructed

3. EXISTING CONDITIONS | TREATMENT FACILITY

3.1 SERVICE AREA

The WWTF receives and treats wastewater from the wastewater collection system service area. The service area presently includes Wausau, Schofield, and an industrial park in Weston. Figure 3-1 shows the existing service area and the Facility.

3.2 THE FACILITY

Figure 3-2 is an aerial view of the WWTF, identifying various structures. Figure 3-3 shows the boundaries of the WWTF site. Figure 3-4 is a Facility-wide process schematic that identifies each of the liquid and solids train unit processes. The unit processes are also summarized in Tables 3-1 and 3-2 below.

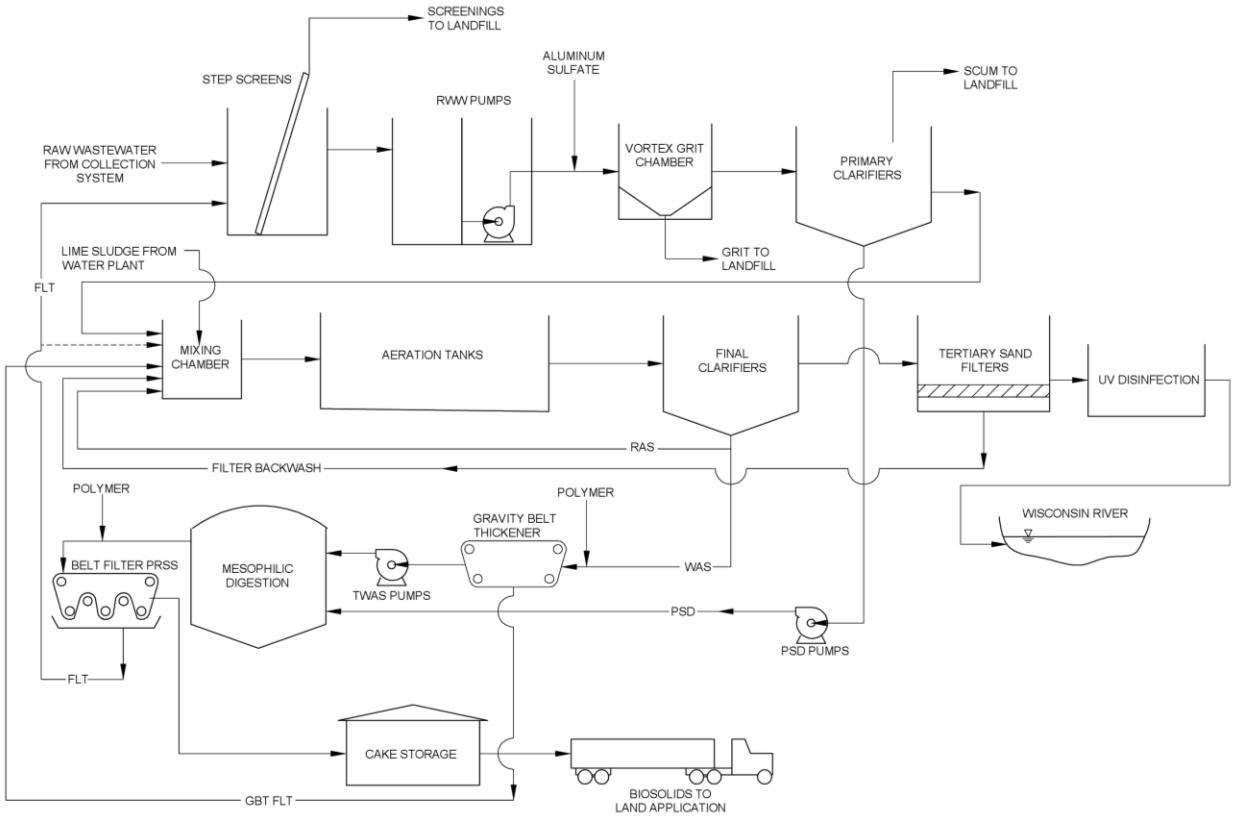
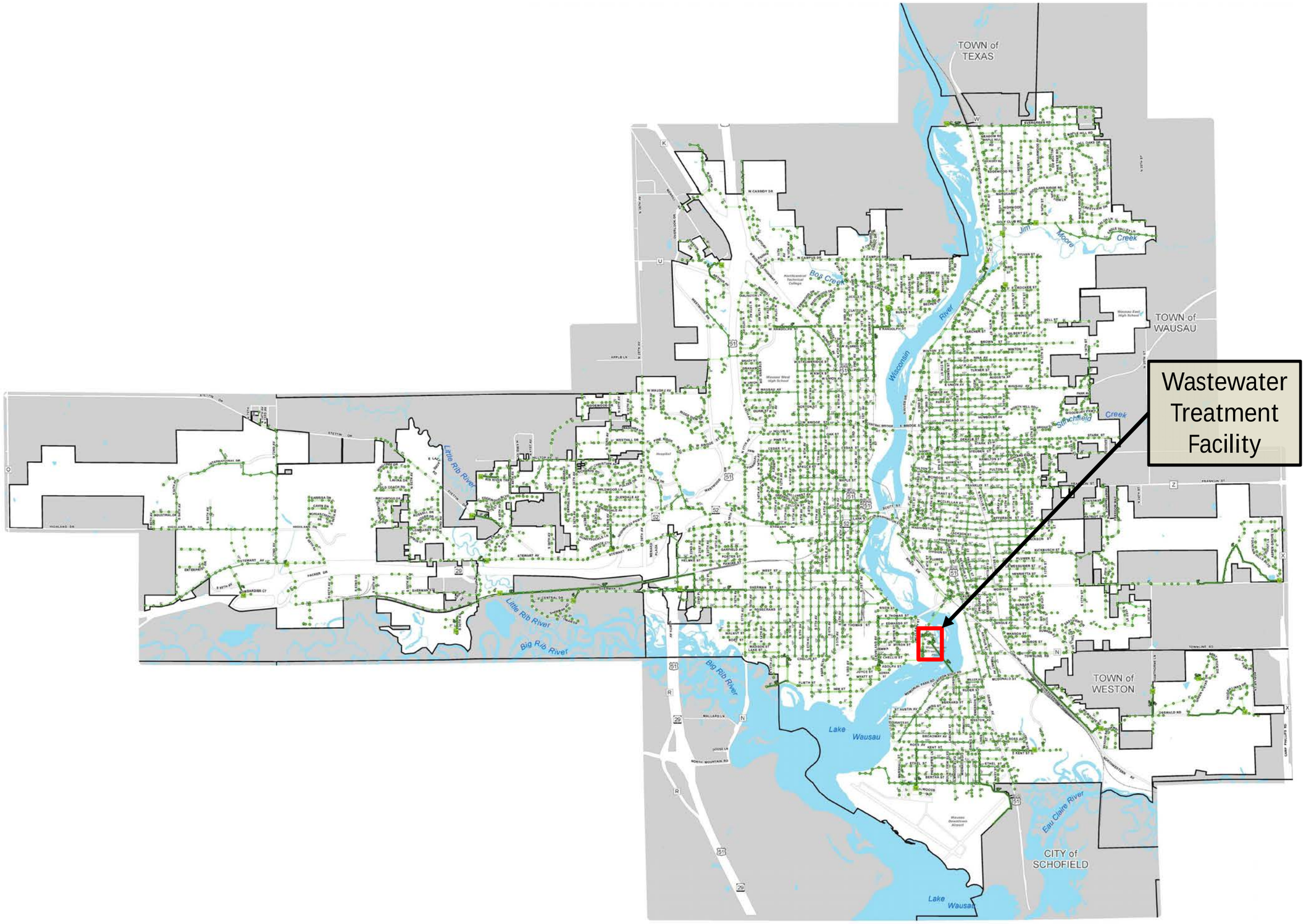


Figure 3-4 Facility Process Schematic



Source: City of Wausau

FIGURE 3-1
Sanitary Sewer Service Area

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2019

13229

DONOHUE

13229 2019

FIGURE 3-2
Treatment Facility Aerial View

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

13229 2019

FIGURE 3-3

Treatment Facility Property Boundary

2040 Wastewater Facility Plan
Wausau, WI

Table 3-1 Existing Liquid Train Processes

Unit Process
Raw Wastewater Screening
Raw Wastewater Pumping
Grit Removal and Influent Flow Measurement
Primary Settling
Activated Sludge System
Secondary Settling
Effluent Filtration
Disinfection
Chemical Phosphorus Removal

Table 3-2 Existing Solids Train Processes

Unit Process
Pre-Digestion Thickening
Anaerobic Digestion
Post-Digestion Dewatering
Biosolids Cake Storage

The Facility was constructed in three phases: Phase 1 in 1939, Phase 2 in 1967, and Phase 3 in 1988. Several minor improvements have been implemented since the most recent major upgrade in 1988: fine fine-bubble diffusers (partial reactor) and aeration blowers (2011), biogas conditioning and biogas-fueled microturbines (2011), UV disinfection (2012), influent screening (2013), digester mixing (2016), and north primary digester cover replacement (2017). Nevertheless, much of the infrastructure and equipment is at least 30 years old. Infrastructure constructed as part of Phases 1 and 2 is 80 and 50 years old, respectively. A significant fraction of the equipment has reached or is rapidly approaching the end of its reliable service life and aging infrastructure needs upgrading.

3.3 POPULATION

Service area populations are provided in Table 3-3. The service area serves the entire residential populations of Wausau and Schofield. It also serves an industrial park within the Village of Weston, but none of the Weston residential population. The Year 2020 population assumes the addition of Brokaw and Maine; however, these communities may be added to the service at a later date. Table 3-3 populations are consistent with Department of Administration (DOA) values and the Wausau Urban Area Sewer Service Area Plan 2040 (NCWRPC, May 2018).

3.4 FLOWS

Present-day flows are representative of recent historical flows measured at the WWTF from January 1, 2012 through December 31, 2016. This five-year period offers a rich data set. Historical flows are provided in Table 3-4.

Table 3-3 Existing Service Area Populations

Community	Existing	Year 2020
Wausau	40,460	40,460
Schofield	2,205	2,205
Weston	0	0
Brokaw	0	270
Maine	0	705
Total Service Area	42,665	43,640

Table 3-4 Recent Historical Flows

Flow	Flow (mgd)	Peaking Factor
Average	5.2	
Maximum Month	8.8	1.69
Maximum Week	11.1	2.14
Maximum Day	16.1	3.10
Peak Hour	21.0	4.06
Peak Instantaneous	35.8	

Wastewater flows are measured near the influent and effluent ends of the Facility. For this five-year period, daily effluent flow measurements were 15% greater than the daily influent flow measurements. The ratio of measured influent and effluent flows are shown in Figure 3-5. The influent flow meter has known configuration issues that reduce its accuracy. The values in Table 3-4 are effluent flows. Loading calculations use effluent flows.

Figure 3-6 shows the historical five-year effluent flow data, the 7-day running average used to produce the present-day maximum week flow, and the 30-day running average used to produce the present-day maximum month flow. The existing average flow is the average of this data. Figure 3-7 shows an effluent flow probability distribution.

Figure 3-8 provides historical precipitation data. The red line represents the precipitation attributed to the most severe wet-weather event during the five-year period (September 4, 2014). Figure 3-9 provides a closer look at the September 4, 2014 event and the wet conditions that preceded it. Figure 3-10 shows the raw wastewater response to the event. The peak hour flow in Figure 3-10 is the maximum flow measured during the historical five-year period (21 mgd).

The raw wastewater pumping system at the WWTF has a firm capacity of 35.8 million gallons per day (mgd). Raw wastewater flows never approached this peak instantaneous capacity during the five-year period; however, WWTF personnel recall an extreme wet-weather event many years in the past when flows approached this ultimate capacity. Pursuant to s. NR 110.15(5)(h), Wisconsin Administrative Code, the Facility is equipped with a manually-opened emergency relief outlet to prevent collection system flooding and widespread property damage during an extreme wet-weather event. The liquid treatment train downstream of primary settling is designed to convey and treat the peak hour flow rate. If collection system flows and raw wastewater pumping rates exceed the peak hour flow rate, Facility staff can open the emergency relief outlet and divert a fraction of the primary effluent to the outfall to

prevent property damage throughout the collection system. City personnel that have worked at the Facility for more than two decades recall only a single event when the emergency relief outlet was put in service to prevent flooding.

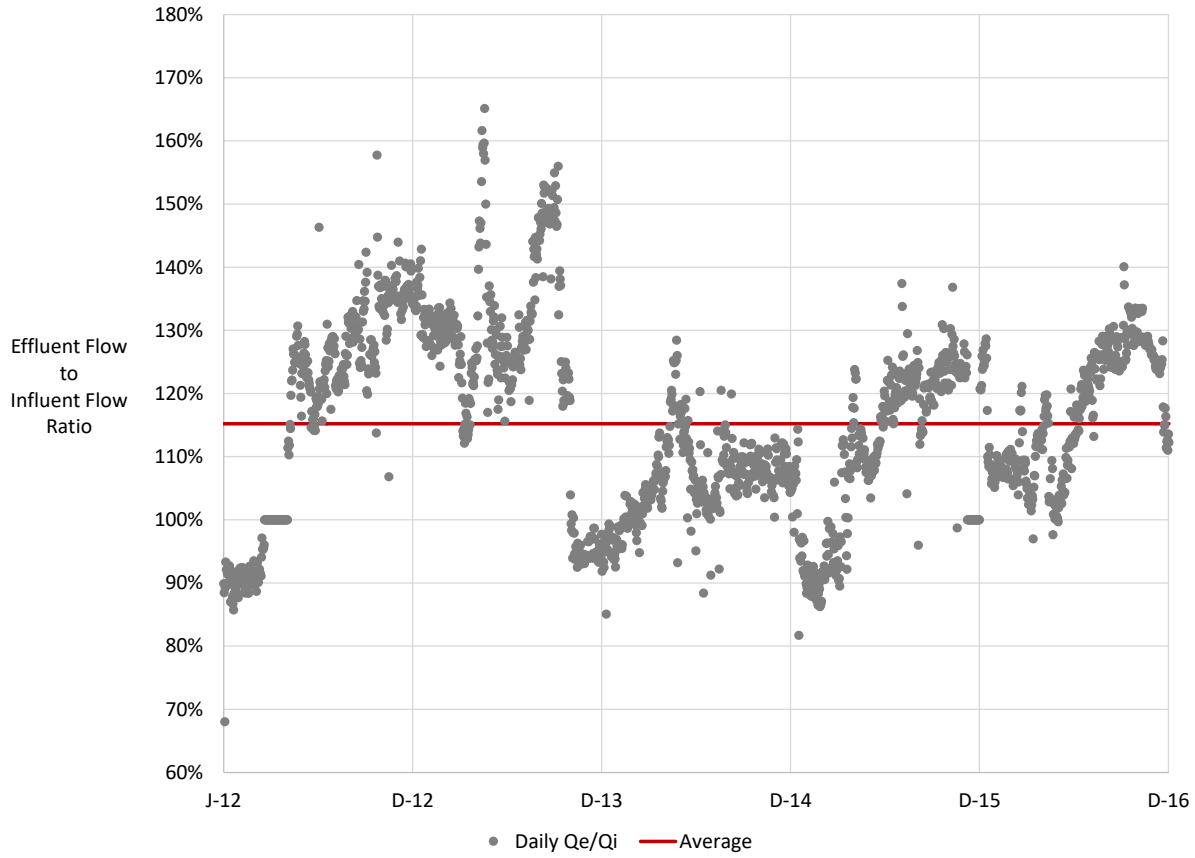


Figure 3-5 Ratio of Historical Measured Influent and Effluent Flows

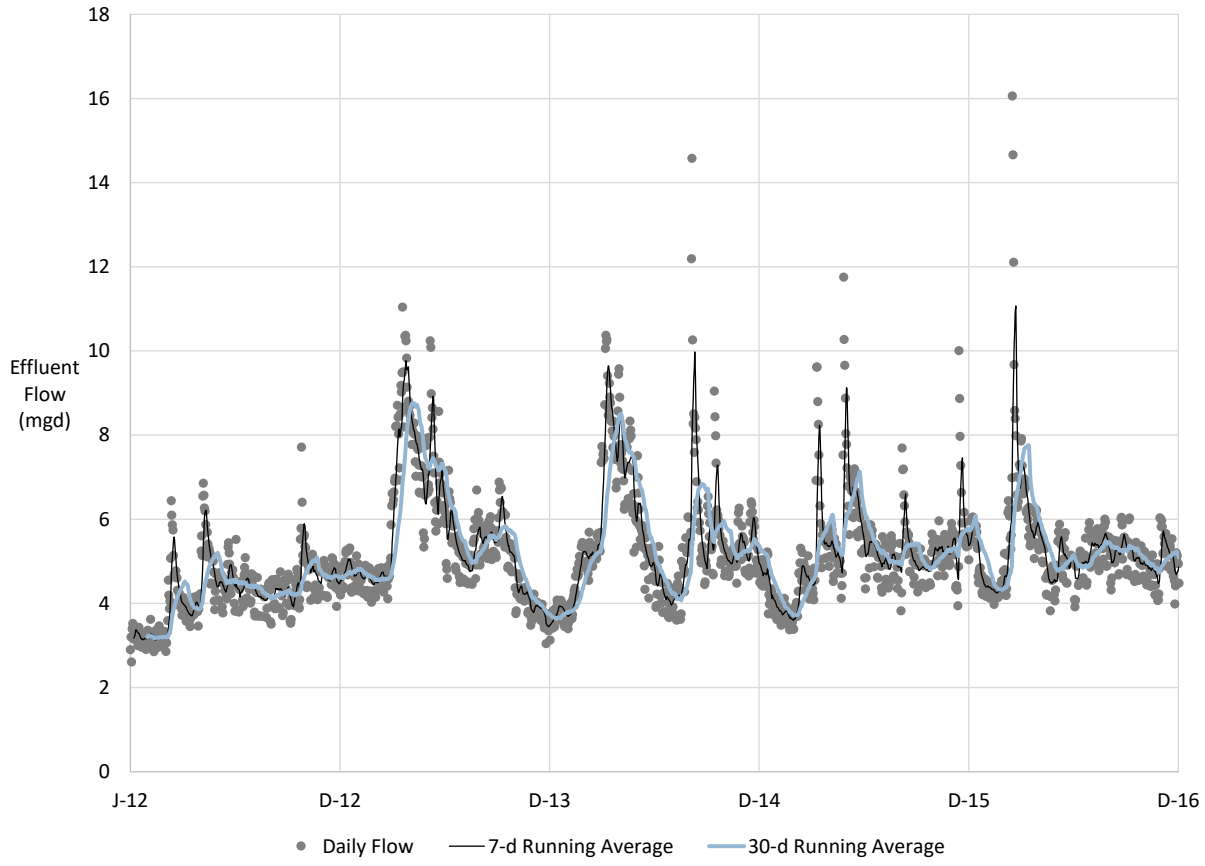


Figure 3-6 Historical Effluent Flows

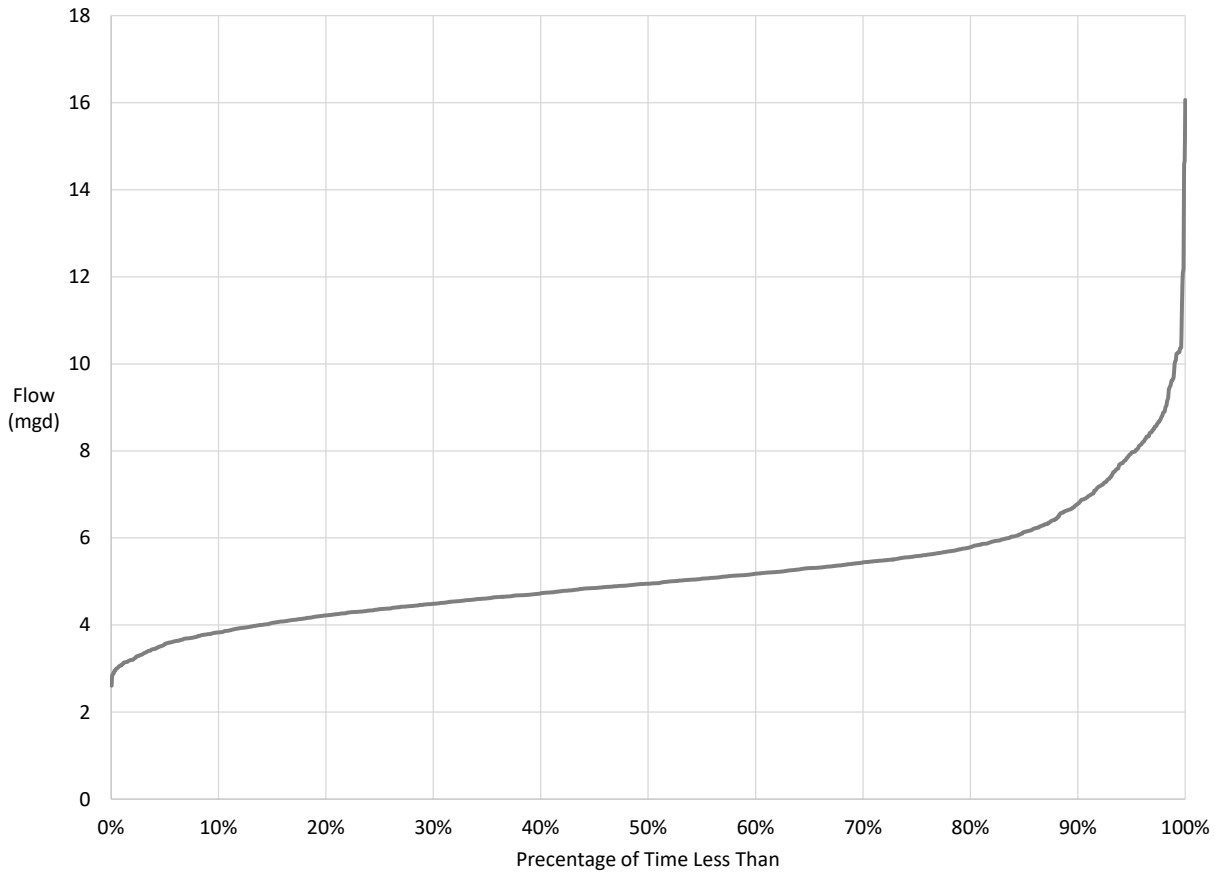


Figure 3-7 Effluent Flow Probability Distribution

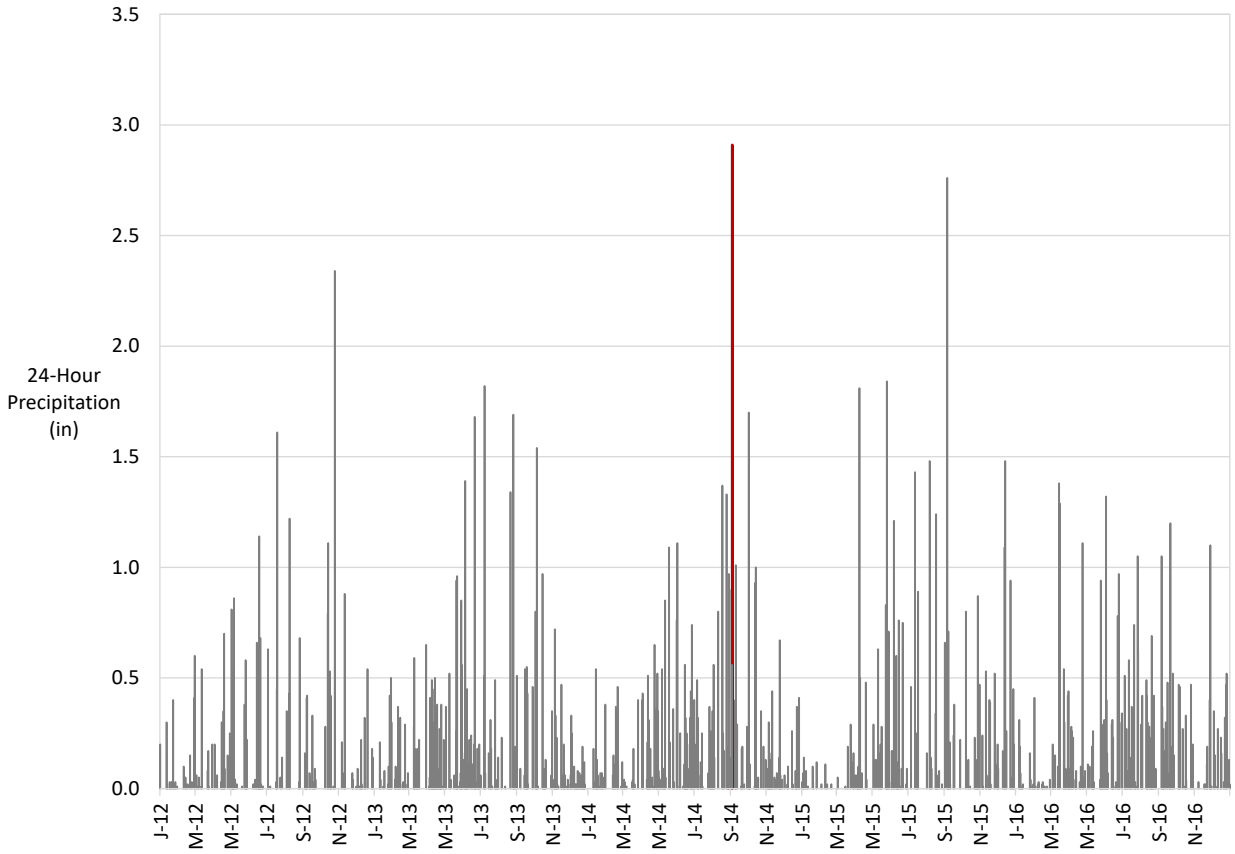


Figure 3-8 Historical Precipitation

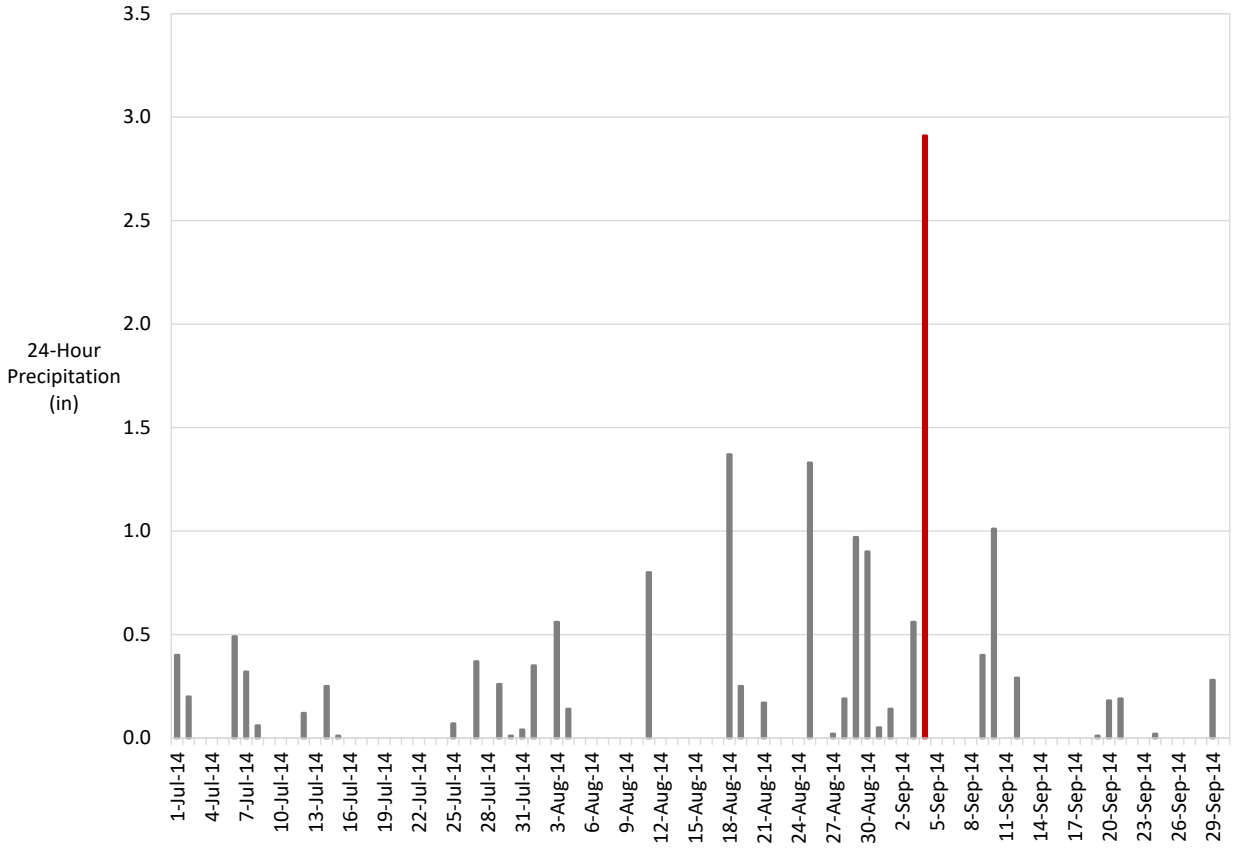


Figure 3-9 Precipitation Before, During, and After the September 4, 2014 Event

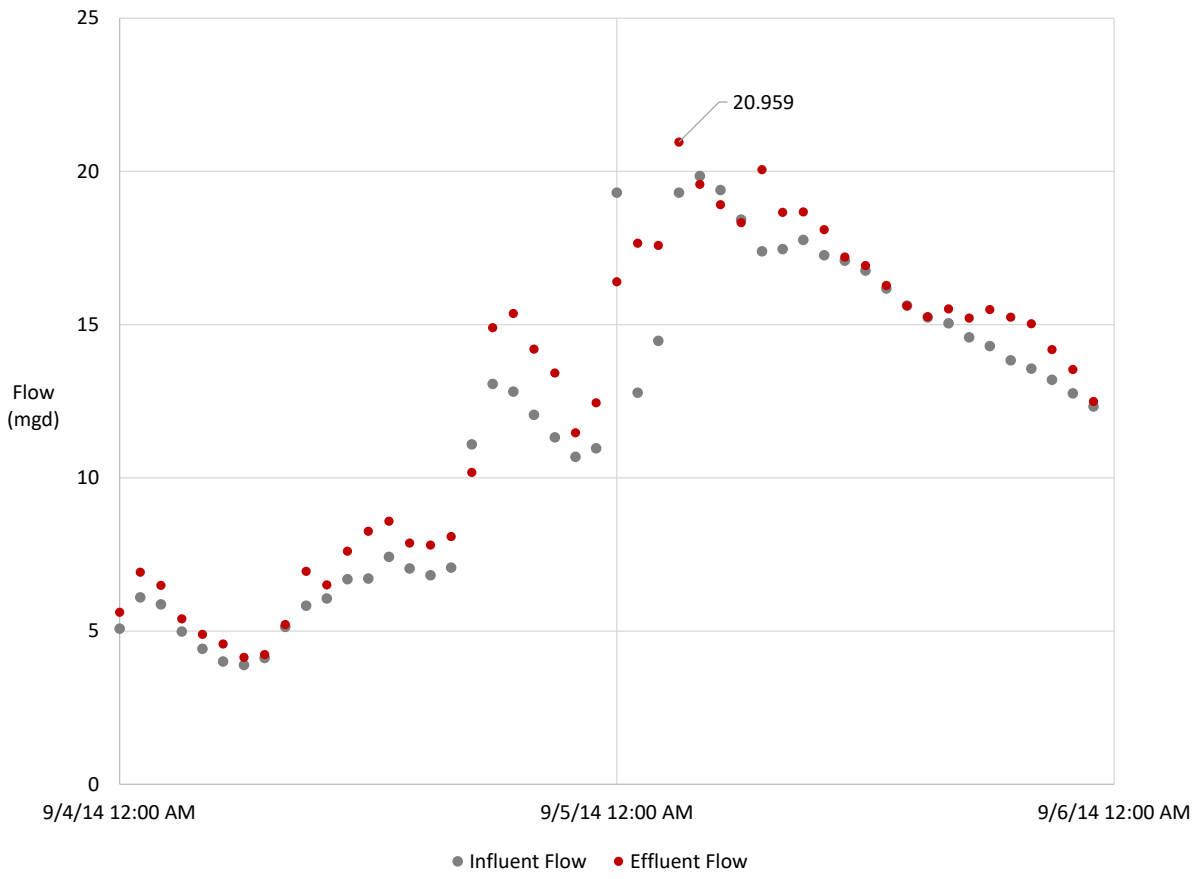


Figure 3-10 Maximum Facility Flow during the Five-Year Period (response to September 4, 2014 event)

3.4.1 INFLOW

The USEPA defines inflow to be water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins. Inflow does not include infiltration. Excessive inflow requires further investigation to determine if it can be reduced in the collection system cost effectively. Inflow is deemed excessive if the total daily flow during a storm exceeds a 275 gpcd guideline (EPA/625/6-91/030). For the present-day population (42,665), 275 gpcd equates to a 11.73 mgd guideline.

Figure 3-11 shows historical precipitation and daily flows. Industrial flows from the service area are relatively small. The flows in Figure 3-11 include the small industrial component. The inflow guideline threshold was exceeded on two occasions: August 2014 and March 2016. Figure 3-12 focuses on those two events. The August 2014 event was attributed to a 2.9-in rain event that followed nearly six inches of rain the preceding days. The March 2016 event was attributed to nearly 2.7 inches of rain. Neither of these events caused operational issues at the Facility. The Facility conveyed and treated these flows. Total daily flows attributed to all other rain events during the five-year period were less than the threshold.

Inflow exceeds the guideline; however, actions to reduce inflow should be cost effective and commensurate with the potential benefits. The City is committed to pursuing cost-effective reduction armed with several important understandings: inflow exceeded the threshold only several times in the past five years due to particularly heavy rain events (2.5 inches), the Facility conveyed and treated all flows from the last five-year period, the Facility has not violated its WPDES Permit because of these flows, and, according to long-employed City personnel, wet-weather flows have not been the sole cause of a basement backup in several decades. A subsequent Section in this Report discusses the actions the City has and will continue to take to cost-effectively reduce inflow.

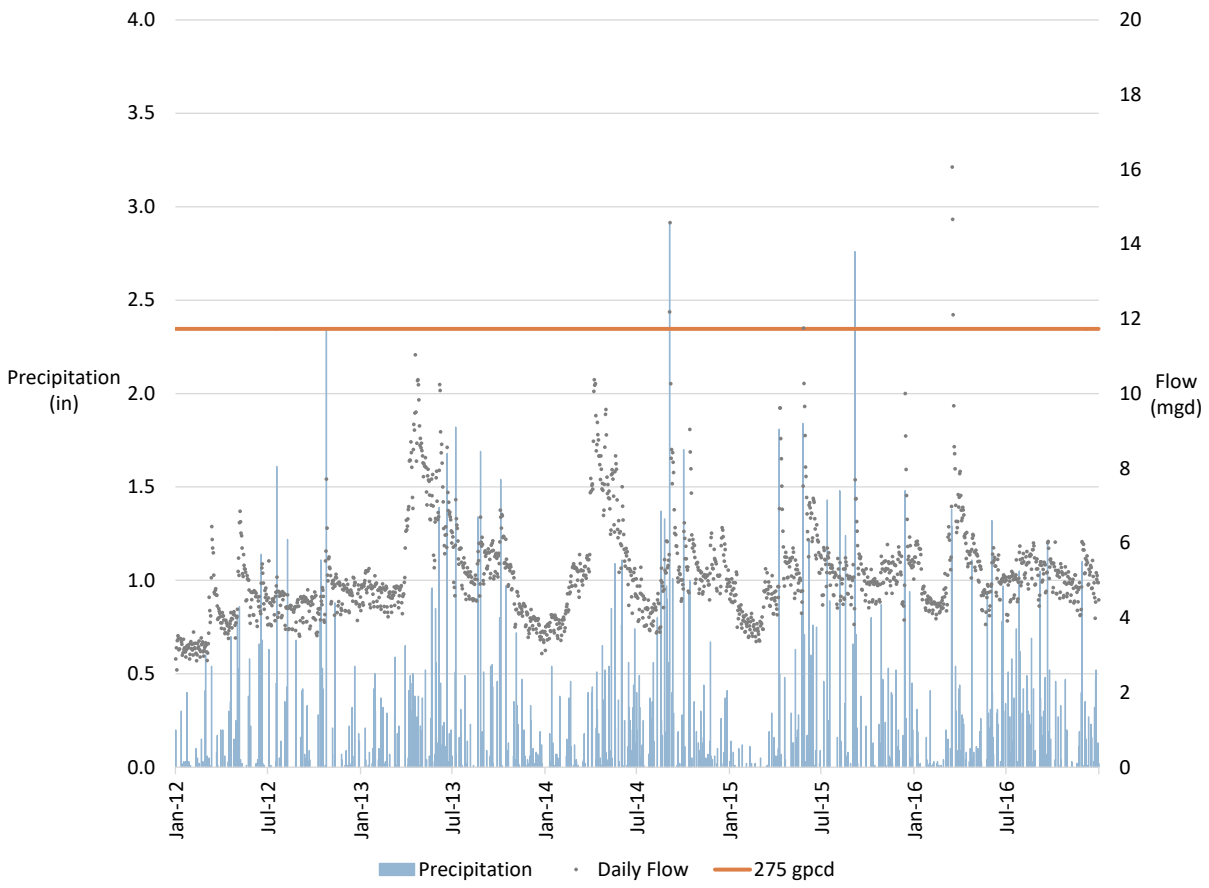


Figure 3-11 Historical Precipitation and Facility Flows

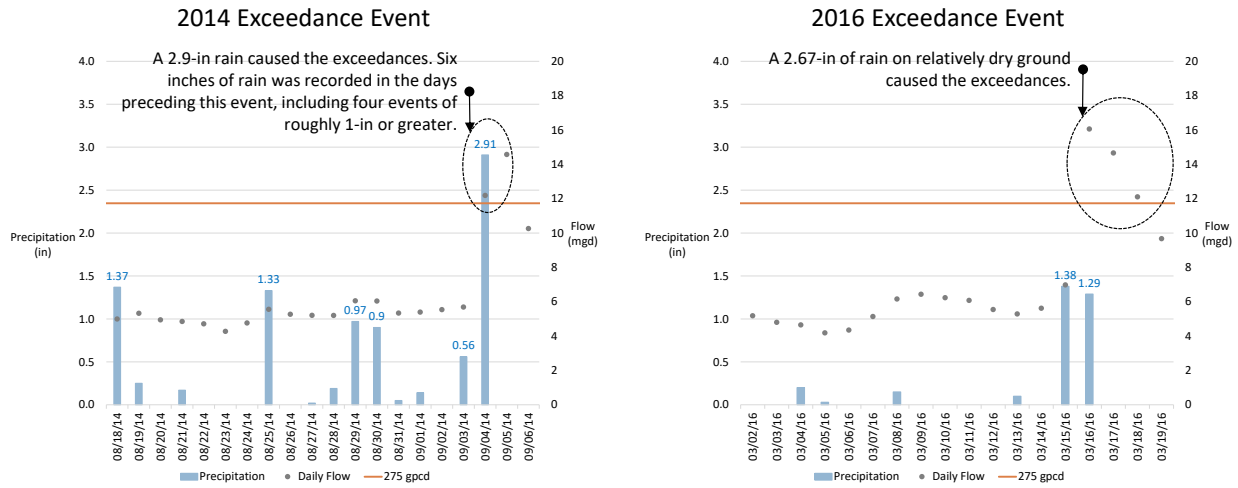


Figure 3-12 Precipitation and Facility Flows Related August 2014 and March 2016 Events

3.4.2 INFILTRATION

The USEPA defines infiltration to be water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes. Infiltration does not include inflow. Excessive infiltration requires further investigation to determine if it can be reduced in the collection system cost effectively. It is deemed non-excessive if the domestic base flow and infiltration does not significantly exceed 120 gpcd, typically in the vicinity of 130 gpcd (EPA/625/6-91/030 and ASCE/EPA Cooperative Agreement CP-828955-01-0). Comparing historical 7-14 day average dry-weather non-industrial flows to this criteria reveals if infiltration is excessive. For the present-day population (42,665), the allowable 120 – 130 gpcd range equates to 5.1 – 5.6 mgd.

Figure 3-13 shows historical precipitation and 7-dry-day average flows (the average flow from seven consecutive days without concurrent precipitation). Industrial flows from the service area are relatively small. The flows in Figure 3-13 include the small industrial component. Of the 155 data points produced during the five-year period, 25 exceeded 120 gpcd and three exceeded 130 gpcd. The average of all the 7-dry-day flows is 106 gpcd. The largest was 138 gpcd.

Infiltration marginally exceeds the guidelines. The City is committed to pursuing cost-effective reduction. A subsequent Section in this Report discusses the actions the City has and will continue to take to cost-effectively reduce infiltration.

3.4.3 INFLOW AND INFILTRATION REDUCTION

The City understands recent inflow and infiltration flows exceed USEPA guidelines. It also understands that actions to reduce these flows must be cost-effective, meaning capital spending is commensurate with flow reductions. Moreover, the wastewater industry as a whole possesses a better understanding of the costs and benefits of inflow and infiltration reduction today than when the USEPA published the inflow and infiltration guidelines several decades ago, recognizing that these thresholds often underestimate the amount of flow that can be economically conveyed in the collection system and treated at a wastewater treatment facility.

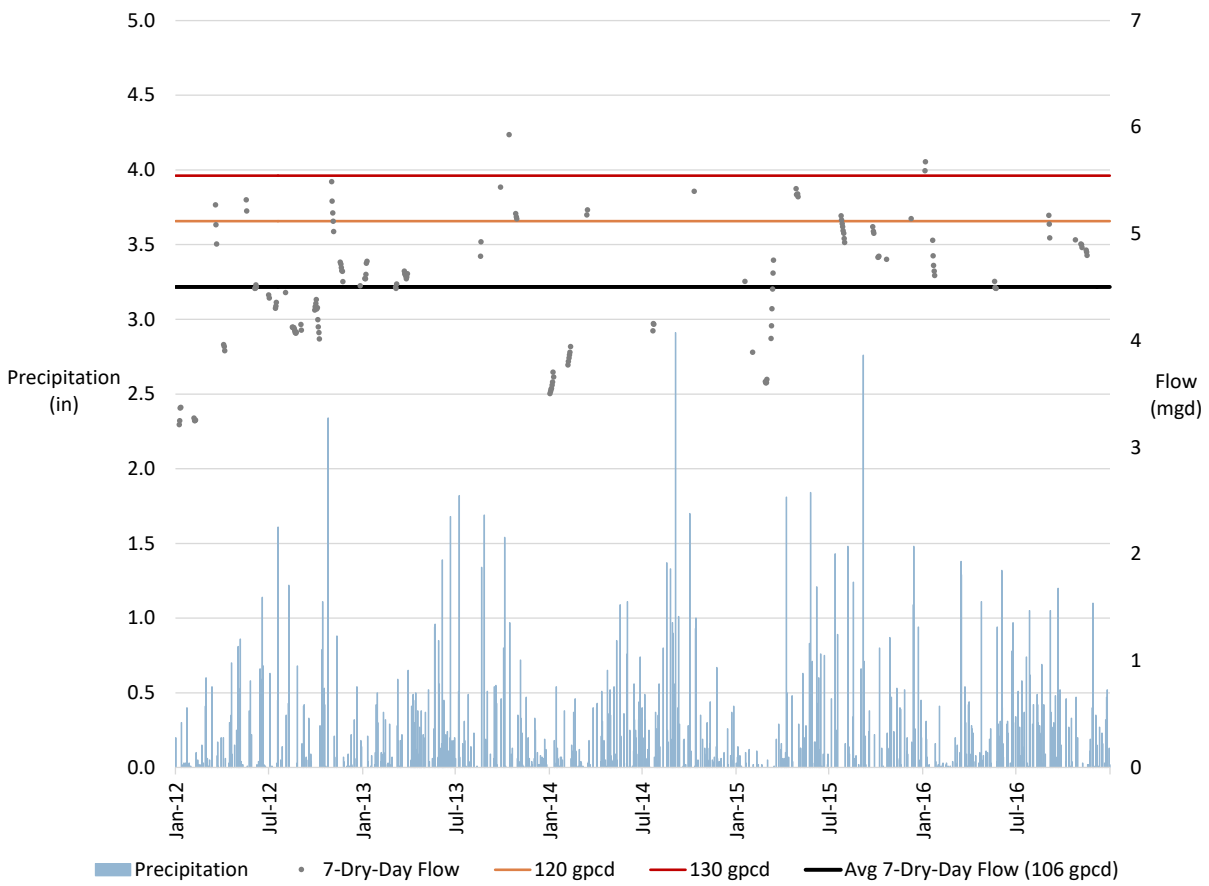


Figure 3-13 Historical Precipitation and 7-Dry-Day Facility Flows

The City has pursued and will continue to pursue inflow and infiltration reduction in a manner consistent with its Capacity, Management, Operation, and Maintenance (CMOM) program. The City has and will continue to collect wet-weather flow information, formulate cost-effective flow-reduction strategies, and implement those strategies. A brief chronology of inflow and infiltration reduction efforts is provided below.

Year	Action / Result
1981	Completed a Sewer System Evaluation Survey (SSES). The collection system consisted of approximately 740,000 ft of sewers and 3,140 manholes. Smoke testing performed on 500,000 ft of sanitary sewers. Dye testing performed on 170,000 feet of storm sewers. Identified 14 manholes where bypassing or overflows could occur.
1989	Completed corrective actions to the 14 manholes that the SSES identified as potential bypass or overflow locations.
2013	Performed inspections to confirm that previous efforts to eliminate bypasses and overflows remained effective.

2013 Performed collection system flow metering in the two large sewersheds with manholes that serve the stormwater and wastewater systems (First Street and Sherman Street). This effort identified the First Street interceptor to be a significant inflow source.

2014 Implemented Phase 1 improvements to the First Street interceptor to prevent stormflow from the wastewater collection system. Replaced a missing steel plate. Adjusted a steel plate that was no longer water tight.

2014 Reviewed Facility flows to assess the benefit of the First Street interceptor improvements. The rainfall-flow data suggested rainfalls exceeding 1.3 inches caused stormflow to rise above a 4-ft wall segregating storm and wastewater flows within the First Street interceptor.

2016 Implemented Phase 2 improvements to the First Street interceptor. Raised a concrete wall separating stormflow and wastewater flow from a 4-ft height to an 8-ft height.

2018 Reviewed pumping station flows for all days that had at least one inch of rain from 2014 through 2017. This analysis compared flows received at the WWTF and pumped volumes on the day of the rain, several days before the rain, and several days after the rain to identify excessive wet-weather flow increases and focus future inflow-reduction efforts. Several important findings are summarized below.

- The collection system downstream of all 25 pumping stations has adequate capacity to accommodate wet-weather pumping rates.
- Pumping station sewersheds, which account for 34% of the total length of collection system piping, contribute 20% of the inflow received at the WWTF.
- Because 80% of the inflow received at the WWTF enters the collection system downstream of the pumping stations, inflow-reduction efforts should, generally speaking, be focused on sewersheds that are not tributary to remote pumping stations.
- Of the 25 pumping stations, the sewersheds upstream of five stations warrant further investigation: LS5, LS7, LS10, LS19, and LS23.

3.5 LOADINGS

Present-day loadings are representative of recent historical loadings measured at the WWTF from January 1, 2012 through December 31, 2016. This five-year period offers a rich data set. Historical loadings are provided in Table 3-5. These loadings were calculated using metered effluent flow and raw wastewater concentrations.

Table 3-5 Recent Historical Loadings

Parameters	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)	Per Capita Loading (ppcd)
BOD	10,676	13,774	16,656	23,000	0.25
TSS	11,222	15,609	18,132	30,000	0.26
TKN	1,912	2,467	2,986	4,000	0.045
TP	520	670	811	1,200	0.012

The average loadings are the averages of the data sets. The BOD, TSS, TKN, and TP data is shown in Figures 3-14 through Figure 3-18. Each figure shows the historical five-year loading data, the 7-day

running averages used to produce the maximum week loadings, and the 30-day running averages used to produce the maximum month loadings. Maximum day values were defined by inspection to exclude anomalous data.

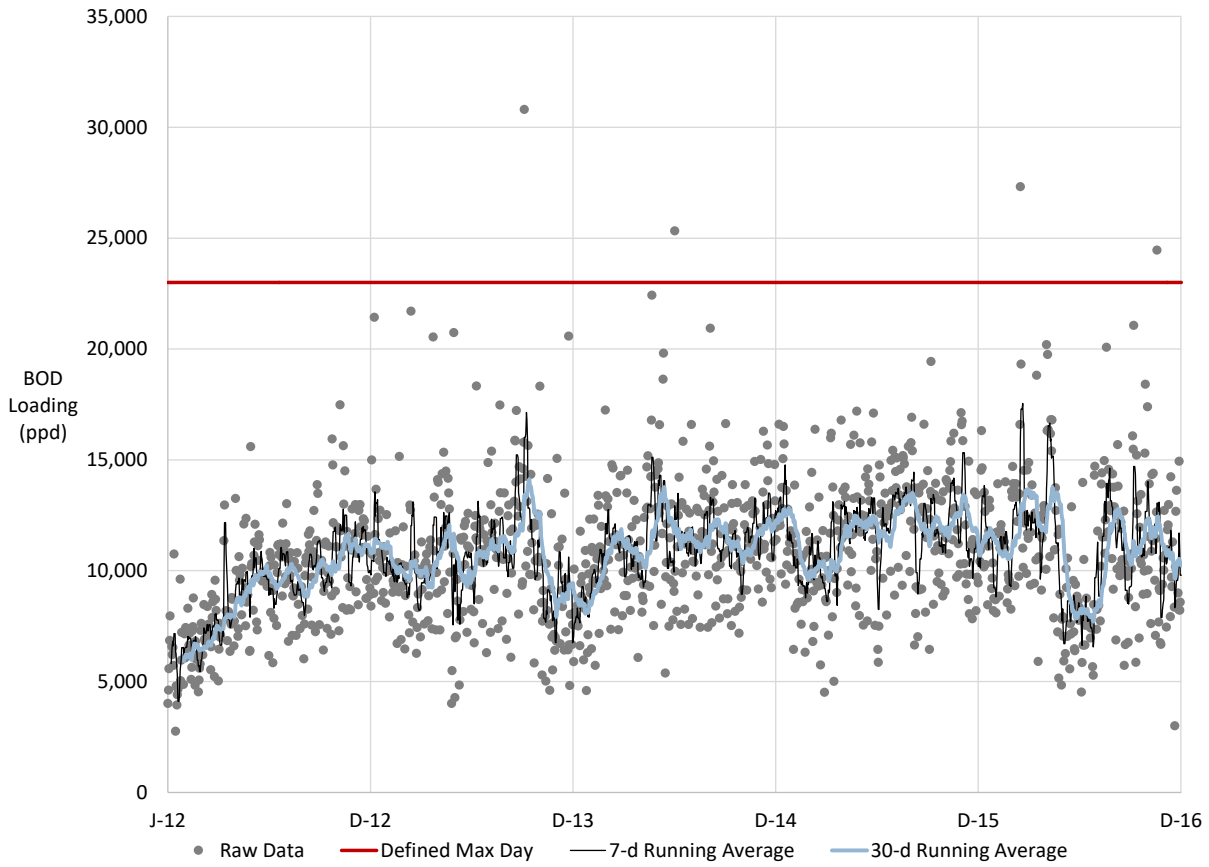


Figure 3-14 Historical BOD Loadings

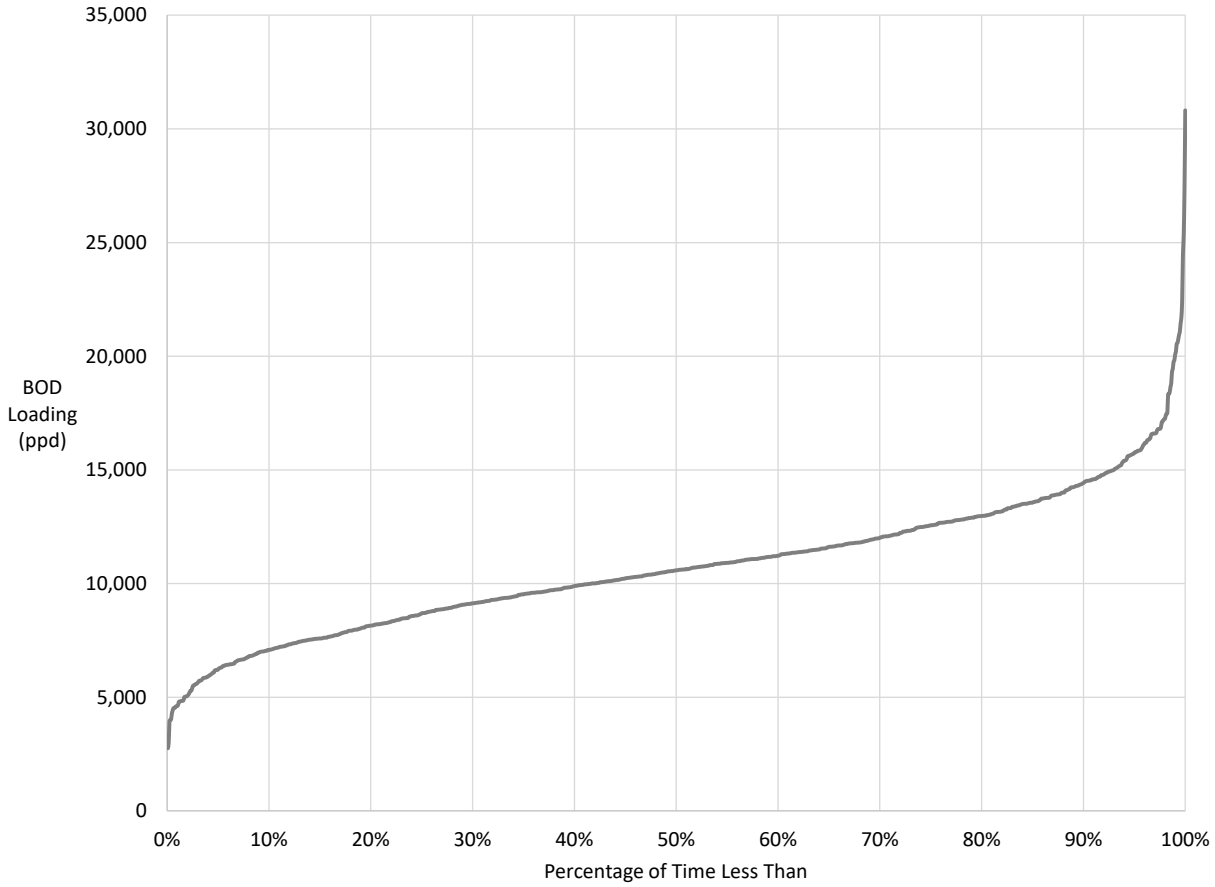


Figure 3-15 Historical BOD Probability Distribution

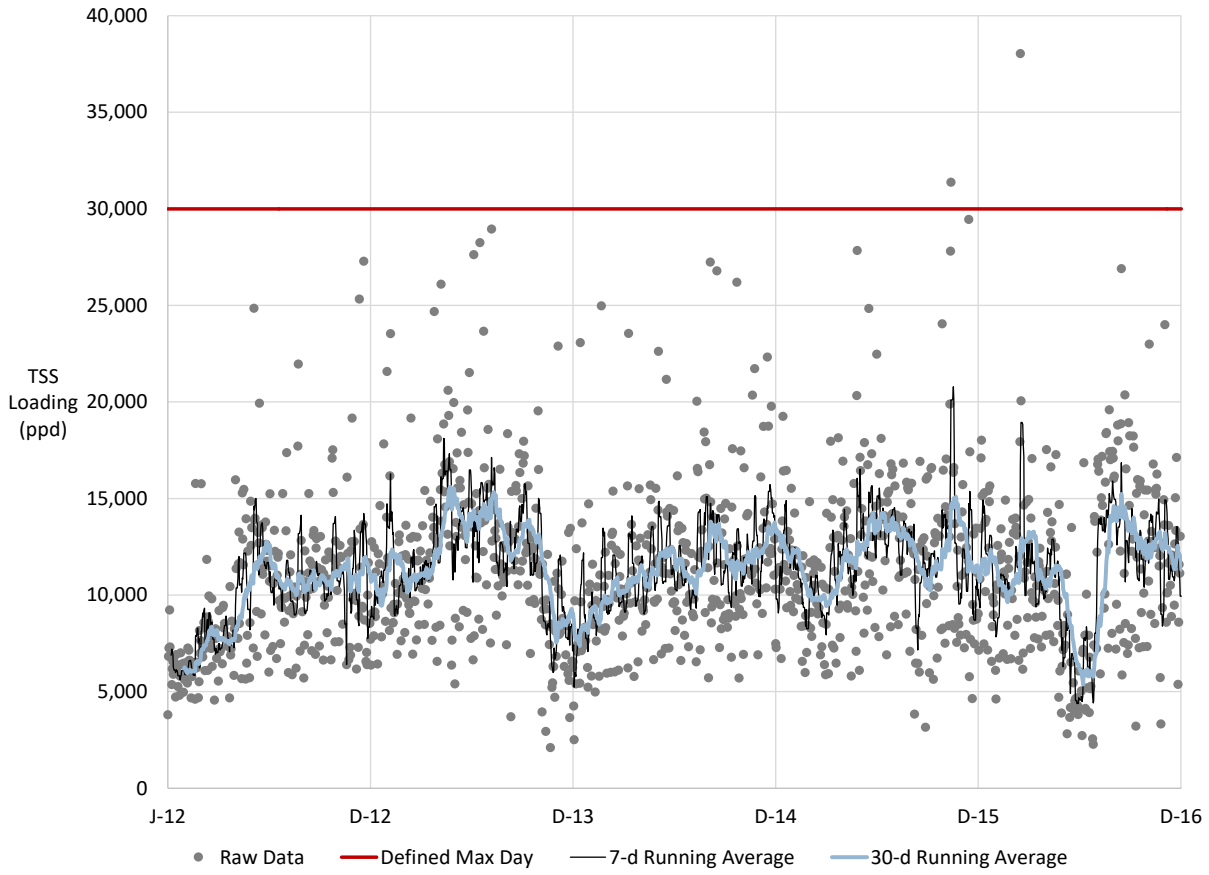


Figure 3-16 Historical TSS Loadings

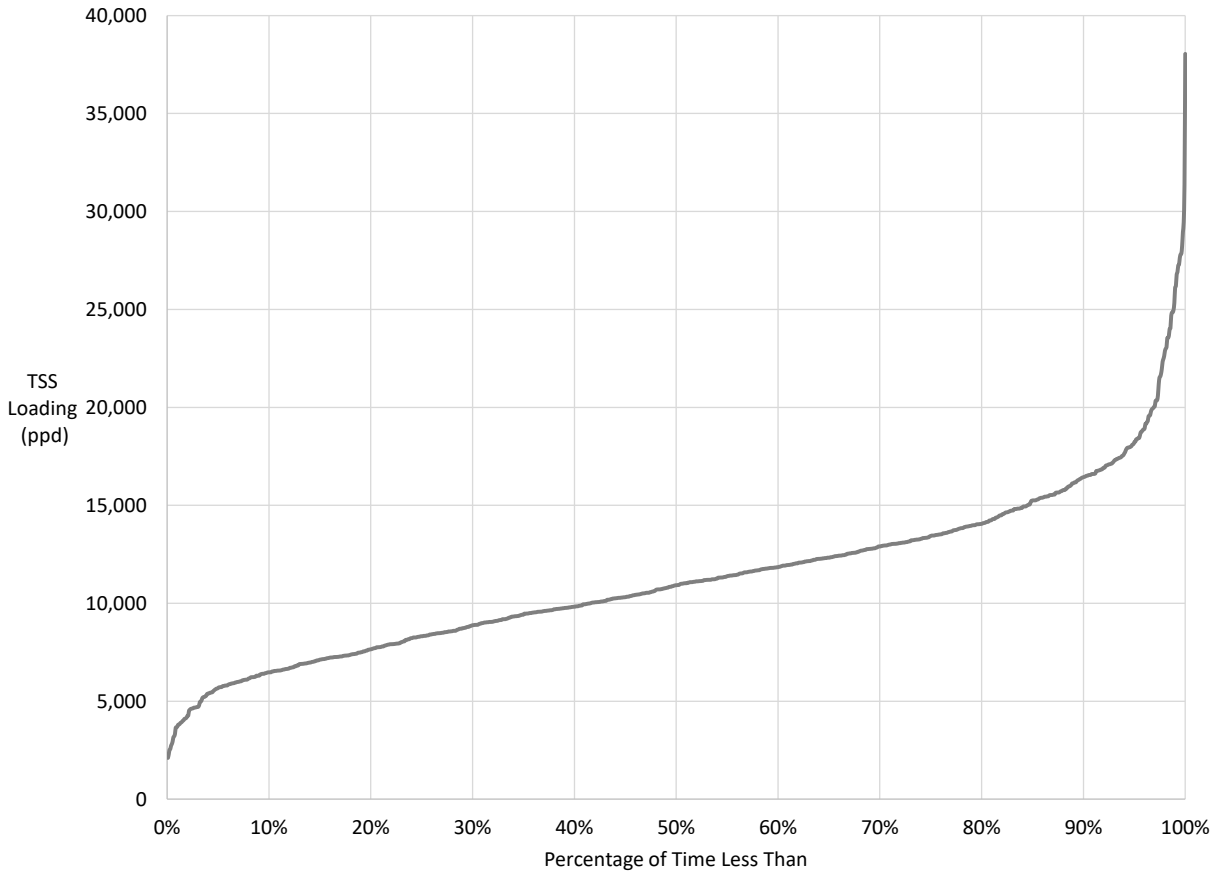


Figure 3-17A Historical TSS Probability Distribution

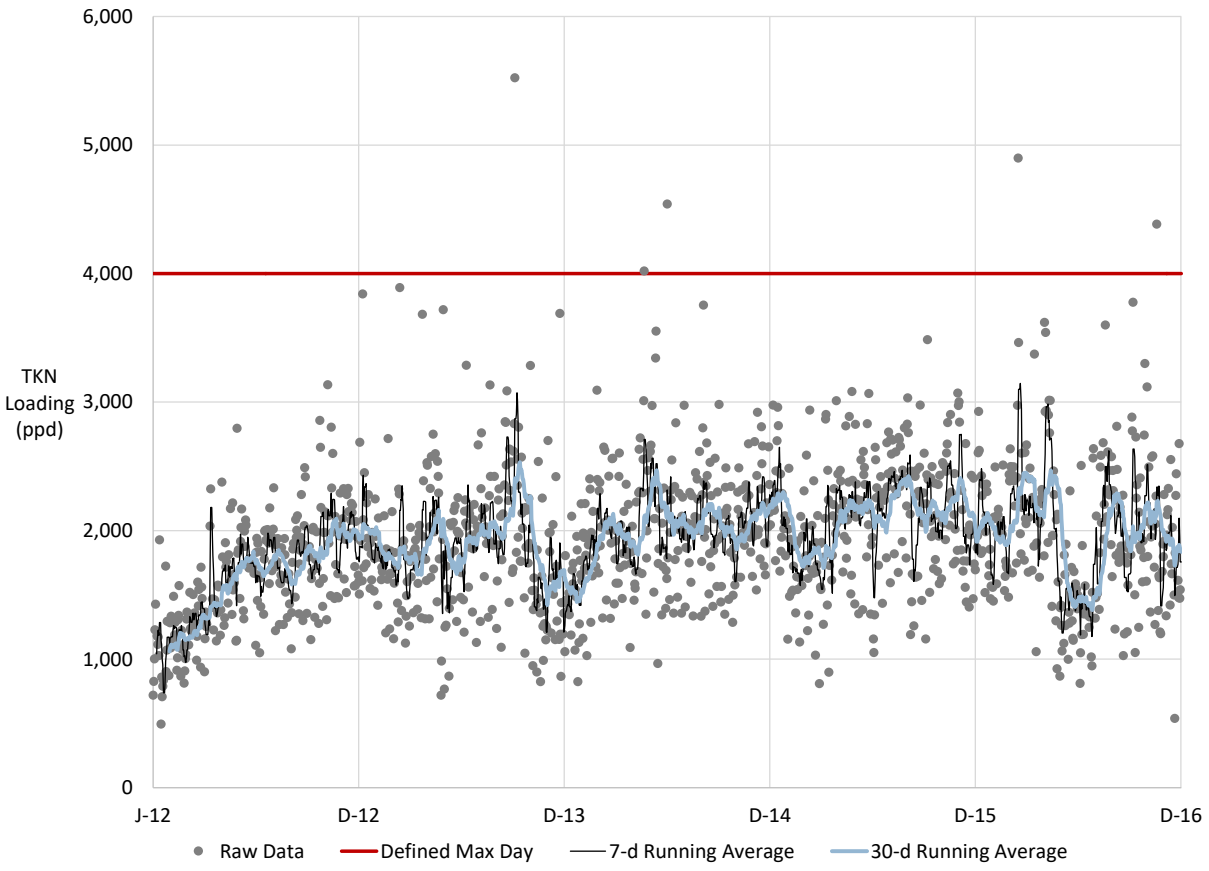


Figure 3-17B Historical TKN Loadings

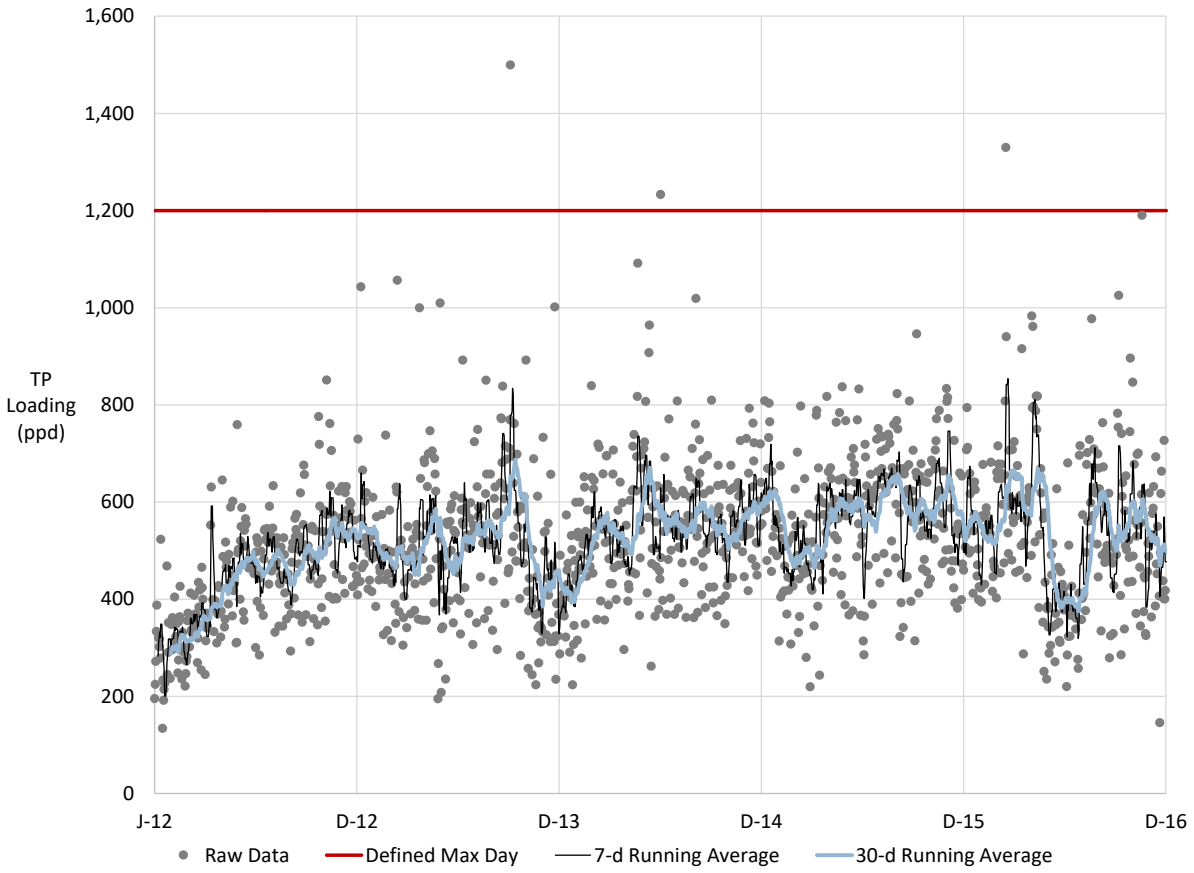


Figure 3-18 Historical TP Loadings

The Facility gathered supplemental data from July 5 through July 18, 2017. Samples were collected from several locations at the Facility: raw influent wastewater, primary effluent, secondary effluent, final effluent, filter backwash, gravity belt thickener filtrate, and belt filter press filtrate. A summary of this data is provided in Appendix C.

Historically, the Facility did not routinely sample and test for influent phosphorus and nitrogen concentrations. The TKN and TP values shown in Figures 3-17 and 3-18, respectively, includes estimated values based on raw wastewater BOD concentrations and P:BOD and TKN:BOD ratios from the July 5 – July 18, 2017. The P:BOD ratio was 0.049 and the TKN:BOD ratio was 0.18. These values align with typical domestic wastewater values.

3.6 SOLIDS PRODUCTION

The Facility measures solids production; however, like many WWTFs, it lacks the means to measure solids with a high degree of accuracy. Considering the shortcomings of the limited historical solids data set, solids production values were estimated using the five-year historical loading data and a mass balance model of the Facility. Present-day solids production values are provided in Table 3-6.

Table 3-6 Present-Day Solids Production Values

Parameters	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)
Primary Sludge	8,422	11,581	10,755	11,880
Waste Activated Sludge	6,555	8,554	11,690	11,690
Total Raw Sludge	14,977	20,135	22,446	23,571
Digested Sludge	9,857	13,881	16,441	17,160

3.7 PERMIT

The Facility is governed by WPDES Permit WI-0025739-08 until it expires on January 1, 2019. After that, the Facility will be governed by WPDES Permit WI-0025739-09 until December 31, 2023. Effluent limits in WI-0025739-08 are summarized in Table 3-7. Effluent limits in WI-0025739-09 are summarized in Table 3-8. Shading in Table 3-8 denotes limits that changed since Permit WI-0025739-08.

3.7.1 BOD WLA

From May – October the BOD limit is based on a Waste Load Allocation (WLA) that establishes BOD mass limits as a function of the Wisconsin River flow and temperature. In general, the BOD mass limit decreases as Wisconsin River flow decreases or temperature increases. A cold, high-flow river can accept more BOD than a warm, low-flow river.

The WLA establishes mass limits. Treatment facilities are generally designed and operated to meet a concentration objective. Figure 3-19 shows the maximum allowable effluent BOD concentration as a function of effluent flow when the flow in the Wisconsin River is relatively low and the Wisconsin River temperature is relatively high. These BOD concentrations were calculated using the WLA mass limits in the Permit and historical Wisconsin River flow-temperature conditions (2012 – 2016). Facility flows exceeding 12 mgd may require effluent BOD concentrations below 10 mg/L. This situation demands a well configured and operated activated sludge system (aeration basins, secondary settling basins, and sidestream controls). It also warrants a properly sized, high-performing effluent filtration system.

Table 3-7 Effluent Limits in WPDES Permit WI-0025739-08

Parameter	Limit Type	Limit	Units
BOD	Monthly Average	30	mg/L
BOD	Weekly Average	45	mg/L
WLA BOD	Daily Maximum	Variable May – Oct	ppd
TSS	Monthly Average	30	mg/L
TSS	Weekly Average	45	mg/L
TP	Monthly Average	1.0	mg/L
pH Field	Daily Maximum	9.0	su
pH Field	Daily Minimum	6.0	su
Fecal Coliform	Geometric Mean - Weekly	400 May – Sep	#/100 mL
Mercury	Daily Maximum	32	ng/L

Table 3-8 Effluent Limits in WPDES Permit WI-0025739-09

Parameter	Limit Type	Limit	Units	
BOD	Monthly Average	30	mg/L	
BOD	Weekly Average	45	mg/L	
WLA BOD	Daily Maximum	Variable May – Oct	ppd	
TSS	Monthly Average	30	mg/L	
TSS	Weekly Average	45	mg/L	
TP	Monthly Average	1.0	mg/L	Interim Limit
pH Field	Daily Maximum	9.0	su	
pH Field	Daily Minimum	6.0	su	
Fecal Coliform	Geometric Mean – Monthly May – Sep	400	#/100 mL	
Fecal Coliform	Geometric Mean – Weekly May – Sep	656	#/100 mL	
Mercury	Daily Maximum	3.8	ug/L	

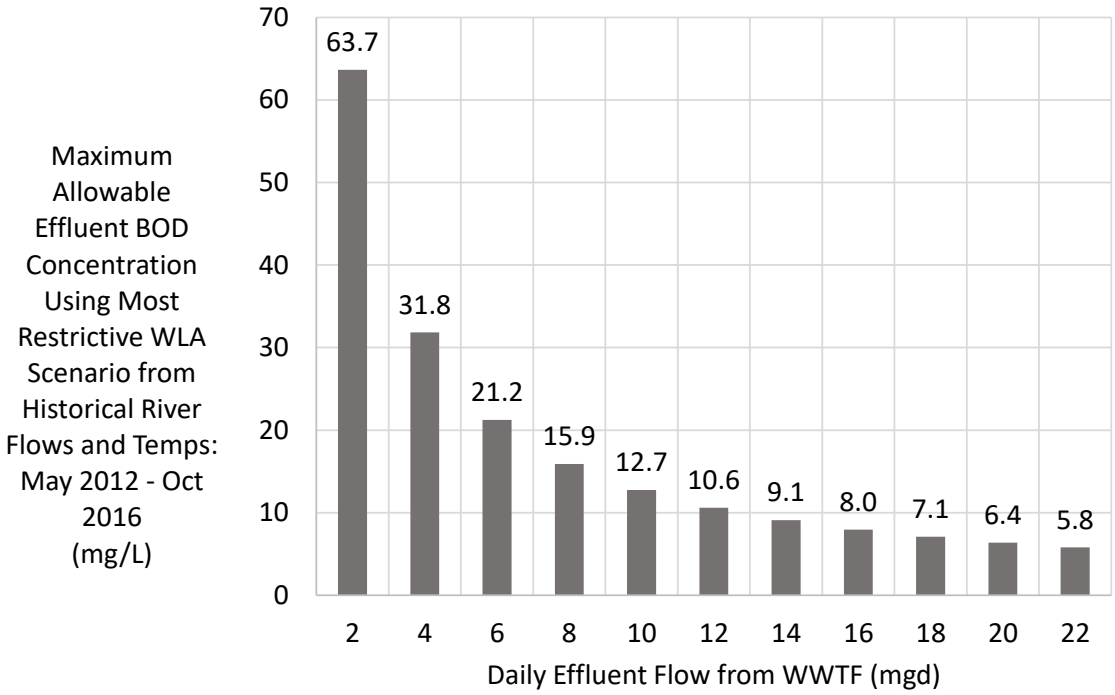


Figure 3-19 Maximum Allowable Effluent BOD Concentrations for Historical WLA Scenarios

3.7.2 PHOSPHORUS TMDL

The WDNR is expected to provide a future effluent TP limit in a future Permit consistent with the Total Maximum Daily Load (TMDL) for the Wisconsin River. In late February 2018, the WDNR released the DRAFT report titled Total Maximum Daily Load for Total Phosphorus in the Wisconsin River Basin (February 2018, WDNR). This report included two TMDL scenarios: one in Appendix J-2 of that report, one in Appendix K-2 of that report. The annual TP wasteload allocations in Appendix J-2 were established using broad statewide water quality criteria. The annual TP wasteload allocations in Appendix K-2 were established using site specific water quality criteria. Appendix K-2 allocations are larger and less restrictive than those in Appendix J-2. At anticipated annual average effluent flows, WLAs would require annual effluent TP concentrations in the vicinity of 0.2 to 0.4 mg-TP/L for the Appendix J-2 and K-2 methodologies, respectively. Either limit is readily achievable with a properly sized, high-performing effluent filtration system. The exact concentration requirements will be better understood as the WDNR communicates how the TMDL will be incorporated in Permits. Figure 3-20 shows allowable TP concentrations for the two TMDL scenarios as a function of annual average effluent flows.

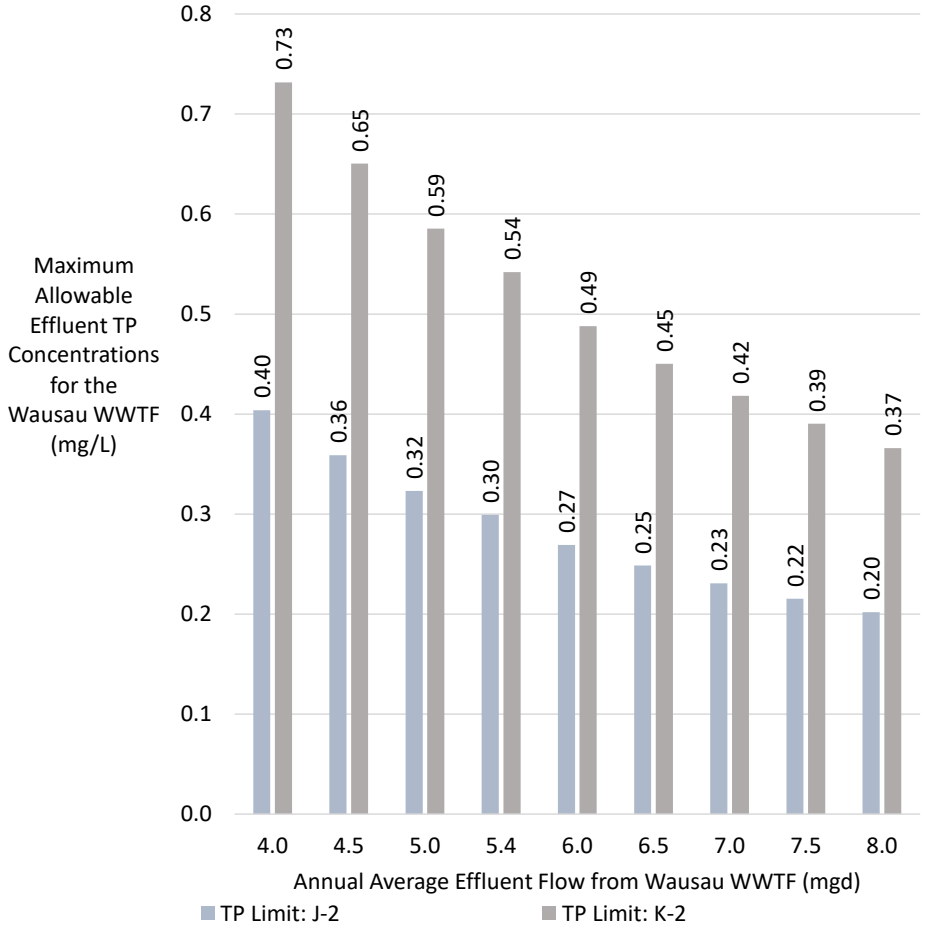


Figure 3-20 Effluent TP Concentration Requirements Associated with Potential TMDL Scenarios

3.8 PERFORMANCE

The primary purpose of the WWTF is to produce permit-compliant effluent and protect the Wisconsin River. This Section documents historical effluent performance relative to the effluent limits in the WPDES Permit.

3.8.1 BOD

The WPDES Permit includes three 5-day biochemical oxygen demand effluent limits: monthly average limit = 30 mg-BOD/L, weekly average limit = 45 mg-BOD/L, and a warm-weather daily maximum limit (WLA) based on River flow and temperature. High-performing activated sludge systems, particularly those with effluent filtration, consistently produce effluent BOD concentrations below 10 mg-BOD/L.

Figure 3-21 shows the calendar monthly average values produced and reported by the Facility during the five-year period. The calendar monthly average limit (30 mg-BOD/L) was exceeded one time and exceeded 25 mg-BOD/L six times. Figure 3-22 shows a running 30-day average of the effluent BOD data relative to the 30 mg-BOD/L limit, ignoring the calendar months and revealing the average effluent BOD concentration for all historical 30-day periods. This presentation reveals the potential for Permit violations. Several historical periods exceeded 30 mg-BOD/L.

Figure 3-23 shows a running 7-day average of the effluent BOD data relative to the 45 mg-BOD/L limit, ignoring the calendar weeks and revealing the average effluent BOD concentration for all historical 7-day periods. This presentation reveals the potential for Permit violations. None of the historical periods exceeded 45 mg-BOD/L.

Figure 3-24 shows effluent BOD data relative to the actual warm-weather WLA limits for each of the five historical warm-weather periods. Effluent BOD loadings exceeded or were perilously close to the WLA limit on approximately 30 occasions. Figure 3-25 shows effluent BOD data relative to the minimum possible WLA limit, revealing the potential for violations. Effluent BOD loadings exceeded the minimum WLA limit on 90 occasions.

3.8.2 TSS

The WPDES Permit includes two total suspended solids effluent limits: monthly average limit = 30 mg-TSS/L and weekly average limit = 45 mg-TSS/L. High-performing activated sludge systems, particularly those with effluent filtration, consistently produce effluent TSS concentrations below 10 mg-TSS/L.

Figure 3-26 shows the calendar monthly average values produced and reported by the Facility during the five-year period. All effluent concentrations are below the monthly average limit. Figure 3-27 shows a running 30-day average of the effluent TSS data relative to the 30 mg-TSS/L limit, ignoring the calendar months and revealing the average effluent TSS concentration for all historical 30-day periods. This presentation reveals the potential for Permit violations. All 30-day averages were less than the Permit limit.

Figure 3-28 shows a running 7-day average of the effluent TSS data relative to the 45 mg-TSS/L limit, ignoring the calendar weeks and revealing the average effluent TSS concentration for all historical 7-day periods. This presentation reveals the potential for Permit violations. None of the historical periods exceeded 45 mg-BOD/L and the Facility would not have exceeded this Permit limit for any calendar week scenario.

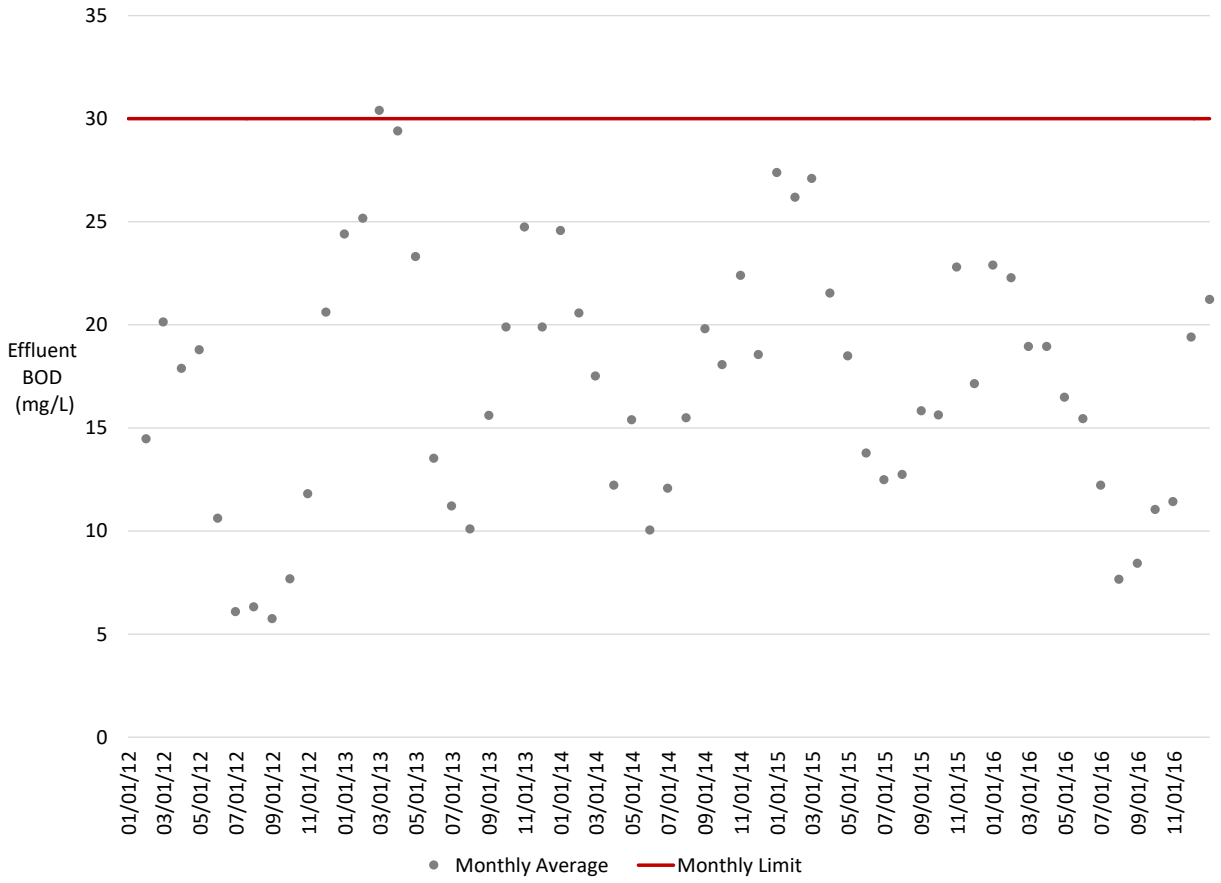


Figure 3-21 Historical Monthly Average Effluent BOD Concentration

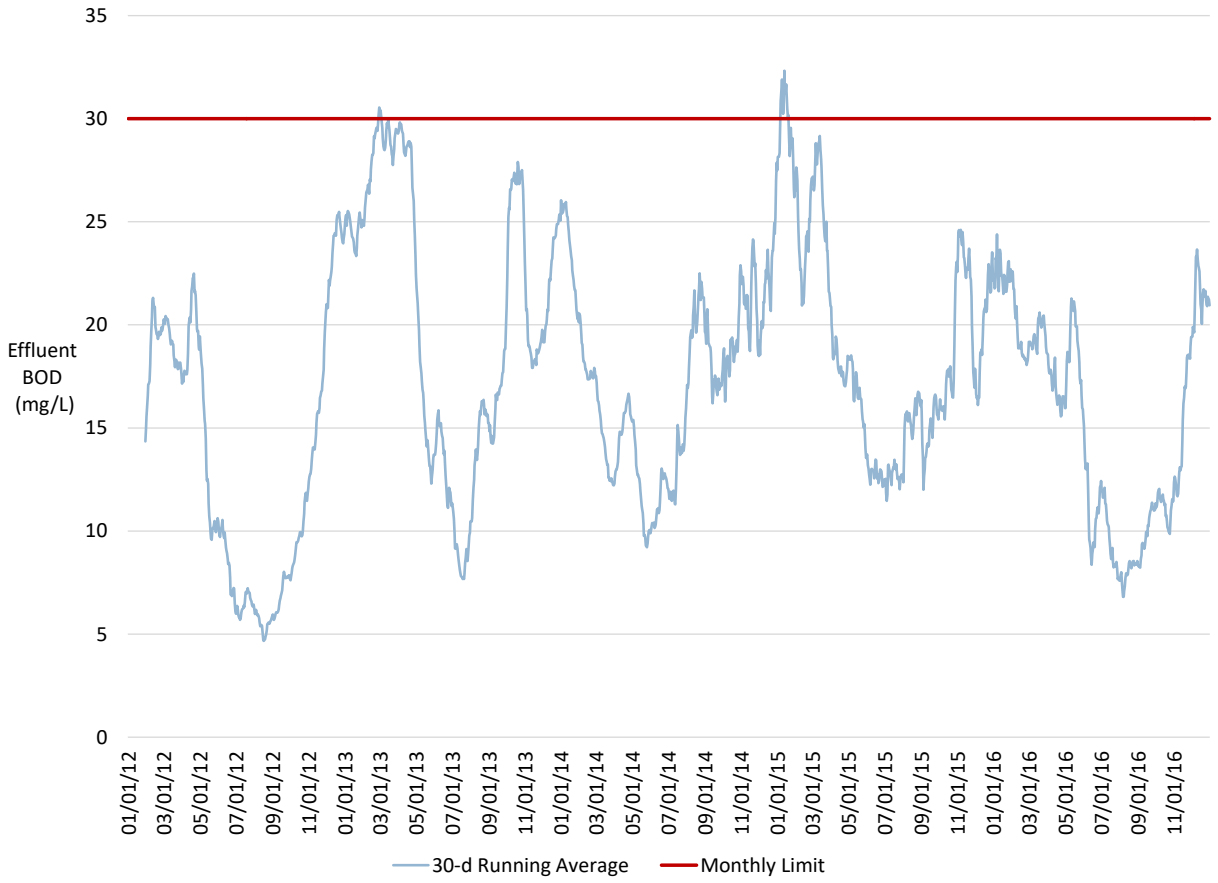


Figure 3-22 Historical 30-d Running Average Effluent BOD Concentrations

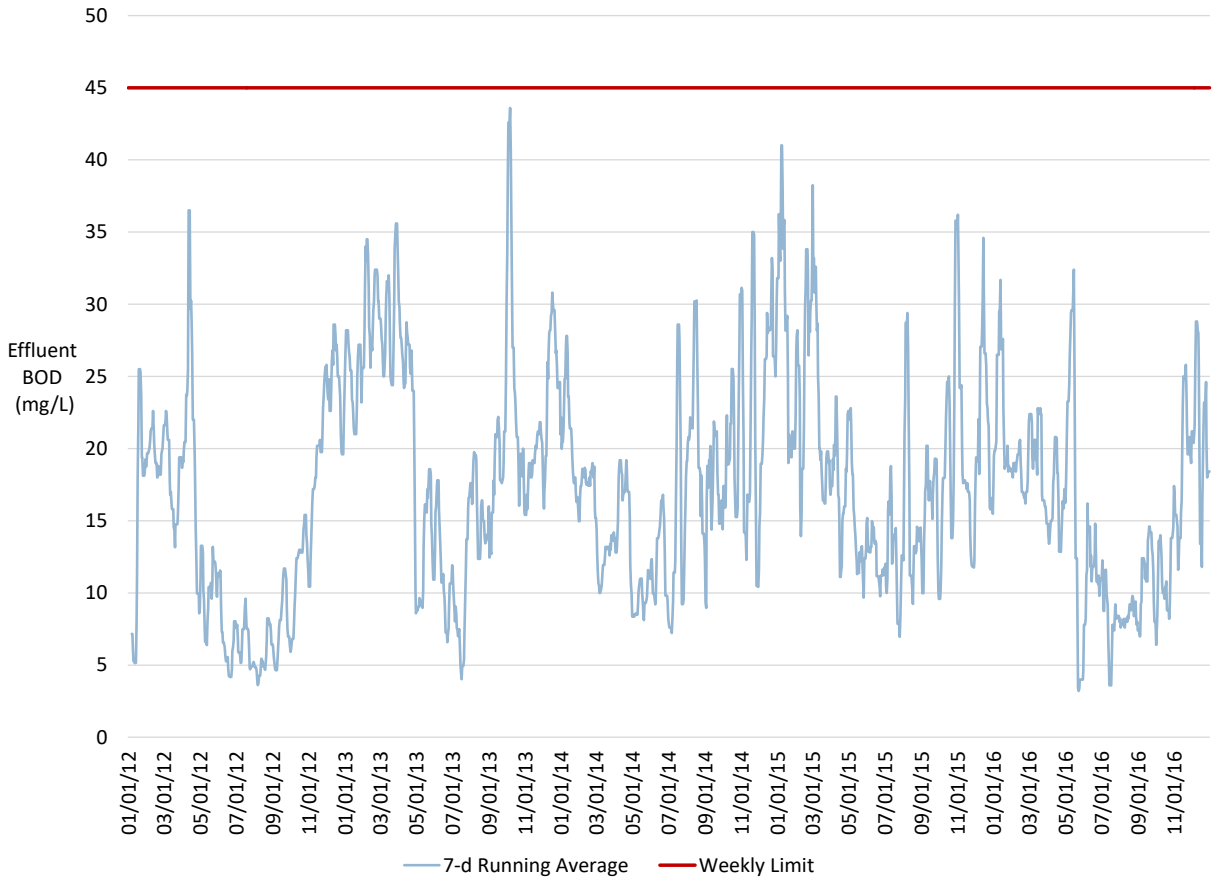


Figure 3-23 Historical 7-d Running Average Effluent BOD Concentrations

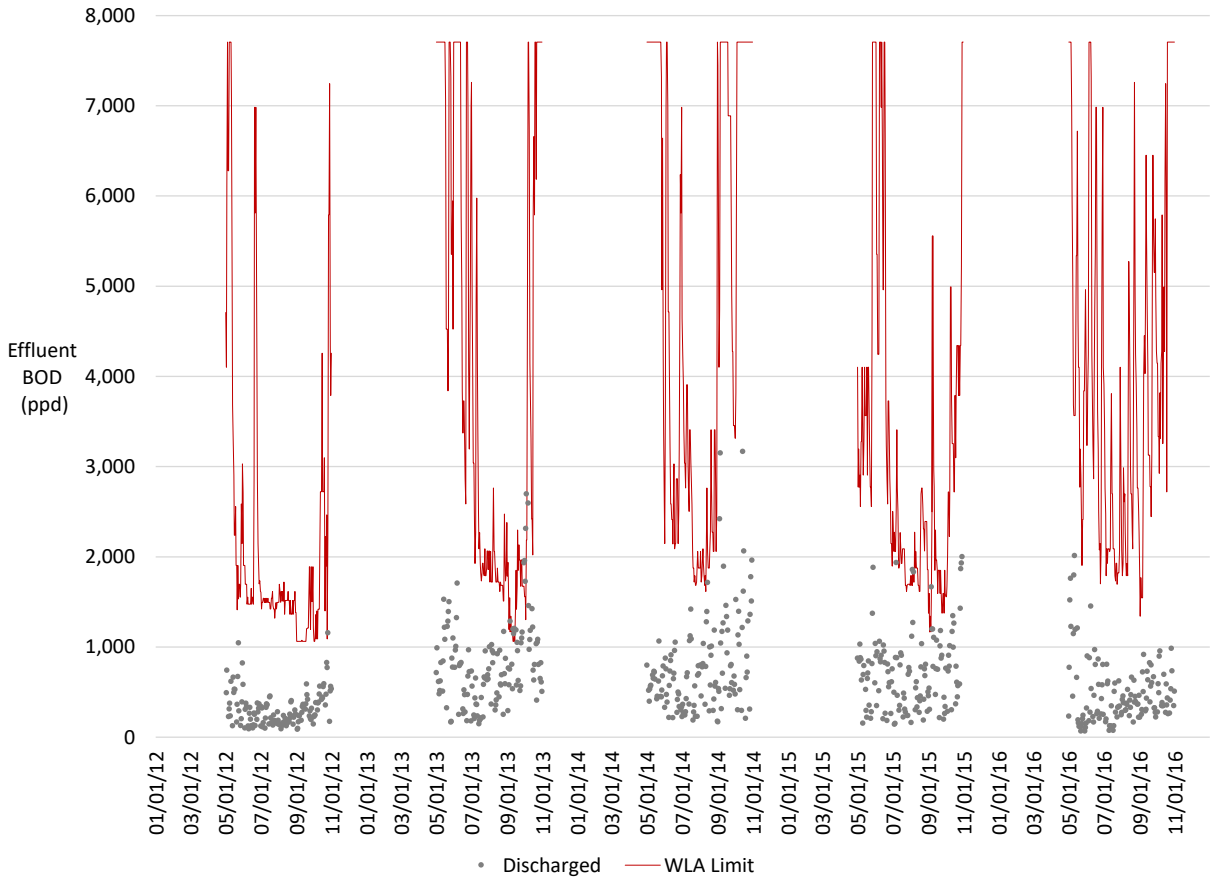


Figure 3-24 Historical Daily Effluent BOD Loadings and WLA BOD Limits

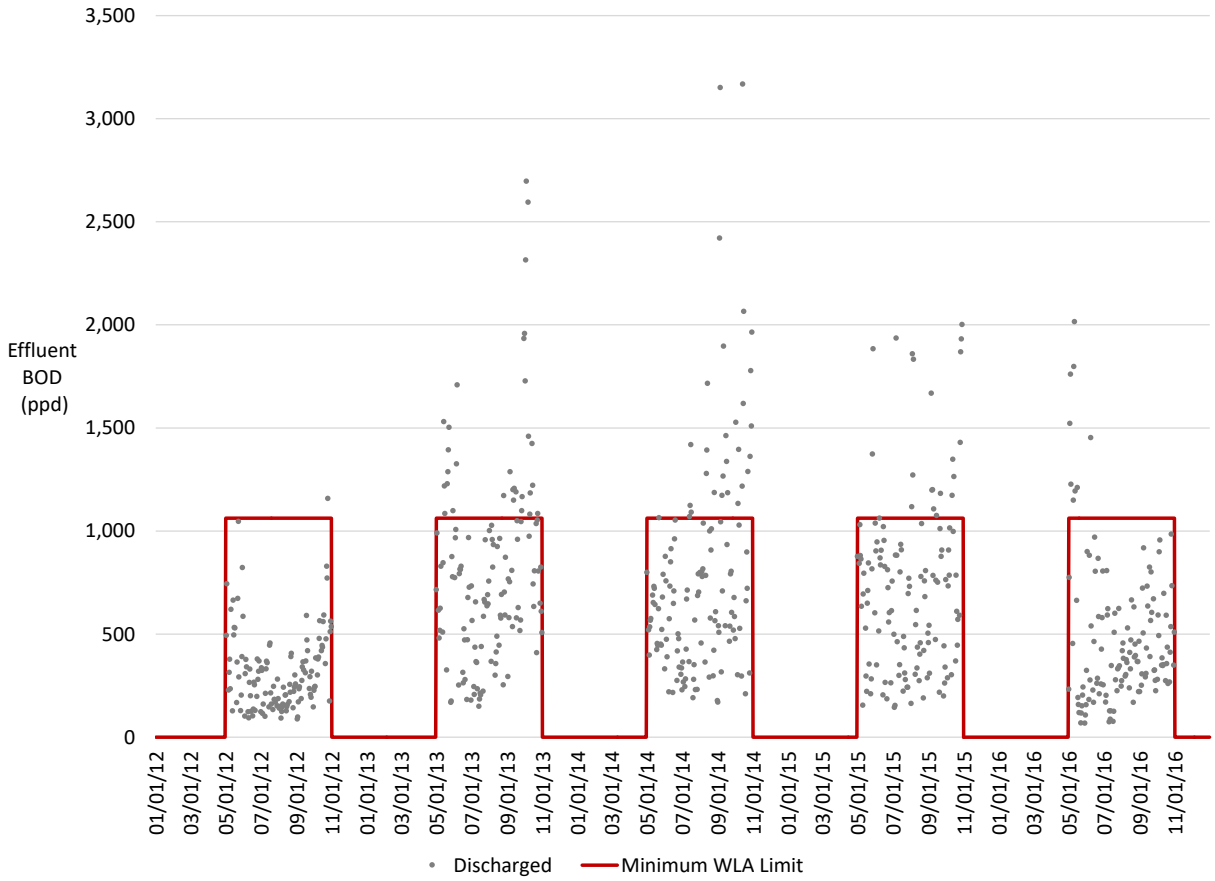


Figure 3-25 Historical Daily Effluent BOD Loadings and Minimum WLA Limits

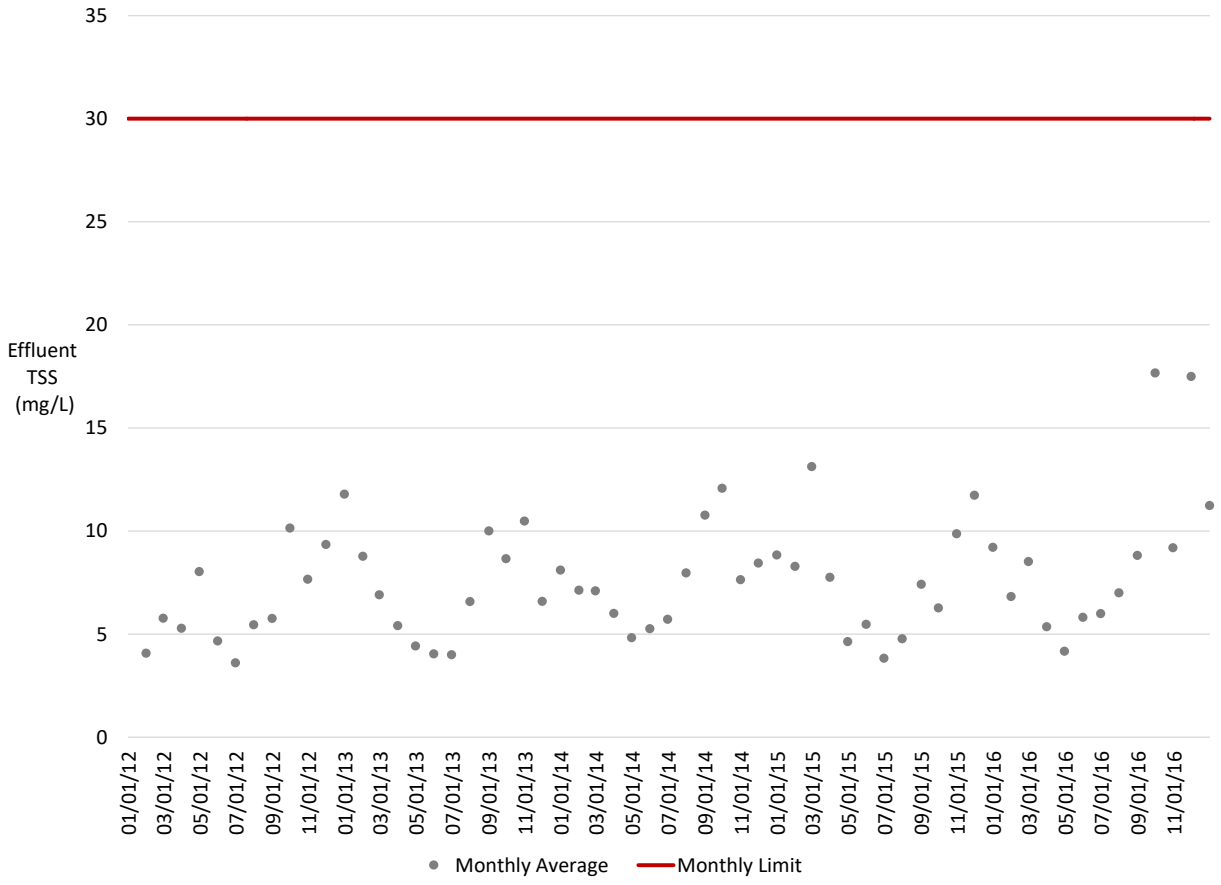


Figure 3-26 Historical Monthly Average Effluent TSS Concentrations

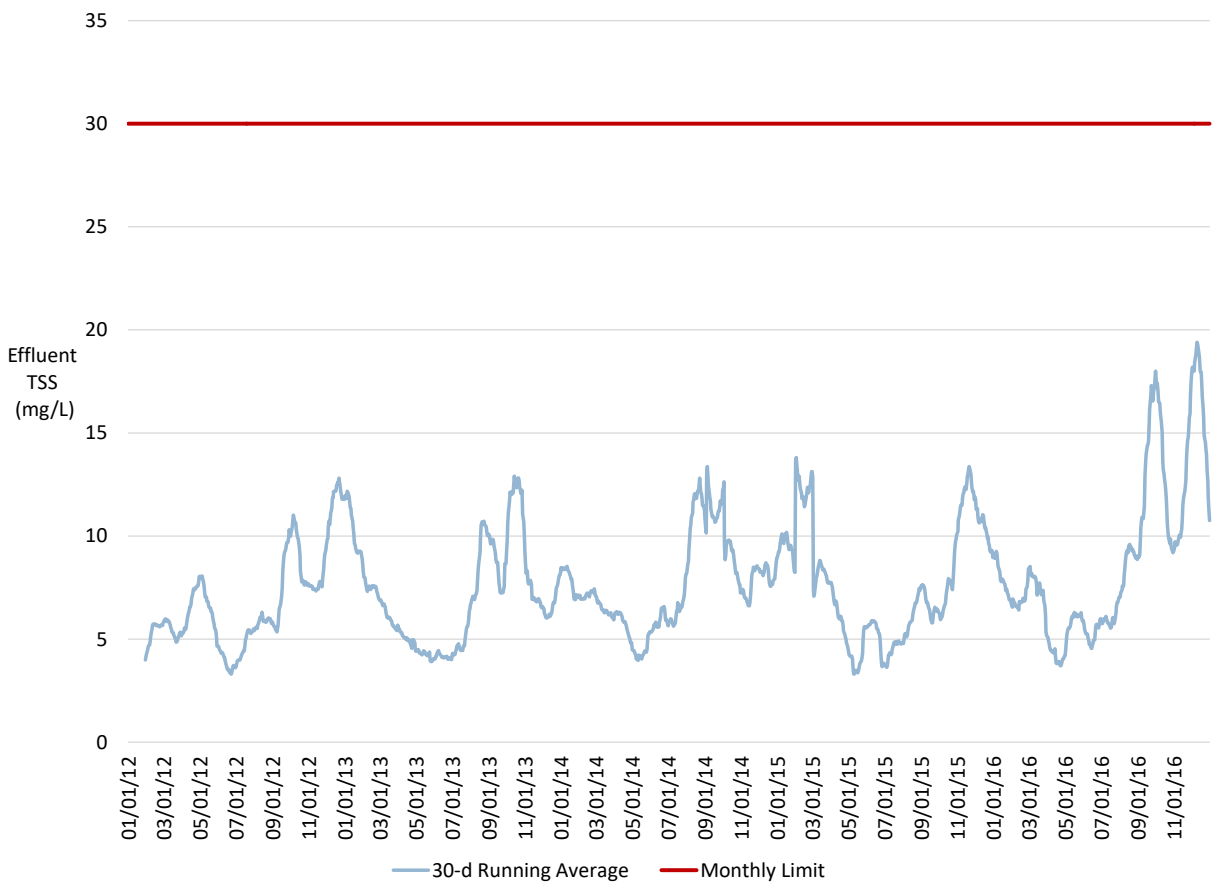


Figure 3-27 Historical 30-d Running Average Effluent TSS Concentrations

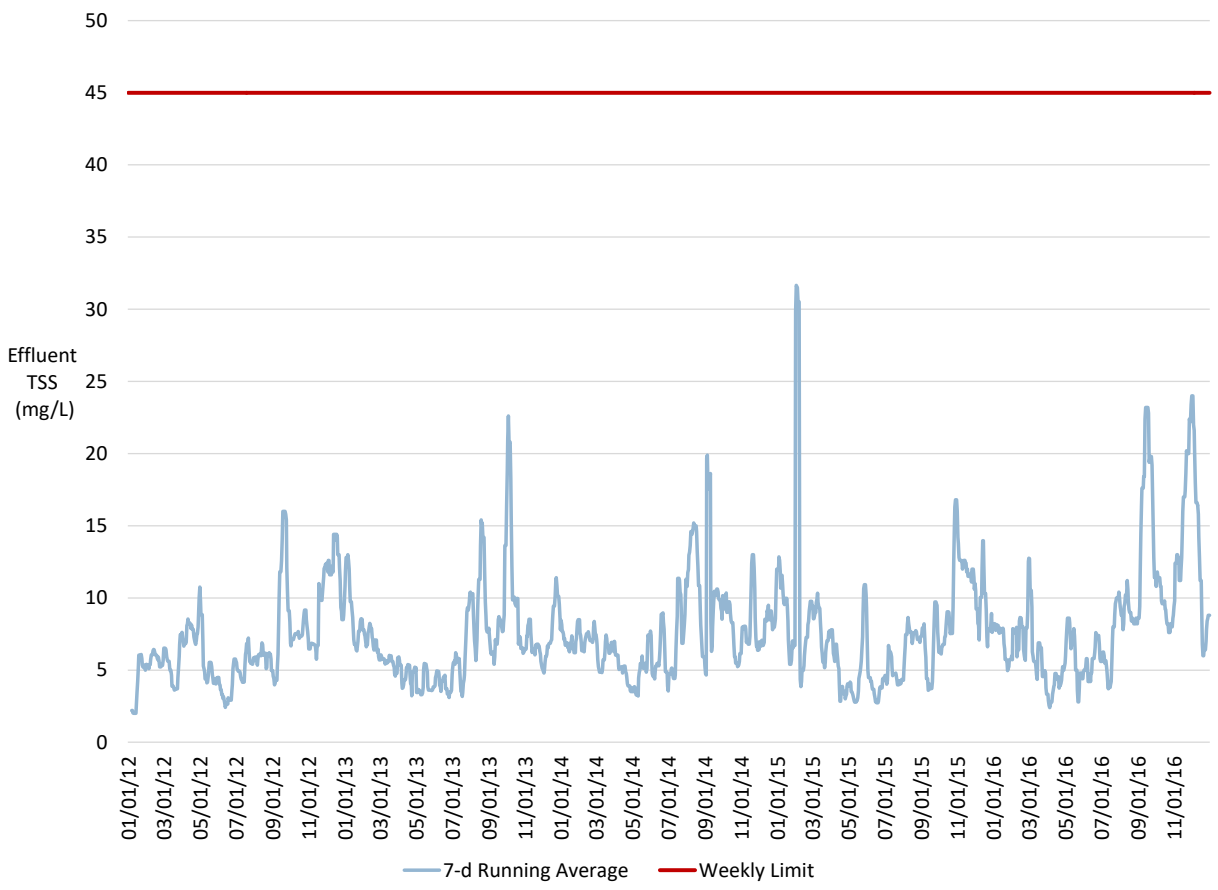


Figure 3-28 Historical 7-d Running Average Effluent TSS Concentrations

3.8.3 TP

The WPDES Permit includes one total phosphorus effluent limit: monthly average limit = 1 mg-TP/L. Figure 3-29 shows the calendar monthly average values produced and reported by the Facility during the five-year period. Effluent TP concentrations exceeded the limit on two occasions. Figure 3-30 shows a running 30-day average of the effluent TP data relative to the 1 mg-TP/L limit, ignoring the calendar months and revealing the average effluent TSS concentration for all historical 30-day periods. This presentation reveals the potential for Permit violations. Multiple 30-day averages exceeded the Permit limit.

The future TP limit will be established by the phosphorus TMDL. This limit will be far more restrictive, likely in the vicinity of 0.2 – 0.4 mg-TP/L. Nearly all of the historical effluent TP concentrations exceeded this impending future limit.

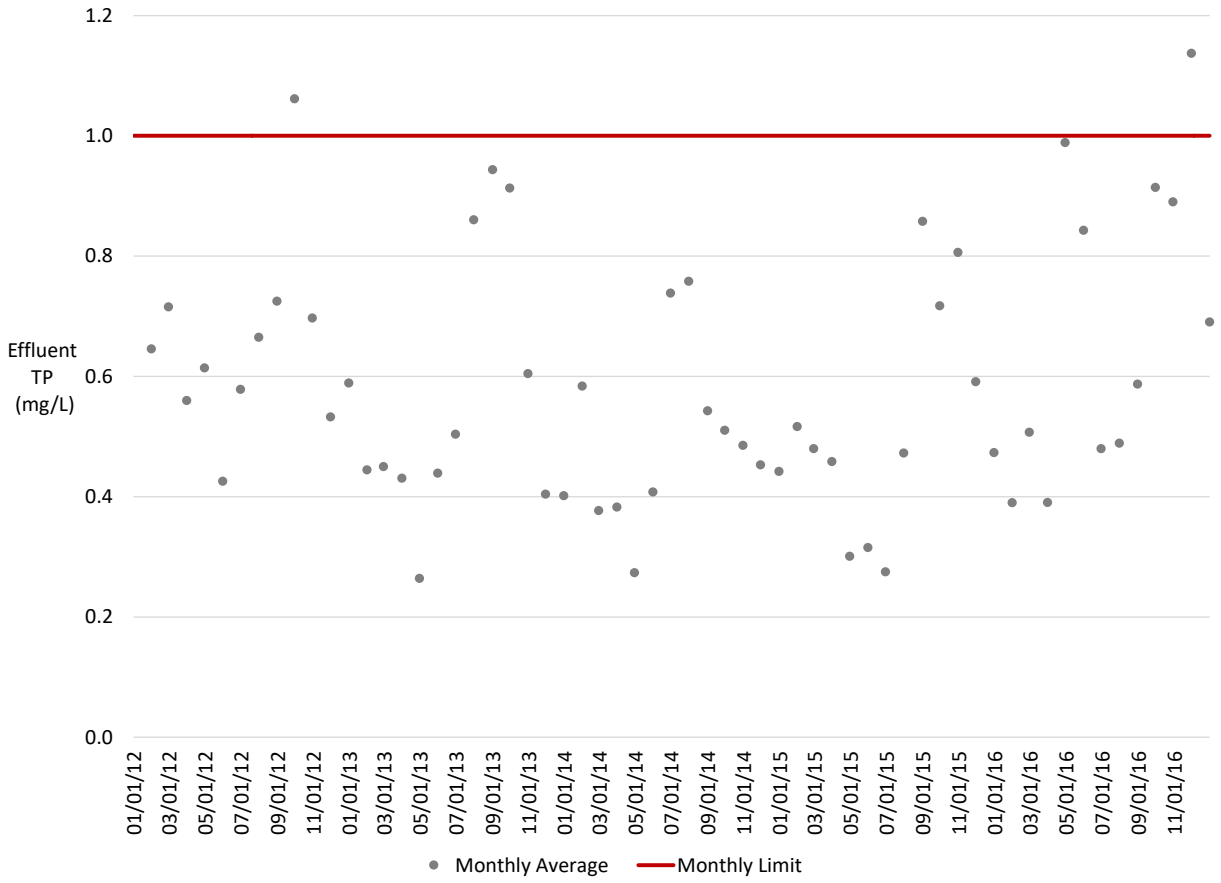


Figure 3-29 Historical Monthly Average Effluent TP Concentrations

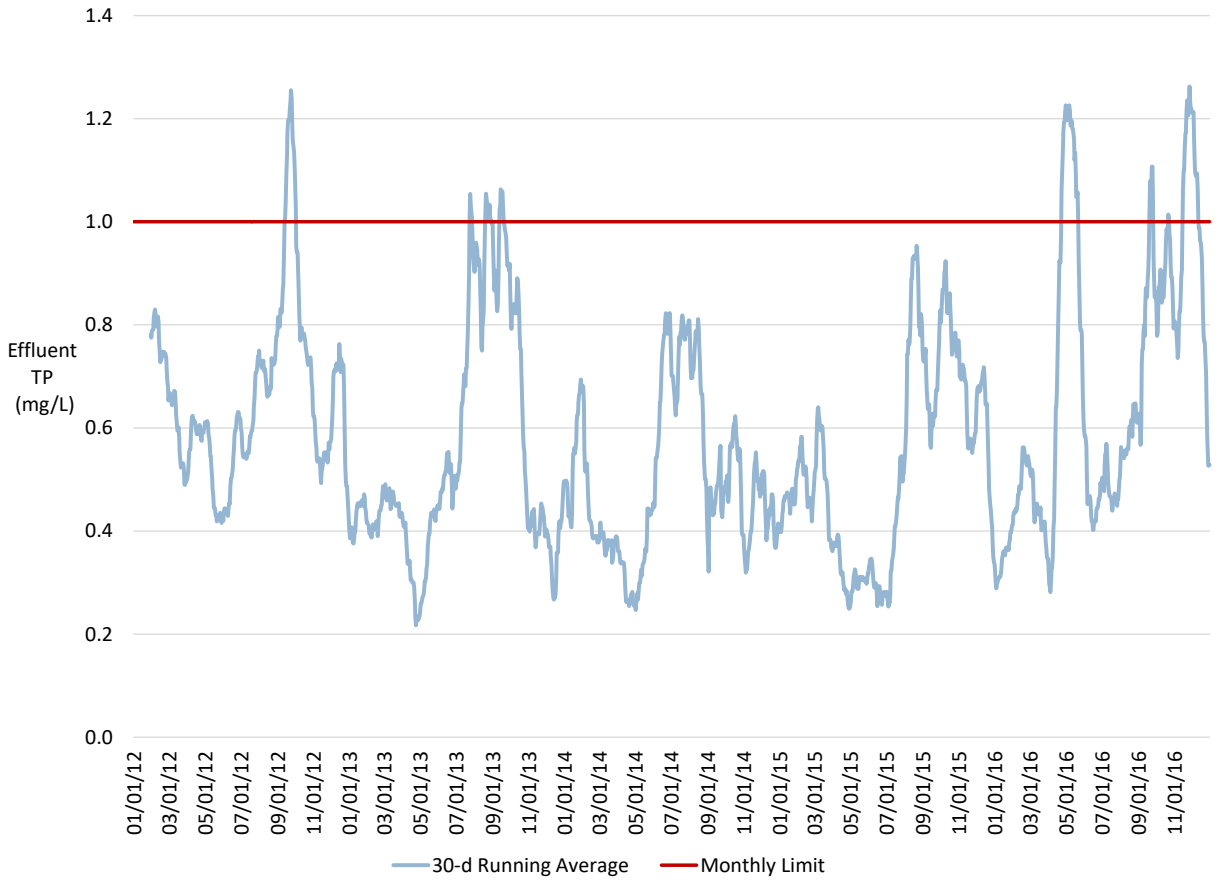


Figure 3-30 Historical 30-d Running Average Effluent TP Concentrations

3.8.4 FECAL COLIFIRM

The previous WPDES Permit included one fecal coliform effluent limit: weekly geometric mean = 400 #/100 mL. The new WPDES Permit includes two fecal coliform effluent limits: weekly geometric mean = 656 #/100 mL and monthly geometric mean = 400 #/mL. Figure 3-31 shows the monthly geometric mean values produced by the Facility during the five-year period. Three values exceeded the monthly average limit.

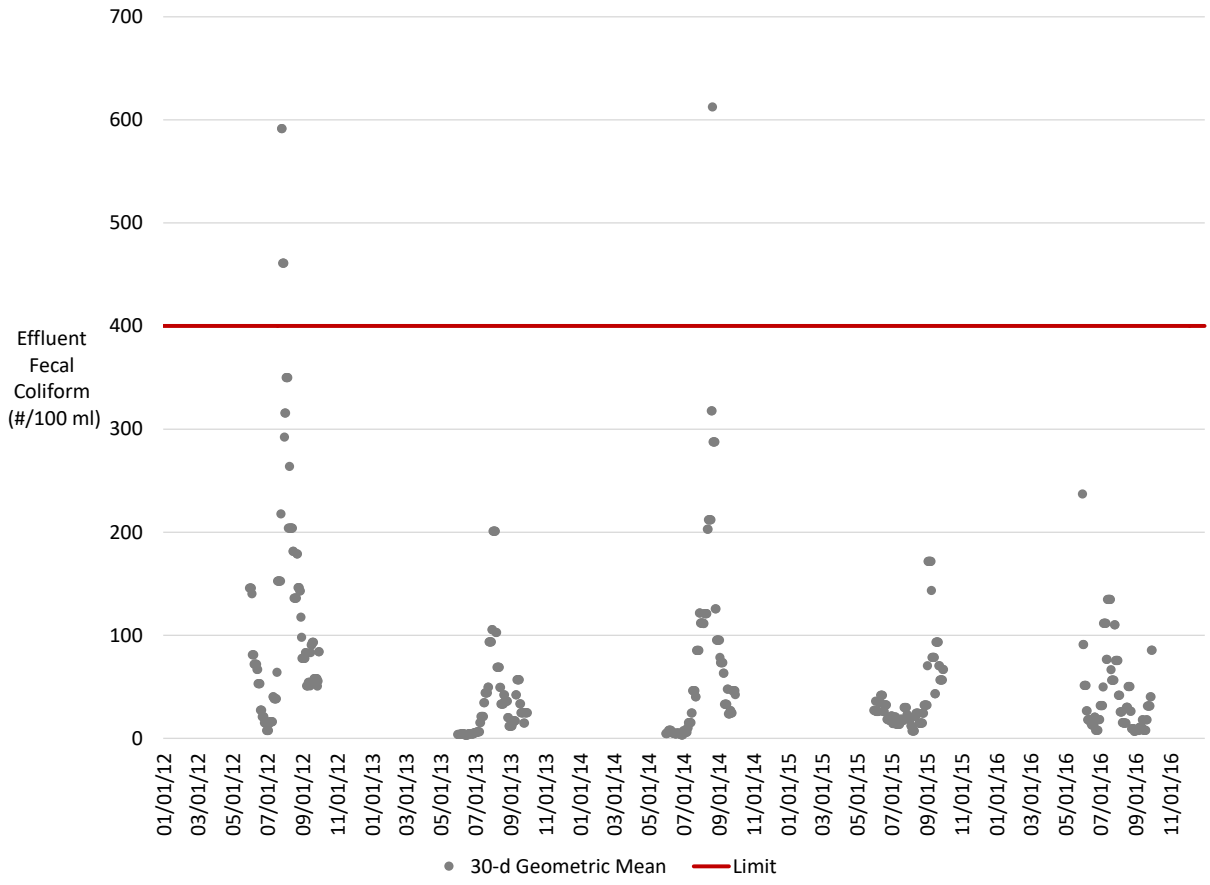


Figure 3-31 Historical 30-d Geometric Mean Effluent Fecal Coliform Values

3.8.5 PH

The WPDES Permit requires effluent pH to be less than 9 and greater than 6. Figure 3-32 shows the values produced and reported by the Facility during the five-year period. Five values were below the required minimum value (6) and 30 were less than 6.2. None of the values exceeded the upper limit (9).

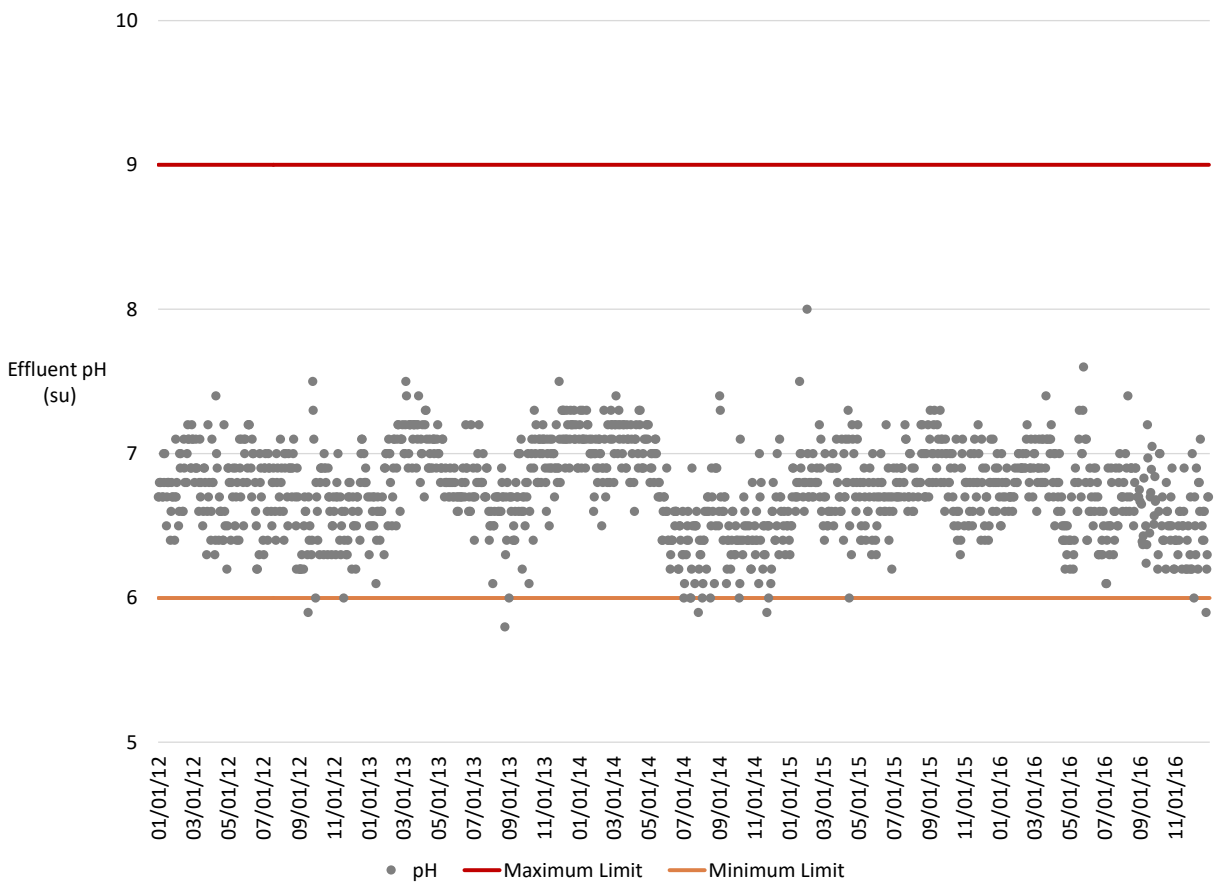


Figure 3-32 Historical Effluent pH Values

3.9 CONDITIONS

This Section documents an assessment of existing unit processes, structures, and equipment. As stated previously, this Plan considers and categorizes issues in three broad categories: 1) Safety, Reliability, Performance; 2) Capacity; and 3) Regulations. In an effort to highlight these concerns and provide a method to efficiently and effectively summarize them for the entire Facility, the unit process assessment tables in the Sections below assign “Pass” and “Fail” ratings to each of these categories. Pass ratings denotes there are no concerns. Fail ratings denotes there are concerns or issues the Plan needs to address. The Sections below reveal issues and concerns are pervasive throughout the Facility, typical for a Facility that has not had a comprehensive Facility-wide upgrade in 30 years.

3.9.1 RAW WASTEWATER SCREENING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations	■	

Capacity

Firm = 20 mgd
Total = 40 mgd

Configuration

Screens
- Number = 2
- Type = 6-mm opening, mechanically-cleaned step screen
- Capacity/Unit = 60 mgd

Conveyor System
- Number = 1
- Type = Shaftless screw
- Capacity/Unit = 2.5 cyh

Description

A 48-in pipe carries all influent wastewater to the screening process. During normal operating conditions, flow is screened by two climbing step screens with 6-mm openings. During screen maintenance or a severe wet-weather event, flow can be diverted to a manually cleaned bar rack. Screenings discharged from the step screens are conveyed to a dumpster. The screening system produces approximately two dumpsters of screenings per week.

Issues

- From a reliability perspective, peak flow capacity is inadequate. The manually-cleaned bar rack provides supplemental capacity; however, the upstream isolation gate must be opened manually and locally. The manual bypass is a safety concern and, because it must be activated manually and locally, it fails to provide adequate backup capacity.
- Mechanical step screens are isolated by large, heavy stop plates. The heavy stop plates are a safety concern. Stop plates often do not seat adequately to isolate flow.
- Screen maintenance is hindered by the fact that the Facility needs to hire a contractor to lift or remove the mechanical screens from the screenings channels.
- Conveyor gearbox requires excessive maintenance.
- Without a screenings washer/compactor, the screenings are excessively wet, organics laden, and odorous.
- Lower and upper levels are NFPA 820 Class 1, Division 1 hazardous locations. The electrical system does not strictly conform to the NFPA 820 requirements. This is a safety concern. See the NFPA 820 discussion (Section 3.10).

3.9.2 RAW WASTEWATER PUMPING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■	
Regulations	■	

Capacity

Firm = 36 mgd
Total = 45 mgd

Configuration

- Number = 4
- Type = Vertical-shafted centrifugal pumps
- Capacity/Unit = 9,500 gpm
- Motor = 100 hp

Description

Three pumps were installed in 1967. One pump was installed in 1988. All four pumps are driven by 100-hp variable frequency drives, controlled by a PanelView 600 Human Machine Interface (HMI), and discharge to a single forcemain that conveys flow to the grit removal system. The wetwell is equipped with a transducer for level measurement and a backup/redundant float system. Raw wastewater samples are collected from the raw wastewater forcemain by a composite sampler located in the motor room.

Issues

- Three pumps, a large number of valves, and a majority of the piping is 40 years old and nearing the end of their reliable service lives. At least one valve is not functioning.
- Control systems components are nearing the end of their reliable service lives.
- Belt-press sidestreams are routed to the raw wastewater wetwell. WDNR requires sidestreams re-introduced to the liquid train downstream of the raw wastewater sampler.
- The raw wastewater sampler is installed in the motor room and, because raw wastewater is open to the atmosphere, does not strictly conform with NFPA 820. This is a safety concern. See the NFPA 820 discussion (Section 3.10).
- Motor rooms should be isolated from process spaces. The motor room is connected to the raw wastewater pumping room.
- The wet well is difficult to access.

3.9.3 GRIT REMOVAL AND INFLUENT FLOW MEASUREMENT

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■ Grit	■ Flow Measurement
Regulations	■	

Capacity

Grit Removal
- Capacity = 30 mgd

Flow Measurement
- Capacity = 20 mgd

Configuration

Grit Removal
- Number = 1
- Type = vortex
- Capacity/Unit = 30 mgd

Grit Slurry Pumping
- Number = 1
- Type = airlift
- Capacity/Unit = 250 gpm

Grit Washing and Dewatering Unit
- Number = 1
- Type = Coanda-style
- Capacity/Unit =250 gpm

Flow Measurement
- Number = 1
- Type = Parshall flume
- Capacity/Unit = 20 mgd

Description

Grit is removed by a vortex grit removal system. Grit slurry is pumped to a grit washer by an airlift grit-slurry pump. The washed grit, along with primary scum is deposited in a dumpster. Primary scum is dewatered via a rotating drum screen. All of the grit and primary scum equipment was installed in 1989. Approximately one dumpster of grit and scum is generated every two weeks.

Issues

- The grit sump in the lower level of the vortex chamber plugs with grit during wet-weather events. Airlift pumps are ineffective and prone to grit plugging problems.
- The flume lacks adequate capacity, surcharging and/or failing to measure flows beyond roughly 20 mgd. Flume entrance conditions are poor, degrading accuracy.
- Belt-press recycle flows are routed to the raw wastewater wet well and therefore measured in the Parshall flume. These sidestreams bias influent flows.
- Primary scum is suitable for anaerobic digestion. Digesting primary scum increases biogas production and reduces landfill costs.
- All of the equipment associated with the grit removal system and primary scum dewatering process are nearing the end of their reliable service lives.

3.9.4 PRIMARY SETTLING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■	
Regulations	■	

Capacity

- Average Capacity = 20.1 mgd [1000 gpd/sf per NR 110]
- Conservative Peak Hour Capacity = 30.2 mgd [1500 gpd/sf per NR 110]
- Aggressive Peak Hour Capacity = 40.2 mgd [2000 gpd/sf per 10-States]

Configuration

Primaries

- Number = 4
- Diameter = 80 ft
- Sidewater Depth = 10 ft
- Unit Surface Area = 5,027 sf
- Total Surface Area = 20,106 sf

Primary Sludge Pumps

- Number = 4
- Type = Progressing cavity
- Capacity/Unit = 10 – 50 gpm

Description

Settleable solids are removed by four primary clarifiers (primaries). Alum is added upstream for chemical phosphorus removal. Flow leaving the grit removal system is routed to each of the four primaries through open-close valves. The flow-split between the four primaries is not proportional, reducing the effectiveness of the primary settling system. The primary sludge pumps operate intermittently based on an operator-defined run sequence.

Issues

- The four isolation valves controlling flow to the primary settling basins are not functioning properly. The flow split between the four clarifiers is not proportional or equal. Floating material (scum) is preferentially routed to Primaries 1 and 2. Heavy material (grit) is preferentially routed to Primaries 3 and 4.
- The four drives are nearing the end of the reliable service lives. The mechanisms in Primaries 1 and 2 need surface coating.
- The center sump periodically plugs with heavy material during wet-weather events, particularly Primaries 3 and 4.
- All four clarifiers require miscellaneous structural repairs and/or surface coatings: concrete, fall protection, and supports.
- The primary sludge pumps are nearing the end of their reliable service lives.

3.9.5 ACTIVATED SLUDGE SYSTEM

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■ Non-Nitrifying	■ Nitrifying
Regulations	■	

Capacity

- Non-Nitrifying = 15,400 ppd-BOD [30% primary BOD removal, 0.25 F:M, and 3000 mg-MLSS/L]

Configuration

Aeration Basins
- Number = 6
- Length = 136 ft, Width 30 ft, Depth = 15 ft
- Total Volume = 2.75 mgal

Aeration Blowers
- Number = 3
- Capacity/Unit = 3,400 scfm
- Motor = 300 hp

Diffusers
- Four Basins = EPDM fine bubble
- Two Basins = Stainless steel coarse bubble

Description

The activated sludge system is equipped with six flow-through aeration basins. The basins are operated as a conventional, non-nitrifying activated sludge system. Aeration is driven by three high-speed turbocompressors.

Issues

- Flow and loading distribution between the on-line aeration basins is poor.
- Air is leaking from buried air distribution piping, revealing that the buried lines are severely corroded and need to be replaced.
- Three high-speed turbocompressors were installed in 2013 to provide air to the aeration diffusers. Those particular machines were offered for a short period of time, have proven problematic at multiple facilities where they were installed and have been operating, and are no longer available or supported by the manufacturer. All three blowers are controlled by a single PLC in one of the blowers. If this blower is off-line for maintenance, the other two blowers must be operated manually.
- High-efficiency EPDM aeration diffusers were installed in four of the six basins in 2013 (Basins 1, 2, 3, and 6). Coarse bubble diffusers are installed in two of the basins (Basins 4 and 5).
- A single dissolved oxygen probe is installed near the center of each tank; however, there are not automatic flow-control valves anywhere on the diffused air piping. The speed of the lead aeration blower can be ramped up/down in accordance with a dissolved oxygen reading. Air distribution between the on-line aeration basins is poor.
- The basins require miscellaneous structural repairs and/or surface coatings: concrete, fall protection, and supports.
- Hauled-in lime sludge from the Wausau Water Plant is introduced to the mixing tank immediately upstream of the aeration basins. This inert material consumes aeration system capacity. The Facility would be better served if the lime was added to the primary settling or anaerobic digestion process.
- The system is operated as a non-nitrifying conventional activated sludge system, preventing cold-weather nitrification and contributing to some performance and stability issues. In general, nitrifying systems provide consistently better and more stable effluent quality than non-nitrifying systems. The system can be configured, with an upstream selector basin, to either an enhanced bioP nitrifying system or an enhanced bioP non-nitrifying system with better performance and stability.

3.9.6 SECONDARY SETTLING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■	
Regulations	■	

Capacity

- Average Capacity = 15.6 mgd [700 gpd/sf per NR 110]
- Peak Hour Capacity = 22.2 mgd [1000 gpd/sf extended aeration per NR 110]
- Peak Hour Capacity = 21.3 mgd [0.25 F:M and 3000 mg-MLSS/L per NR 110]

Configuration

Secondaries

- Number = 3
- 2 x Diameter = 90 ft and Sidewater Depth = 10 ft
- 1 x Diameter = 110 ft and Sidewater Depth = 13 ft
- Total Surface Area = 22,227 sf

RAS Pumps

- Number = 3
- Type = Centrifugal
- Capacity/Unit = 2400 gpm

WAS Pumps

- Number = 2
- Type = Centrifugal
- Capacity/Unit = 200 – 550 gpm

Description

Mixed-liquor solids are removed by three secondary clarifiers (secondaries). The flow-split between the three secondaries is not proportional to surface area, reducing the effectiveness of the secondary settling system. Settled solids are removed from the bottom of the secondaries by suction-header mechanisms. Each of the secondaries has been recently reconditioned. Three RAS pumps, one installed per secondary, return solids to the activated sludge basin. Two WAS pumps convey waste solids to thickening. Flow meters are installed on the suction side of each pump.

Issues

- The MLSS flow split between the three secondaries is not proportional to secondary surface area. Without a proper surface area based flow split, the secondary settling system performs below its potential capacity.
- The downstream end of the activated sludge basins and the mixed liquor channels feeding the secondaries is not equipped with chemical feed for phosphorus removal. All chemical addition for phosphorus removal must occur upstream of primary settling. This arrangement provides inadequate chemical-feed control, which could manifest itself in operational problems within the activated sludge system, overfeeding/overspending on alum, or underfeeding and, in turn, permit violations.
- Algae grows on the weirs, breaks free, and causes problems in the downstream UV disinfection system.
- The RAS and WAS pumps are nearing the end of their reliable service lives. The RAS pump removing solids from the largest secondary has been problematic.
- All three clarifiers require some miscellaneous structural repairs.

3.9.7 EFFLUENT FILTRATION

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations		■

Capacity

The filters have capacity to treat 9 mgd. The filter feed pumps that lift forward flow to the filters have a firm capacity of 8 mgd.

Configuration

Filters
- Number = 6
- Type = Rapid-sand gravity filters
- Dimensions = 10 ft x 25 ft
- Unit Surface Area = 250 sf
- Firm Surface Area = 1,250 sf
- Total Surface Area = 1,500 sf
- Peak Hour Loading Rate = 5 gpm/sf [NR 110]
- Capacity = 9 mgd

Filter Feed Pumps
- Number = 2
- Type = Centrifugal
- Capacity/Unit = 5,700 gpm
- Firm capacity = 8.2 mgd
- Motor = 40 hp

Filter Backwash Pumps
- Number = 2
- Type = Centrifugal
- Capacity/Unit = 3,000 gpm
- Motor = 30 hp

Description

Tertiary rapid-sand gravity filters remove effluent solids and the associated BOD and TP before disinfection and discharge to the Wisconsin River. The filters were added to the Facility during the 1989 upgrade. Secondary effluent is lifted to the filters by filter feed pumps. The filtration system capacity is limited by the filter feed pumps (8.2 mgd). The filtration system has and will continue to help the Facility comply with its stringent daily BOD WLA limit. The filters will also be instrumental in the Facility complying with its impending phosphorus TMDL and the associated low-level phosphorus mass limit.

Issues

- Inadequate capacity for BOD WLA and impending phosphorus TMDL
- The sand filters have been overhauled since commissioning in circa 1989. A significant fraction of the sand media has been lost and has been deposited in the mud well. The underdrain conditions is not known, but the underdrain system likely requires maintenance.

3.9.8 DISINFECTION

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations	■	

Capacity

The UV system was designed to disinfect 20 mgd at an effluent transmissivity of 55%. Historical transmissivity values are less than the design value. The disinfection capacity at historical transmissivities is less than 20 mgd.

Configuration

- 7 modules or channel banks at 8 lamps per module (Trojan UV 3000+)

Description

Ultraviolet (UV) light disinfects the effluent. Channel banks are paced by flow and the lamp intensity is paced by transmissivity. The water surface in the UV reactor is controlled with a counter-weighted and hinged flap gate. The WPDES Permit requires disinfection from May through September.

Issues

- Treatment facilities must accommodate the 100-year flood elevation in the receiving stream, capable of operating and maintaining compliance during such a flood event. The current UV system will not perform as required if the Wisconsin River rises to the 100-year flood elevation.
- The current design capacity (20 mgd) is less than the peak-hour flow. Historical effluent transmissivities are less than the transmissivity used to design the current UV disinfection system. The disinfection capacity at historical transmissivities is less than 20 mgd.
- Algae grows on the secondary clarifier effluent launders. Occasionally large pieces of algae break free from the secondary clarifiers, coating the UV bulbs and increasing headloss through the UV system.
- The UV system has struggled to achieve compliance when effluent solids concentrations are high and the effluent filters are not operating.

3.9.9 CHEMICAL PHOSPHORUS REMOVAL

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations		■

Capacity

The storage and feed capacity is adequate for the current WPDES Permit limit; however, both will be inadequate for the future phosphorus TMDL limit. Moreover, the Facility will need the ability to feed phosphorus-removing chemicals to multiple locations – e.g., upstream primary settling, upstream secondary settling, upstream filtration, and to the belt-filter press underflow.

Configuration

- Number of Chemical Storage Tanks = 1
- Number of Chemical Feed Pumps = 2
- Type of Chemical Feed Pumps = diaphragm
- Storage Volume = 4,800 gal

Description

The Facility uses aluminum sulfate (alum) to comply with its current 1 mg-TP/L limit. Alum is stored in a single 4,800-gal chemical storage tank and fed to the grit system upstream of primary settling. This is currently the only alum feed point. The Facility currently uses roughly 350 gpd on average.

Issues

- The current system lacks storage volume to meet the demands of the impending phosphorus TMDL. Moreover, the Facility might be best served by feeding multiple chemicals.
- The existing system feeds alum to a single location. The impending phosphorus TMDL will require multiple feed locations.
- The chemical storage tank lacks adequate containment. This is a safety concerns.

3.9.10 PRE-DIGESTION THICKENING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations	■	

Capacity

- Firm Capacity = 0 gpm
- Total Capacity = 200 – 500 gpm

Configuration

- Number = 1
- Type = Gravity belt thickener
- Size = 3 meter

Description

A single 3-m gravity belt thickener (GBT) thickens waste activated sludge solids (WAS) produced by the activated sludge system. The thickened WAS (TWAS) is pumped to anaerobic digestion. The single GBT was installed in 1988. This is an essential process and demands redundancy. The current system lacks redundancy and has no firm capacity. The 3-mg GBT operates approximately 8 hr/d.

Issues

- Inadequate redundancy and firm capacity. This is an essential unit process that must be available at all times.
- The 30-year-old GBT is nearing the end of its reliable service life.
- Underflow is routed to the aeration basins. This should be discharged to the forward flow upstream of the primary settling.
- Motor control centers (MCCs) are located in the same space as the GBT. The MCCs show signs of hydrogen sulfide (H2S) exposure. MCCs should be located in a clean, dry, area free from the potential for H2S exposure.
- Ventilation of the TWAS pumping area is inadequate to avoid a Class 1, Division 2 NFPA 820 hazardous classification. This space requires 6 continuous air changes per hour to avoid this classification. This is a safety concern. See the NFPA 820 discussion (Section 3.10).

3.9.11 ANAEROBIC DIGESTION

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity	■	
Regulations	■	

Capacity

- Firm Capacity = 74,501 gpd

Configuration

Primary Digesters

- Number = 2
- Diameter = 65 ft
- Side Water Depth = 22.5 ft
- Unit Volume = 74.7 kcf
- Loading Rate = 65 ppd-VSS/kcf
- Detention Time = 24 to 27 days
- Mixing = Draft tube/heated

Secondary Digesters

- Number = 2
- Diameter = 80 ft
- Side Water Depth = 20 ft
- Unit Volume = 100.5 kcf
- Detention Time = 30 days
- Mixing = JetMix

Total Digester Volume = 2.62 mgal

Description

Primary sludge and waste activated sludge are stabilized by mesophilic anaerobic digestion. There are two primary digesters and two secondary digesters. External draft-tube mixers heat and mix both primary digesters. Digested sludge flows by gravity from the primary digesters to the secondary digesters. The secondary digesters are not heated but are mixed by a pump-nozzle mix system. Capacity is adequate when both primary digesters are in service; however, converting one or more secondary digesters to primary digesters will enhance performance, capacity, and maintainability. Large secondary digesters provide minimal value, serving only to equalize flow upstream of dewatering.

Issues

- The biogas compressors are nearing the end of their reliable service lives and are unable to maintain adequate pressure in the biogas-storage sphere. The sphere is rated for 30 psi. The compressors maintain between 12-20 psi. This reduced pressure reduces storage biogas volume or stored biogas capacity.
- The biogas piping is undersized and has an interior coating that has reduced its capacity. Piping needs to be replaced with stainless steel piping.
- The two secondary digesters provide minimal value as such. One or both should be converted to primary digesters, enhancing biogas production, capacity to produce biogas, and enhancing digester complex flexibility to better accommodate digester cleaning and maintenance.
- Digester complex piping limits operating flexibility.
- The secondary digester covers are in poor condition and need to be replaced. The digester complex roof needs to be replaced.
- Digesters overheat during the warm-weather months when the microturbines are running.
- The digester complex does not comply with NFPA 820. This is a safety concern. See the NFPA 820 discussion (Section 3.10).

3.9.12 POST-DIGESTION DEWATERING

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations	■	

Capacity

- Firm Capacity = 72,000 gpd

Configuration

- Type = Belt Filter Press
- Number = 2
- Size = 3 m
- Finish Solids Concentration = 22 to 25%

Description

Two belt -filter presses, installed in 1988, dewater digested sludge. The dewatered cake averages about 16% TS. The dewatered cake is discharged into a 12-cy dump truck that sits below the presses. Final effluent is used for wash water while the filtrate is sent to the head of the Facility. This sidestream should be introduced downstream of influent flow measurement and sampling.

Issues

- The belt-filter presses are nearing the end of their reliable service lives. The presses have not been rehabilitated in more than 10 years and are severely corroded. Replacement parts are difficult to obtain.
- The clam doors located below each belt press are nearing the end of their reliable service lives.
- Belt-filter press filtrate is routed to the raw wastewater wet well. This high-strength sidestream is co-mingled with the raw wastewater and included in the raw wastewater samples, biasing the influent wastewater results. The sidestream is also introduced upstream of the influent flow meter, biasing influent flow values. The sidestream should be reintroduced downstream of raw wastewater sampling and flow measurement.
- The MCC in the press room is in poor condition and shows signs of H2S damage. MCCs should be physically separated from wet, corrosive process areas. The MCC should be replaced and located in a clean, dry environment with an HVAC system that is not connected to a process area.

3.9.13 BIOSOLIDS CAKE STORAGE

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations	■	

Capacity

- Capacity = 144,000 sf

Configuration

- Number = 1
- Dimensions = 80 x 300 ft
- Retention Time = 150 days

Description

Cake biosolids are stored in an open-sided sludge storage building that was originally designed to provide 180 days of storage time. With cake solids averaging 16% TS, the actual storage time is more like 150 days. Stored biosolids cake is land applied by City personnel and equipment. This equipment includes an articulated four wheel drive tractor, biosolids spreader, and two biosolids hauling trucks. NR 110 requires at least 180 days of biosolids storage. The existing biosolids cake storage building is undersized, failing to provide the required 180 days of storage. Because agricultural practices, road weight limits, weather patterns, and WDNR tolerance for land application on frozen ground have changed, the previously narrow spring and fall land application windows have become narrower or, during some years, virtually eliminated. If/when the storage building is full, the City is left with a single costly alternative: landfilling wet cake solids.

Issues

- The storage building is open on the sides, including the entrance side. To keep biosolids in and rain water out of the storage bays, sand from 3M is used to make temporary walls at the entrance-side of the building. The sand gets washed into the Facility or gets inadvertently mixed with the biosolids, adding to the amount of material that must be hauled off site and land applied.
- The spring and fall hauling windows are getting progressively narrow, often precluding land application of the material generated between hauling periods. Spring hauling has become particularly challenging due to agricultural practices, road weight limits, and weather patterns. The existing storage building does not provide the required 180 days of storage; however, 180 days of storage is no longer a feasible storage time. Recently, many facilities with a robust land application program have elected to construct far more than 180 days of storage (e.g., 365 days of storage).
- Some of the biosolids generated at the Facility have exceeded the high quality standard of 41 mg/Kg of arsenic. These concentrations are suitable for land application as a Class B material; however, they would preclude classification as a Class A EQ material. The City should continue its efforts to identify the source of arsenic.

3.9.14 ANCILLARY SYSTEMS

Emergency Generator System

The Facility is powered by a 750-kW diesel-fueled emergency generator. The generator was installed in 1988, has 694 runtime hours, and is well maintained. The generator is undersized to power the entire Facility. The room that houses the generator also houses a 750-gal diesel fuel tank. Per NFPA 37, fuel tanks in a room with other equipment cannot exceed 660 gallons. The generator room houses a motor control center that contains a 600-amp breaker that feeds an emergency feed to the Blower Building. This feeder provides generator power to a portion of the Blower Building. The parallel conduit/feeders take different routes to the Blower Building. Code states parallel conduit/feeders shall take the same route, be the same length, and be physically the same. Since the parallel conduit/feeders are different, one feeder could carry more than half the load and could become overloaded. The electrical distribution system is nearing the ends of its reliable service life.

Reclaimed Effluent System

The Facility uses reclaimed effluent at multiple locations for wash-down water, including pre-digestion thickening and post-digestion dewatering. The water supply pumps often plug with algae and need automatic strainers. Because the reclaimed effluent is pulled from the forward flow upstream of disinfection and does not carry a chlorine residual, the distribution piping is likely to have a significant build-up of biological growth.

Polymer Systems

The polymer systems were installed in 1988 and are nearing the end of their reliable service lives. Polymer is fed to pre-digestion thickening and post-digestion dewatering.

Boiler System

Three natural gas fired boilers provide heat to the hot water loop. All three boilers are nearing the end of their reliable service lives. One of the boilers is leaking and the room housing the boilers has high levels of carbon dioxide. The boilers are installed below grade and the room often has standing water on the floor. See the NFPA 820 discussion (Section 3.10).

Biogas Storage Sphere

The 40-ft diameter storage sphere was recently rehabilitated. At 40 psi, the sphere can store nearly 125 kcf of biogas. The biogas compressors are nearing the end of their reliable service lives and can only operate at approximately 25 psi. There is currently no H2S or moisture removal prior to the biogas storage sphere.

Microturbines

Two 65-kW microturbines burn biogas from the digestion process and produce electricity that partially powers the Facility. Heat produced by the microturbines is recovered and used to discharge heat to the hot water loop. The units draw warm air from inside the Blower Building rather than cooler outside air.

The microturbines would be more efficient if they used outside air. The heat recovery system cannot be bypassed to reject excess heat. This can overheat the digesters during warm-weather months.

3.9.15 BUILDINGS

Main Building

This building houses the administrative offices, process control room, laboratory, pre-digestion thickening, post-digestion dewatering, maintenance spaces, storage spaces, and garage spaces. The majority of this Building was constructed in 1939 and 1967. The roofing, walls, ceiling, and floors are in poor condition. The HVAC system has poor zone control as most of the pneumatic controls are nearing the end of their reliable service lives. The lighting system is inefficient. There is no female locker room in the Main Building or anywhere else on site. The process control room is undersized and lacks proper climate control. The laboratory is undersized and has old casework and counters. Much of the equipment in the laboratory is nearing the end of its reliable service life. There is no laboratory computer. Without a drainage system and sump pump, the lower level is inundated with groundwater infiltration. The backflow preventers in the lower level are susceptible to flooding. A flood could contaminate the City water supply. In general, the Facility lacks adequate equipment storage space. See the NFPA 820 discussion (Section 3.10).

Grit Building

The Grit Building houses the grit removal, grit separation/washing, scum thickening, and influent flow metering systems. The fiberglass structure is minimally insulated and a tremendous heat sink for the hot water loop during the cold-weather months. Lighting is poor and inefficient. The internal environment is extremely humid and corrosive. The building contains exposed raw wastewater and is a Class I, Division 1 Hazardous Classified location per NFPA 820. All equipment and conduit in this space must be suitable for this classification.

Blower Building

The Blower Building houses the aeration system blowers, the microturbines, and the gas treatment equipment. The building is also used to store equipment. The roof is in poor condition: the joints are pulling loose, the insulation is deteriorating, and the membrane is pulling apart. The lighting system is inefficient. See the NFPA 820 discussion (Section 3.10).

Effluent Filter Building

This building houses effluent filtration, disinfection, and the reclaimed effluent pumping system. The HVAC equipment is nearing the end of its reliable service life. The lighting system is inefficient. The roof is in poor condition: the joints are pulling loose, the insulation is deteriorating, and the membrane is pulling apart.

Digestion Building

This building houses the digestion process equipment, biogas system equipment, biosolids piping, and biogas piping. Lighting is poor and inefficient. The roof is in poor condition: the joints are pulling loose,

the insulation is deteriorating, and the membrane is pulling apart. See the NFPA 820 discussion (Section 3.10).

Vehicle Storage Building

The Vehicle Storage Building wastewater vehicles and some wastewater equipment. The building is in good condition; however, it lacks adequate space to house all of the wastewater vehicles and equipment.

3.10 NFPA 820

The purpose of the National Fire Protection Association's NFPA 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities is to provide a degree of fire and explosion protection for life, property, continuity of mission, and protection of the environment; and reduce or eliminate the effects of fire or explosion by maintaining structural integrity, controlling flame spread and smoke generation, preventing the release of toxic products of combustion, and maintaining serviceability and operation of the facility. It is concerned with hazards created by flammable/combustible gases, liquids, and dusts at wastewater treatment and collection facilities and defines the hazard and classification for the process areas. Hazards present at WWTFs are listed below.

- Flammable/Combustible Gases and Liquids
  - Methane/Biogas/Digester Gas
  - Formed by the biological degradation of volatile solids, typically in the absence of free oxygen
  - Flammable hydrocarbons
  - Gasoline, solvents, oils, and greases
- Combustible Dusts
- Dried sludge

The classification of hazards are delineated below. Spaces of greater hazard shall be "physically separated" from spaces of lower hazard or else the rating of the greater hazard applies to the connected space. "Physical separation" means a gas tight partition or non-adjacent spaces.

- Class I, Division 1: (CID1)
  - A location in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions.
  - Examples: Building with exposed raw wastewater (prior to primary sedimentation), digester gas handling spaces, tanks with stored sludge.
- Class I, Division 2: (CID2)
  - A location in which volatile liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case or abnormal operation of equipment.
  - Examples: Below grade sludge and raw wastewater pumping spaces with closed piping systems, digester gas utilization spaces (boiler room), dewatering spaces.
- Class II hazards are associated with combustible dust and can be Division 1 or Division 2 dependent on the anticipated frequency of dust exposure. Class II locations are typically limited to sludge drying processes.

The Screening Room has exposed raw wastewater. This space should be treated as a CID1 hazardous environment and should be physically separate from other spaces. Most equipment within this space is currently suitable for the hazard and the space is generally physically separate from other spaces in the Facility.

The Raw Wastewater (RWW) Pump Room has below-grade raw waste water pumping. This space should be considered a CID2 hazard unless continuously ventilated at a rate of 6 ACH with outside air. The existing ventilation systems appear inadequate to achieve this minimum ventilation rate. Additionally, the RWW Pump Room is physically connected to the rest of the Main Building and the majority of the Facility through the tunnel system, extending the hazard throughout the plant. None of the components within the RWW Pump Room are suitable for a hazardous environment.

The lower level of the Main Building houses digester gas fired boilers and digester gas drip and condensate traps. Digester gas fired boilers are considered gas utilization equipment. This type of process space requires 6 ACH of continuous ventilation or be considered a CID2 hazard. The drip and condensate traps are considered gas handling equipment and this type of process space should be considered a CID1 hazard. Like the RWW Pump Room, this Boiler Room is connected to the plant through the tunnel system and none of the equipment within the Boiler Room is suitable for a hazardous environment.

The Tunnel, Main Building, Digester Building, and Blower Building contain below-grade sludge pumping equipment. Additionally the Blower Room contains the biogas-fired microturbines which are classified as gas utilization equipment. These spaces should be considered a CID2 hazard unless continuously ventilated at a rate of 6 ACH with outside air. The existing ventilation systems appear inadequate to achieve this minimum ventilation rate. Additionally, the tunnel system connects to the Main Building, extending the hazard throughout that structure. None of the components within these spaces, other than a percentage of components in the Digester Complex are suitable for a hazardous environment.

The Gas Compression Room adjacent to the Blower Building contains gas handling equipment. The space is connected to the Blower Building through a vestibule space, extending the hazard into the Blower Building. The Gas Compression Room space should be treated as a CID1 hazardous environment and should be physically separate from other spaces. Most equipment within this space is currently suitable for the hazard.

The lower level of the Blower Building and portions of the Tunnel include drip traps and condensate traps on the biogas piping system that are classified as gas handling equipment. These spaces should be treated as a CID1 hazardous environment and should be physically separate from other spaces.

4. FUTURE CONDITIONS | TREATMENT FACILITY

4.1 SERVICE AREA

The City intends to accept, convey, and treat wastewater from two small neighboring communities during the 20-year planning period: Brokaw and Maine. During the preparation of this Plan, Marathon City and Edgar, communities west of the City, asked the City to consider accepting, conveying, and treating their wastewater. Figure 4-1 shows where Brokaw and Maine are located. Regionalizing with Marathon City and Edgar proved cost prohibitive. For the purposes of this Plan, the future Service Area includes the City of Wausau, the City of Schofield, the Weston industrial park, the Village of Brokaw, and a portion of the Village of Maine.

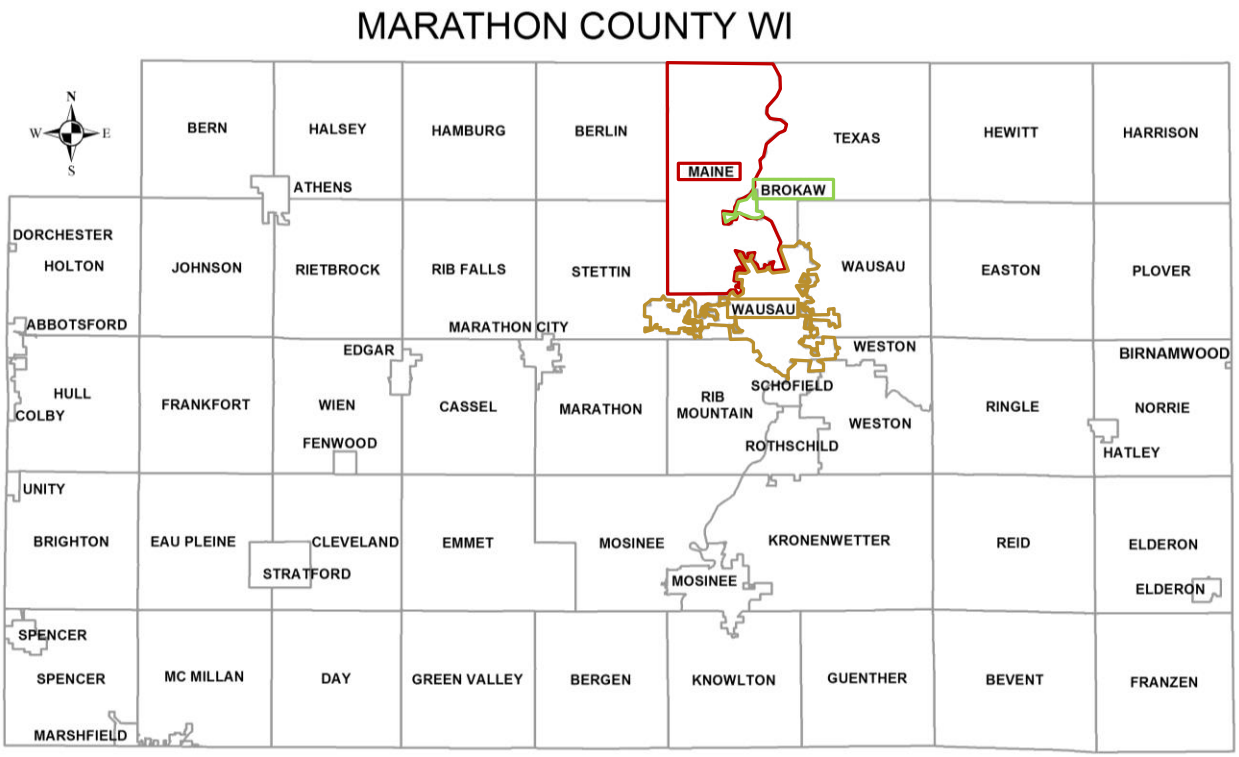


Figure 4-1 Regional Location Map Showing Brokaw and Maine Relative to Wausau

4.2 POPULATION

Service Area population projections were developed using Department of Administration (DOA) population projections and in a manner consistent with the Wausau Urban Area Sewer Service Area Plan 2040 (NCWRPC, May 2018). The Year 2020 is considered the present day. The future Service Area includes the City of Wausau, the City of Schofield, the Weston industrial park, the Village of Brokaw, and a portion of the Village of Maine. Estimated present day (Year 2020) and projected future (Year 2040) populations for Wausau, Schofield, and Brokaw are identical to those provided by the DOA. The Maine population is identical to that included in the Wausau Urban Area Sewer Service Area Plan 2040 (NCWRPC, May 2018).

Populations predicted for the Design Year (2040) and preceding years are shown in Table 4-1. The Year 2020 populations, which represent present-day populations, are included for reference. The maximum estimated Service Area population occurs in Year 2030. Future flow and loading calculations use this maximum Service Area population (44,720), also referred to as the Design Basis Population.

Table 4-1 Design Period Service Area Populations

Community	2020	2025	2030	2035	2040
Wausau	40,460	41,100	41,490	41,450	41,070
Schofield	2,205	2,210	2,205	2,180	2,135
Brokaw	270	280	300	315	325
Maine	705	718	725	726	721
Total Service Area	43,640	44,308	44,720	44,671	44,251

4.3 FLOWS

Design flows were calculated by multiplying the existing flows by the Design Basis Population and dividing by the present-day population without Brokaw and Maine. This simple proration method is appropriate considering that the projected population increase is relatively small and the Service Area is anticipated to grow in a manner consistent with its current mix of residential, public, commercial, and industrial contributions.

The Design Basis Flows are shown in Table 4-2. The corresponding Design Basis Population is 44,720. The design peak instantaneous flow will remain consistent with the current peak instantaneous capacity of the Facility (35.8 mgd). The peaking factors in the table below are calculated by dividing the particular parameter value by the average value.

Table 4-2 Design Basis Flows

Flow	Flow (mgd)	Peaking Factor
Average	5.4	
Maximum Month	9.2	1.69
Maximum Week	11.6	2.14
Maximum Day	16.8	3.10
Peak Hour	22.0	4.06
Peak Instantaneous	35.8	

4.4 LOADINGS

Future loadings were calculated by multiplying the present-day loadings by the Design Basis Population and dividing by the present-day population without Brokaw and Maine. This simple proration method is appropriate considering that the projected population increase is relatively small and the Service Area is anticipated to grow in a manner consistent with its current mix of residential, public, commercial, and industrial contributions. The Design Basis Loadings are shown in Table 4-3. The corresponding Design Basis Population is 44,720.

Table 4-3 Design Basis Loadings

Parameter	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)	Per Capita Load [ppcd][(2)]
BOD	11,190	14,438	17,458	24,108	0.25
TSS	11,763	16,361	19,005	31,445	0.26
TKN	2,004	2,586	3,130	4,193	0.045
TP	545	703	850	1,258	0.012

4.5 SOLIDS PRODUCTION

Design Basis Solids Production values are provided in Table 4-4. These values correspond to the Design Basis Loadings.

Table 4-4 Design Basis Solids Production Values

Parameters	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)
Primary Sludge	8,824	12,138	11,195	12,443
Waste Activated Sludge	6,869	8,966	12,202	12,202
Total Raw Sludge	15,693	21,104	23,397	24,645
Digested Sludge	10,409	14,662	17,229	18,053

4.6 THE PERMIT

The WPDES Permit issued effective on January 1, 2019 is provided in Appendix B. This Permit, unless modified for some unforeseen reason, will remain in effect until at least December 31, 2023. The total phosphorus limit is currently an interim limit. The future limit will be defined by the impending WDNR- and USEPA-accepted phosphorus TMDL. The WPDES Permit also defines the biosolids stabilization, handling, and land application requirements. Based on the current regulatory focus and discussions with WDNR, none of the non-phosphorus effluent limits and biosolids requirements are expected to change in the five- to 10-year horizon. Nonetheless, regulations have changed abruptly and unexpectedly in the past. The next Section discusses the current regulatory landscape and the potential for future requirements beyond the 10-year horizon.

4.7 THE REGULATORY LANDSCAPE

4.7.1 NUTRIENTS

The USEPA developed regional nutrient criteria, referring to them as ecoregional nutrient criteria, with the expectation that individual states would use the seventeen ecoregional nutrient criteria as starting points to develop more precise numeric levels to protect aquatic life and recreational or other uses on a site-specific or subregion-specific basis. The USEPA expects states to develop more precise criteria on a smaller geographic scale than the ecoregional values. States may develop criteria using other scientifically defensible methods and appropriate water quality data or adopt USEPA's recommended

water quality criteria in the absence of better data. The WDNR has established phosphorus criteria. It has not established criteria for total nitrogen.

Total Phosphorus

Until recently, the Wisconsin Administrative Code (WAC) established a technology-based effluent phosphorus limit of 1.0 mg-TP/L. Revisions effective December 1, 2010 established water quality criteria for phosphorus. TMDLs are required for surface water bodies that do not meet their water quality standards and are therefore, by definition, impaired. TMDLs define the amount of a particular pollutant that may be present in a waterbody, allocates allowable pollutant loads to all contributing point and nonpoint sources, and provides the basis for attaining or maintaining water quality standards.

Because downstream Wisconsin River water bodies are phosphorus impaired, the WDNR is developing a phosphorus TMDL for the Wisconsin River. The TMDL will be completed and approved by the WDNR and USEPA in the next year or two. Based on a draft TMDL published in early 2018, the effluent phosphorus mass allocation will require effluent phosphorus concentrations in the range of 0.2 – 0.4 mg-TP/L. Neither the WDNR nor USEPA are likely to impose effluent phosphorus limits more restrictive than the impending phosphorus TMDL.

Ammonia

An effluent ammonia limit is unlikely based on the current NR requirements. Because flow in the Wisconsin River is much larger than the flow from the Facility, an effluent limit is not expected for the foreseeable future. If the Department elected to include an ammonia limit in a future Permit, the limit would be high enough that the Facility could easily meet it assuming the current River to effluent dilution ratio and historical effluent pH values are representative of the conditions at that time. Ammonia is not a near-term compliance issue or concern.

Total Nitrogen

The WDNR has not established a schedule to develop total nitrogen criteria despite the USEPA's expectation for them to do so. Potentially a precursor to a future TN limit, the current WPDES Permit includes effluent monitoring for the various nitrogen species: ammonia nitrogen, total kjeldahl nitrogen, nitrate and nitrite nitrogen, and total nitrogen. It seems prudent to consider secondary treatment alternatives that, at a minimum, possess an inherent flexibility to be readily modified to produce effluent TN concentrations less than 10 mg-TN/L.

4.7.2 MICROPOLLUTANTS

Micropollutants refer to emerging contaminants of concern that can persist in the environment and remain bioactive. These contaminants represent a multitude of compounds, including pharmaceuticals, pesticides, personal care products, and endocrine disrupting compounds that may pose a threat to aquatic life. Some of these compounds can bioaccumulate in the tissue of aquatic organisms. Research into the causal effects and cost-effective treatment strategies is ongoing. Studies have found the fate of these compounds through a WWTF is variable and compound specific. Operating activated sludge systems at longer solids retention times (SRTs) has demonstrated an ability to enhance the destruction or removal of many of the studied compounds. Researchers are also looking at the significance of micropollutants in biosolids. These compounds could one day be regulated in biosolids. Nevertheless,

there are currently no Federal or State regulations for these compounds either in the effluent or biosolids. It is unknown when, or even if, regulations will be established. As such, micropollutants are not a near-term compliance issue or concern.

4.7.3 BIOSOLIDS

The USEPA refers to biosolids as the nutrient-rich organic materials that are produced when treating domestic or municipal wastewater at a wastewater treatment facility. When sufficiently treated and processed, these residual solids can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth. Based on more than a decade of scientific study and a research-based risk assessment, the USEPA established regulations for the final use and disposal of biosolids in 40 Code of Federal Regulations (CFR), Part 503 (1993) and adopted a national policy to promote beneficial reuse through land application. The WDNR has taken the same position regarding beneficial reuse. NR 204 states the following: the beneficial use of biosolids and recycling them to the land as a fertilizer or soil conditioner is encouraged, rather than disposing of them through incineration or landfilling. The WDNR directly regulates biosolids through the WPDES Permit program.

Biosolids are classified as either Class A or B. If concentrations of specific metals is less than the values stated in 40 CFR, Part 503 and NR 204, then Class A biosolids are designated as Exceptional Quality (EQ). Metals requirements are summarized in Table 4-5. Historical metals concentrations (2014 – 2016) are below the Class A EQ thresholds with one exception: the arsenic concentration for the April – June 2015 reporting period was 55.2 mg/Kg. This appears to be an anomaly and the Facility has the potential, with proper biosolids processing, to produce a Class A EQ biosolids end product.

Table 4-5 Biosolids Metals Restrictions

Metal	Class A EQ Concentrations (mg/Kg)	Class A or B Ceiling Concentrations (mg/Kg)	Lifetime Cumulative Limit for Class B (lbs/ac)
Arsenic	41	75	36
Cadmium	39	85	34
Copper	1,500	4,300	1,339
Lead	300	840	268
Mercury	17	57	15
Molybdenum	*	75	*
Nickel	420	420	375
Selenium	100	100	89
Zinc	2,800	7,500	2,500

*USEPA is revising

Class B Biosolids

Class B biosolids are produced by a process that reduces pathogens to a level that significantly reduces the risk to the public. The Facility currently uses and has historically used mesophilic anaerobic digestion to produce a Class B biosolids product. These solids are restricted to landfilling or bulk application to

agricultural land, forest, or reclamation sites as a fertilizer and soil amendment. This end product is not suitable for unregulated distribution to the agricultural community, landscapers, or general public. Class B biosolids carry strict site restrictions that limit crop harvest schedules and public/livestock access or contact. Table 4-6 summarizes other Class B site restrictions (NR 204) to protect groundwater, surface water, public access, and public perception.

Table 4-6 Class B Site Criteria by Land Application Method

Criteria	Surface	Tillage	Injection
Depth to Bedrock (ft)	3	3	3
Depth to High Groundwater (ft)	3	3	3
Allowable Slope (%)	<6	0 - 12	0 - 12
Distance to Well: Community or School (ft)	1,000	1,000	1,000
Distance to Well: Private Potable (ft)	250	250	250
Distance to Well: Irrigation (ft)	50	50	50
School or Healthcare Facilities (ft)	1,000	1,000	1,000
Property Lines (ft)	50	25	25
Stream, Lake, or Wetland (ft): 0 to 6% Slope	200	150	100
Stream, Lake, or Wetland (ft): 6 to 12% Slope	Not Allowed	200	150
Soil Permeability (in/hr)	0.2 – 6	0 – 6	0 - 6

Current agricultural practices limit Class B land application to narrow spring and fall time frames, often on the order of two weeks and potentially narrower depending on weather conditions and seasonal weight limits on County Highways. “Mother nature” is in charge of all Class B land application programs that rely on agricultural fields. Recent weather trends have proven problematic for both spring and fall hauling and land application seasons.

NR 151 now requires agricultural operations to implement nutrient management plans. These plans monitor nutrients such as nitrogen and phosphorus through routine soil samples and documentation of crop rotations. This relatively recent requirement (2010) has increased the cost, effort, and challenge to land apply biosolids on agricultural fields. Facilities need more fields than they did previously. Many of these fields are farther from the Facility, increasing hauling costs, labor requirements, competition for suitable sites, and other logistical challenges related to finding, getting approval of, getting to, and getting on suitable Class B land application sites.

Historically and presently, Class B biosolids application rates are limited to agronomic nitrogen loadings. Future application rates are likely to be limited by agronomic phosphorus loadings to better protect surface waters. This requirement would roughly triple the required acreage and time to land apply. Limiting application rates to agronomic phosphorus loadings is likely to cause another distressing challenge: acceptance by the agricultural community. Applying biosolids at an acceptable phosphorus loading will dramatically reduce the nitrogen loading to roughly 1/3 of historical or present-day loadings. Land owners are likely to decide biosolids application no longer provides adequate value as the fields will need supplemental nitrogen fertilizer after the biosolids are applied and biosolids application delays planting and compacts the soil.

Although current Class B biosolids regulations are science based, future regulations may be defined by public opinion. High-profile stories involving Class B biosolids have prompted public discourse regarding the longevity of Class B regulations and the potential for future Federal regulations eliminating Class B and allowing only Class A. Such a change would not be driven by science, but rather by one or several sensational news stories and/or effective activist groups that change public perceptions and acceptance. Neither the USEPA nor the WDNR require facilities to produce a Class A end product. It's quite the opposite as both agencies endorse and advocate for Class B land application. Nevertheless, facilities making a significant biosolids program investment might be wise to consider the potential for future regulations that are more restrictive.

Biosolids are land applied by City staff and equipment on WDNR-approved agricultural fields. Land owners have historically accepted Class B biosolids as a nutrient supplement; however, it is increasingly difficult for staff to haul and land apply biosolids on WDNR-approved fields during increasingly short spring and fall hauling seasons. Moreover, it is becoming increasingly difficult to find fields in the area that can satisfy the nutrient management plan and WDNR requirements for topography, soil type, and separation from groundwater. The Facility will face an additional significant challenge if/when land application rates are limited to agronomic phosphorus loadings.

Class A Biosolids

Class A biosolids undergo a process to further reduce pathogens to a level that is nearly non-detectable and similar to the native soil and environment, eliminating crop harvest and public access restrictions. Class A EQ biosolids can be distributed to and used by the general public as a fertilizer product and have minimal regulatory requirements. In addition to agriculture, these end products can be used for landscaping, horticulture, and other public uses.

Because of the additional processing required to reduce pathogen levels, the initial cost to produce Class A biosolids is often higher than the cost to produce Class B biosolids. Relaxed regulations, however, offer the potential to reduce annual costs for biosolids disposal. The increasingly troublesome and restrictive logistics inherent with large Class B land application programs are prompting an increasing number of facilities to invest in Class A technologies, particularly those that produce a dry Class A EQ product that can be distributed unhindered. In addition to reducing land application restrictions, drying dramatically reduces biosolids volume, weights, and, in turn, vehicle traffic to/from a Facility and on City streets.

4.7.4 CMOM PROGRAM

The WDNR, through the WPDES Permits, requires all collection system owners to develop and implement a Capacity, Management, Operations, and Maintenance (CMOM) Program. According to the Department, a CMOM Program is to assure that a sewage system is properly managed, operated and maintained at all times; has adequate capacity to convey peak flows; and all feasible steps are taken to eliminate excessive infiltration and inflow from the system. A CMOM Program must mitigate the impact of overflows on waters of the State, the environment, and public health. The City has a Permit-compliant CMOM program.

5. ALTERNATIVES ANALYSIS | TREATMENT FACILITY

This Chapter documents the evaluation of alternatives that address present-day and design-year issues and concerns. The alternatives that address these shortcomings have been grouped into the three categories listed and defined in Table 5-1. Many of the alternatives, particularly those that address safety-, condition-, and/or performance-related issues, do not have a competing alternative or alternatives. Alternatives that do not have a competing alternative remedy shortcomings in a straightforward and cost-effective manner consistent with the present-day Facility configuration, leveraging to the maximum extent possible previous infrastructure investments.

Table 5-1 Issue Categories

Issue Categories	Definition
Safety, Reliability, and Performance	Some of these alternatives remedy safety-, condition-, or age-related deficiencies associated with process equipment, equipment ancillary to processes, process-related infrastructure, and Facility-related infrastructure. Other alternatives enhance the performance, stability, reliability, and/or efficiency of a particular unit process.
Capacity	These alternatives enhance the capacity of a particular unit process to adequately and efficiently accommodate projected Design Year flows and loadings.
Regulations	These alternatives enhance existing unit processes, replace existing unit processes, or add unit processes to comply with more stringent future regulations. For this Plan, these alternatives were aimed exclusively at phosphorus compliance. The Facility discharges to a stretch of the Wisconsin River that is part of a phosphorus TMDL. The WDNR and USEPA have not completed the TMDL; however, the draft TMDL suggests the Facility will likely be assigned a maximum daily phosphorus mass limit that requires effluent phosphorus in a range of 0.2 – 0.4 mg-TP/L.

5.1 PROCESS ISSUES AND CONCERNS

Process issues and concerns are pervasive throughout the aging Facility. These were delineated in Chapters 3 and 4 and are summarized in Table 5-2. Figure 5-1 shows required unit process capacities relative to the current capacities. Bars that exceed the horizontal 100% line lack adequate capacity.

5.2 NON-PROCESS ISSUES AND CONCERNS

Non-process issues and concerns are pervasive throughout the aging Facility. These were delineated in Chapters 3 and 4. In general, non-process issues and concerns are related to aging Buildings, aging Site features and infrastructure, and changed or more restrictive safety Standards, building Codes, and workplace requirements. Example age-related issues include aging or near-end-of-life pavement, sidewalks, roofing systems, doors, windows, HVAC systems, electrical/lighting systems, and control systems. Example changed or more restrictive Standards, Codes, and workplace requirements include NFPA 37 requirements, NFPA 820 requirements, the need to provide handicap accessibility, and the need to better accommodate female staff and visitors.

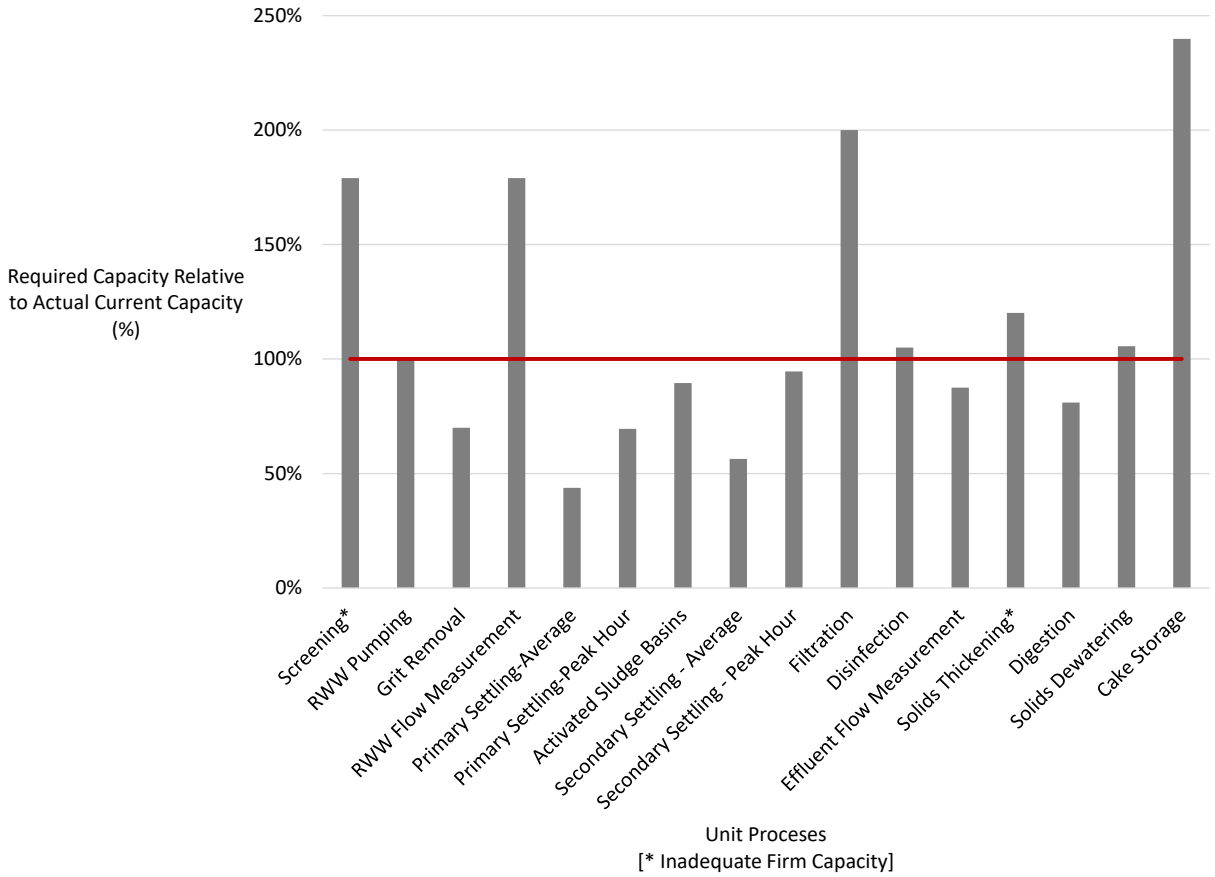


Figure 5-1 Existing Unit Process Capacities Relative to Required Capacities

Table 5-2 Summary of Existing Unit Process Issues and Concerns

Unit Process	Safety, Reliability, Performance	Capacity	Regulations
Raw Wastewater Screening	■	■	
Raw Wastewater Pumping	■		
Grit Removal and Influent Flow Measurement	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Effluent Filtration	■	■	■
Disinfection	■	■	
Chemical Phosphorus Removal	■	■	■
Pre-Digestion Thickening	■	■	
Anaerobic Digestion	■		
Post-Digestion Dewatering	■	■	
Biosolids Cake Storage	■	■	●

● Denotes does not meet the regulatory required 180-d of storage. This is an existing regulation, not a new one. The existing cake storage capacity does not provide a robust and reliable 180-d of storage; however, 180-d of storage is woefully inadequate for the Wausau situation.

5.3 ALTERNATIVE COMPARTMENTS

The alternatives developed and evaluated in this Report were precipitated by discussions that occurred during multiple Workshops in 2017 and 2018. City staff, Becher Hoppe, and Donohue participated in these Workshops. The collaborative Workshops identified alternatives to address the issues and concerns documented in Chapters 3 and 4. Alternatives were grouped in the Alternative Compartments listed below. Table 5-3 shows how unit processes are assigned to the Alternative Compartments, and the issues and concerns the alternatives must address.

11. Preliminary Treatment
12. Primary Settling
13. Activated Sludge System
14. Secondary Settling
15. Phosphorus and Filtration
16. Disinfection
17. Anaerobic Digestion
18. Solids Processing
19. Site Features
20. Administration-Maintenance-Storage

Although the unit processes assigned to the Phosphorus and Filtration Alternative Compartment have condition and capacity concerns that must be addressed, all feasible alternatives for this Compartment must be capable of satisfying both the impending low-level phosphorus limit and the current daily WLA BOD limit. With that in mind, this Compartment is viewed to exclusively address the Regulatory concern.

5.4 COST ALLOCATION

Elected officials and the rate paying community deserve a clear and succinct explanation of the issues and concerns proposed capital improvements address. For each Alternative Compartment, Table 5-4 allocates costs to the issues it addresses. These allocations are used in a later section to show the costs of addressing the various issues.

5.5 OPINIONS OF COST

Detailed planning phase capital cost opinions are included in Appendix D. The cost opinions include standard percentage allowances as follows: 30% allowance for undefined design detail, 25% contractor overhead and profit, and 15% for design and construction engineering services. Alternatives also include alternative-specific allowances for undefined design detail related to the various construction disciplines: civil, process-mechanical, electrical, instrumentation, plumbing, and HVAC.

Annual cost opinions are developed when two competing alternatives have different annual operating costs. The annual costs are converted to a 20-year present worth cost using the WDNR prescribed discount rate (3.625%). The 20-year present worth represents the current dollars required to construct the improvements and operate them for 20 years.

Table 5-3 Alternative Compartments

Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Raw Wastewater Screening	■	■	
Raw Wastewater Pumping	■		
Grit Removal and Influent Flow Measurement	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Chemical Phosphorus Removal	■	■	■
Effluent Filtration	■	■	■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Pre-Digestion Thickening	■	■	
Post-Digestion Dewatering	■	■	
Biosolids Cake Storage	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Denotes Alternative Compartment

● Denotes does not meet the regulatory required 180-d of storage. This is an existing regulation, not a new one. The existing cake storage capacity does not provide a robust and reliable 180-d of storage; however, 180-d of storage is woefully inadequate for the Wausau situation.

Table 5-4 Cost Allocation to Issue Categories

Alternative Compartments	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	80%	20%	
Primary Settling	100%		
Activated Sludge System	80%	20%	
Secondary Settling	100%		
Phosphorus and Filtration			100%
Disinfection	20%	80%	
Anaerobic Digestion	100%		
Solids Processing	60%	40%	
Site Features	100%		
Administration, Maintenance, and Storage	100%		

5.6 RESIDENTIAL USER COST PERSPECTIVE

In addition to presenting capital, annual, and total present worth cost opinions, subsequent sections provide opinions of the typical residential rate increases. Two scenarios are considered: Clean Water Funding (CWF) over a 20-year term (1.87%) and over a 30-year term (2.07%). During multiple discussions throughout 2018, the WDNR and CWF staff have stated that, starting in 2019/20, WWTF projects will be eligible for 30-year financing. A 30-year financing term appears entirely appropriate considering that the most recent major Facility upgrade was 30 years ago. As intended, the City would use the Replacement Fund to pay for equipment that must be replaced before the next major Facility upgrade.

According to the City, the typical residential rate payer in 2018 pays $16.39 per month for wastewater service based on a $17 per quarter fixed fee, a $2.59/100-cf usage fee, and an annual consumption of 37,176 gpy. Rate implication opinions assume 110% revenue coverage and approximately 51.94% of the total revenue is derived from the residential class comprised of 14,163 users. Table 5-5 provides some user rate perspectives for a typical residential user.

Table 5-5 Opinion of Monthly Residential Rate Increases

Amount Borrowed	20-Yr Term	30-Yr Term
$1M	$0.203	$0.152
$10M	$2.03	$1.52

5.7 EVALUATION

5.7.1 PRELIMINARY TREATMENT

This Alternative Category addresses the issues associated with raw wastewater screening, raw wastewater pumping, and grit removal. Collectively these unit processes are regarded in the wastewater treatment industry as Preliminary Treatment processes. There are two competing alternatives: PRT-1 | Rehabilitate Existing Preliminary Treatment Processes and PRT-2 | Construct a New Preliminary Treatment System.

PRT-1 | Rehabilitate Existing Preliminary Treatment Processes

This alternative rehabilitates the existing raw wastewater pumping system, retaining its existing firm and total pumping capacity. It replaces the four raw wastewater pumps, replaces all raw wastewater valves and piping, and generally reconditions the system for another generation or more of reliable services. This alternative also enhances the existing screening system by addressing maintenance concerns. It replaces the problematic screenings handling system, automates the gates upstream of the screens and contingent bar rack, and expands the grade-level screening room to facilitate screen removal and maintenance. This alternative also rehabilitates the existing grit removal system by improving flow measurement (twin magnetic flow meters) and sampling, replacing the fiberglass enclosure with a masonry structure, replacing the grit removal equipment, and enhancing proportional flow splitting to the downstream Primaries. Costs are provided in the table below.

Table 5-6 Capital and Associated User Costs for Preliminary Treatment Alternative PRT-1

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
PRT-1A	4.875	0.74	0.99
PRT-1B	3.975	0.60	0.81
Total	8.850	1.35	1.80

PRT-2 | Construct a New Preliminary Treatment System

This alternative abandons the existing Preliminary Treatment process and replaces them in the form of a new Preliminary Treatment Building, providing completely new raw wastewater pumping, screening, and grit removal systems. Costs are provided in the table below.

Table 5-7 Capital and Associated User Costs for Preliminary Treatment Alternative PRT-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
PRT-2	21.258	3.23	4.32

Recommendation

Implement PRT-1 | Rehabilitate Existing Preliminary Treatment Processes. This alternative addresses the issues and concerns, is capable of providing a generation or more of reliable performance, maximizes the return on previous infrastructure spending, and costs significantly less than the competing alternative: RPT-2. Because annual costs between the two competing alternatives are similar or identical, a total present worth cost comparison is irrelevant. Costs are provided in the table below.

Table 5-8 Costs for the Preliminary Treatment Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
PRT-1	8.850	7.080	1.770	0	1.35	1.80

5.7.2 PRIMARY SETTLING

This alternative (SET-1 | Rehabilitate the Primary Settling System) addresses the issues associated with the Primary Settling process by rehabilitating the existing primary settling complex to provide another generation or more of reliable service. The continued use of the existing infrastructure maximizes the return on previous infrastructure spending. There are no competing cost-effective alternatives.

Recommendation

Implement SET-1 | Rehabilitate Primary Settling System. Costs are provided in the table below.

Table 5-9 Costs for the Primary Settling Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SET-1	1.671	1.671	0	0	0.25	0.34

5.7.3 ACTIVATED SLUDGE

This alternative (AS | Rehabilitate and Enhance Activated Sludge System) addresses the issues associated with the Activated Sludge System: aging and antiquated diffused air system, leaking aeration piping, poor operational control, poor load distribution between parallel treatment trains, and poor historical performance and stability. This alternative would address the age- and condition-related concerns as well as enhance its performance, controllability, and nitrification capacity. It would also provide an inherent capability to enhance biological phosphorus removal, control filament bacteria growth, alkalinity recovery, and nitrogen removal.

A schematic of the configuration is provided in Figure 5-1. The six existing activated sludge basins would be modified so they can either operate as two parallel three-pass basins or six parallel single-pass basins (current operating mode). A high F:M selector would be constructed upstream of the activated sludge basin to dramatically enhance mixed liquor (ML) settling performance. All primary effluent flows less than an operator-defined high-flow threshold (e.g., the maximum day flow rate or 16 mgd) would be routed to the selector and activated sludge basins. Primary effluent flows beyond the high-flow threshold could be routed to the back end of the activated sludge basins to dramatically increase the wet-weather flow performance and capacity of the secondary settling system by reducing the solids loading rate on the secondary settling system. The primary effluent routed to the back-end of the activated sludge system would co-mingle with the ML upstream of settling and receive solids-contact biological treatment.

The F:M selector volume would be approximately 0.38 mgal, supplementing the 2.75 mgal available in the six existing activated sludge basins. The total activated sludge volume would be 3.13 mgal. At the future average raw wastewater BOD loading condition and a conservatively low 30% BOD removal in primary settling, the activated sludge system would receive a volumetric BOD loading of less than 20 ppd-BOD/kcf. Activated sludge systems, here in Wisconsin and throughout the wastewater industry, have proven capable of providing reliable warm- and cold-weather nitrification at this volumetric loading.

The F:M selector basin, revised activated sludge basin configuration, and enhanced aeration system configuration and controls offers the potential to satisfy a future 10-mg-TN/L limit. Routing primary effluent to the third pass of the three-pass activated sludge system could serve to further enhance total nitrogen removal through simultaneous nitrification/de-nitrification. The proposed configuration addresses all of the current and near-term issues facing the existing Activated Sludge System. It can also, if operated in a manner to do so, enhance total nitrogen removal. Operating at cold-weather nitrification solids retention times (SRTs), the system is likely to remove micropollutants better than the system does today.

The continued use of the existing infrastructure maximizes the return on previous infrastructure spending. The F:M selector basin adds a small fraction of additional activated sludge system volume (14%) but, in concert with the well-conceived modifications to the six existing basins, offers tremendous operating and performance benefits. There are no competing cost-effective alternatives.

Recommendation

Implement AS | Enhance Activated Sludge System. Costs are provided in the table below.

Table 5-10 Costs for the Activated Sludge System Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
AS	8.299	6.639	1.660	0	1.26	1.68

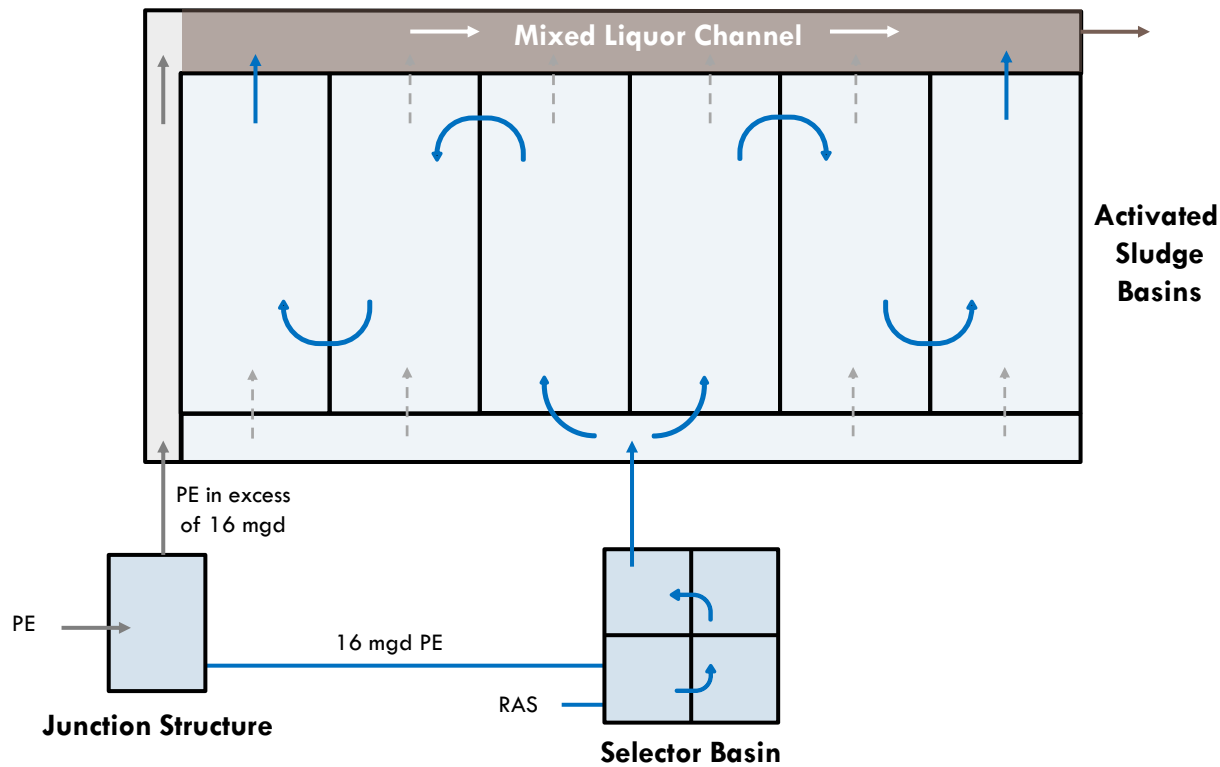


Figure 5-1 Activated Sludge System Schematic for Alternative AS

5.7.4 SECONDARY SETTLING

This alternative (SET-2 | Rehabilitate the Secondary Settling System) addresses the issues associated with the Secondary Settling process by rehabilitating the existing secondary settling components and structures to provide another generation or more of reliable service. The continued use of the existing

infrastructure maximizes the return on previous infrastructure spending. There are no competing cost-effective alternatives.

Recommendation

Implement SET-2 | Rehabilitate Secondary Settling System. Costs are provided in the table below.

Table 5-11 Costs for the Secondary Settling Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SET-2	0.974	0.974	0	0	1.26	1.68

5.7.5 PHOSPHORUS AND FILTRATION

This Alternative Compartment addresses the issues associated with the existing effluent filtration, phosphorus-removal chemical storage/feed, and reclaimed effluent processes. Collectively these unit processes are regarded here as the Phosphorus and Filtration processes. The foremost objective of these alternatives is to provide the Facility with the means to consistently, reliably, simply, and cost-effectively comply with two stringent effluent limits: 1] the impending low-level phosphorus limit associated with the Wisconsin River phosphorus TMDL and 2] the existing daily BOD WLA limit. The Facility has violated the BOD WLA limit on multiple occasions and regularly discharged BOD beyond the minimum-allowable WLA limit. There are two competing alternatives: PFL-1 |Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters] and PFL-2 | Add Nutrient Recovery Systems [Algae Effluent Polishing and Struvite Recovery].

Conventional Phosphorus Removal Strategies

Effluent phosphorus is either soluble or exists as a component of a particle. Figure 5-2 shows the various forms of phosphorus. Conventional low-level phosphorus technologies remove particulate phosphorus (PP) by filtration or settling. Soluble reactive phosphorus (SRP) can be converted to a particle by reacting with a chemical agent (coagulant). Theoretically, soluble non-reactive phosphorus (SNRP) cannot be removed from effluent because it is soluble and will not react with a chemical agent and convert to a solid form. In some instances, where the low-level effluent phosphorus limit is in the vicinity of 0.1 mg-TP/L or lower, SNRP concentrations are important determinants of success and may factor into the selected technology to achieve compliance. For the impending low-level effluent phosphorus limit associated with the Wisconsin River phosphorus TMDL (0.2 – 0.4 mg-TP/L), SNRP concentrations are far less important. The two-week special sampling data gathered during 2017 indicates that the SNRP concentrations at this Facility are not unusual or a cause for concern. Conventional low-level phosphorus technologies are suitable for the impending limit.

With conventional technologies, the Facility will comply with the impending low-level phosphorus limit using a two-step tertiary process: Step 1 – Add a chemical “cocktail” to convert soluble phosphorus to particulate phosphorus bound in a chemical floc (chem-floc) and Step 2 – Remove the chem-floc by filtration, sedimentation, or a combination of the two.

Step 1 requires three chemical-activation zones: a rapid-mix zone, a coagulation zone, and flocculation zone. The initial rapid-mix zone, where coagulant is added to the forward flow, has the largest influence on the necessary coagulant dose. Figure 5-3 shows coagulant effectiveness increases dramatically as the mean velocity gradient (G) in the rapid-mix zone increases (Szabo et al., 2008). Instantaneous phosphate removal is more chemically efficient when the coagulant is dosed to the secondary effluent and mixed under high G conditions. G values should exceed 400 1/s. The existing Facility does not have a suitable chemical-activation zone that provides or is capable of providing efficient rapid-mixing, flocculation, and coagulation.

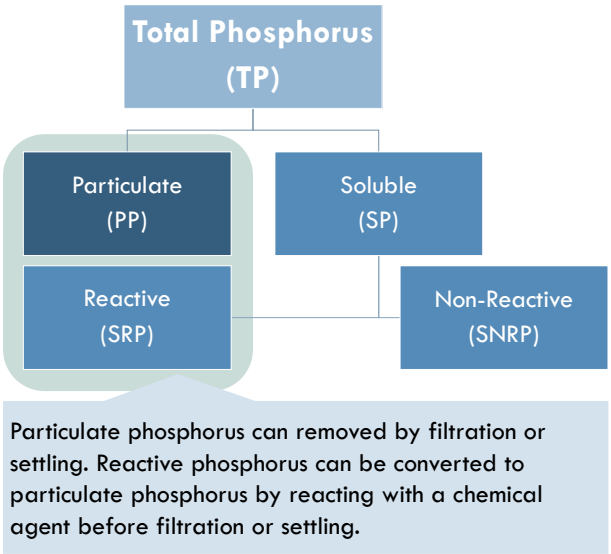


Figure 5-2 Phosphorus Forms

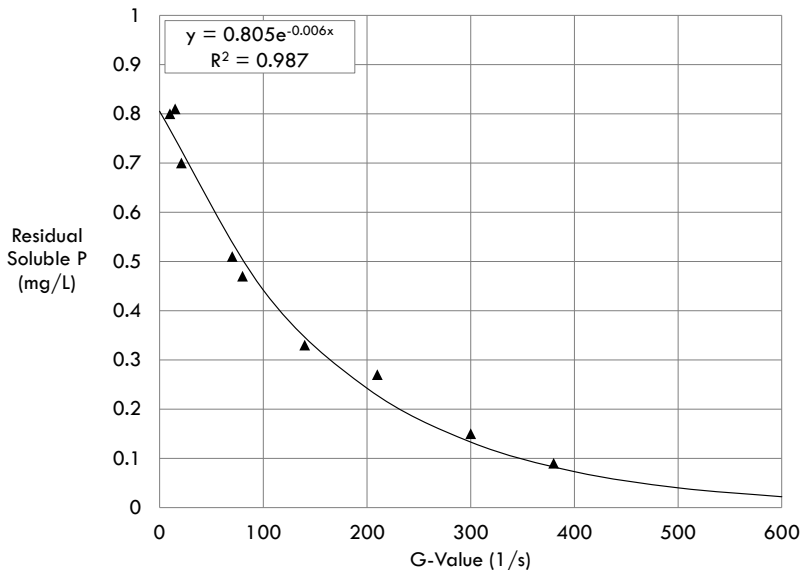


Figure 5-3 Residuals Soluble Phosphorus as a Function of Mixing Intensity in Rapid-Mix Zone

Step 2 can take multiple forms. Three conventional alternatives identified during the development of this Plan are shown in Figures 5-4, -5, and -6. Each has proven effective at achieving compliance with a low-level phosphorus limit. Tertiary settling followed by sand filtration (Figure 5-5) was eliminated from further consideration because of the cost and footprint required to construct tertiary settling, and the limited flow capacity of the existing sand filters. Ballasted settling (Figure 5-6) was eliminated because of the operational complexity of a ballasted-settling system and the fact it would be difficult and cost prohibitive to fit within the limits of the existing Filter Building. Cloth-media filtration (Figure 5-4) was retained for detailed consideration because it has proven effective at discharging effluent phosphorus concentrations below 0.2 mg-TP/L, is a cost-effective method to retrofit sand filters and increase their hydraulic capacity, and the entire system fits easily within the existing Filter Building. Example cloth-media disk filters are shown in Figure 5-7. This alternative, by increasing the hydraulic capacity of the filtration system, coupled with the performance enhancements offered by AS | Enhance Activated Sludge System, will dramatically enhances the Facility's ability to consistently comply with the stringent BOD WLA limit.

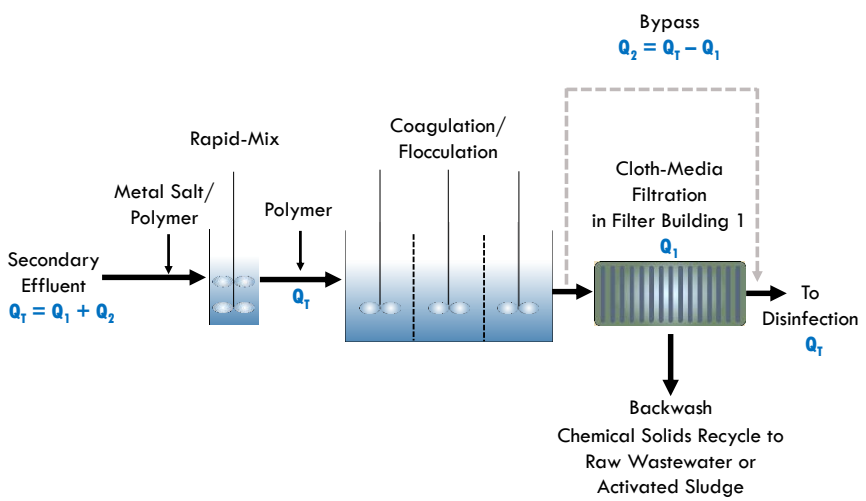


Figure 5-4 Low-Level Phosphorus Compliance Strategy Using Cloth-Media Filtration

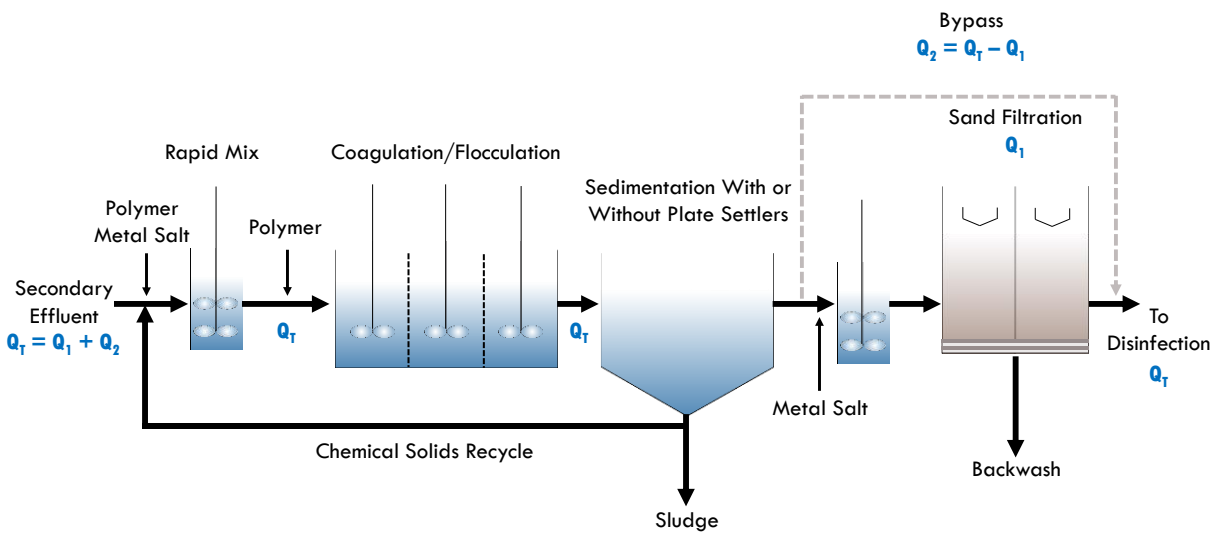


Figure 5-5 Low-Level Phosphorus Compliance Strategy Using Tertiary Settling and Sand Filtration

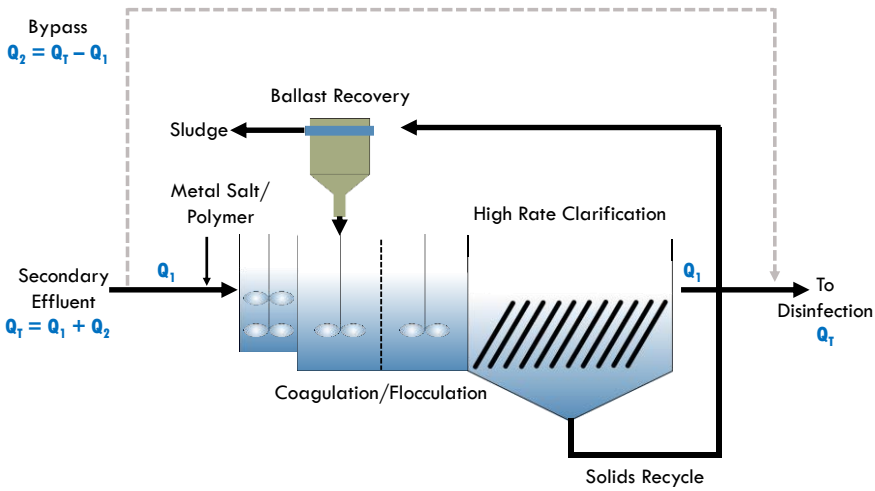


Figure 5-6 Low-Level Phosphorus Compliance Using Ballasted Sedimentation

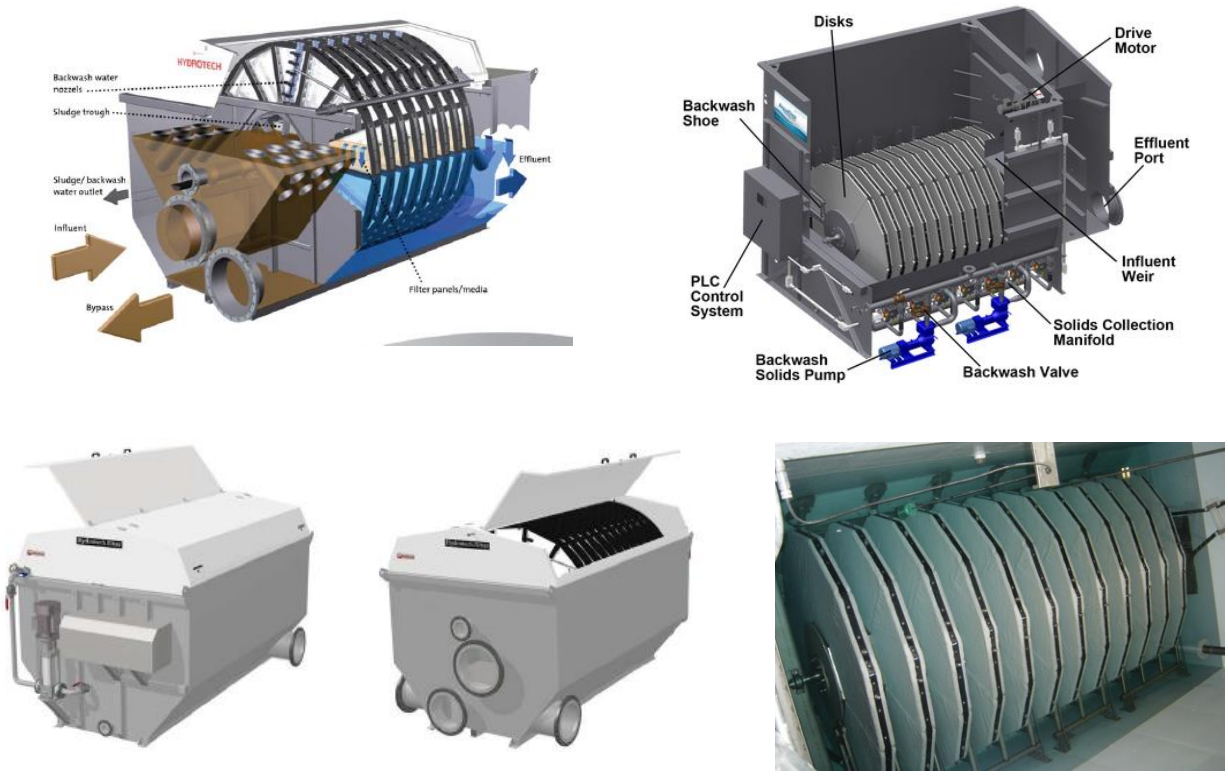


Figure 5-7 Cloth-Media Filtration

Non-Conventional Phosphorus Recovery Strategies

In addition to conventional low-level phosphorus strategies, a non-conventional strategy was considered. Within the last several years, some facilities, most facing effluent phosphorus limits below 0.1 mg-TP/L, have considered and some have elected to construct an Advanced Biological Nutrient Recovery (ABNR) system designed and sold by Clearas Water Recovery. The ABNR system uses photo-bioreactors to grow algae and other microorganisms that consume phosphorus and nitrogen. An ultrafiltration membrane separates the algae from the effluent to bring the effluent quality down to near non-detect phosphorous levels. These systems perform extremely well, with effluent total phosphorus biologically reduced below 0.02 mg/L. ABNR effluent may be disinfected before being discharged to the receiving stream.

Figure 5-8 provides an overview of the ABNR process. Figure 5-9 shows a schematic and the potential effluent quality. A mix of carbon dioxide, microorganisms, and wastewater enters a photo-bioreactor where the microorganisms consume nutrients such as phosphorus, nitrogen, and carbon dioxide in the wastewater. The photo-bioreactors are stored in greenhouses that allow for photosynthesis to enhance the carbon dioxide and nutrient consumption. Once thoroughly mixed and recovered, the algae can then be separated from the water and wasted or sent back to be reused in the mix stage. The ABNR system consumes and recovers nutrients while increasing dissolved oxygen. This process does not require pretreatment or chemical addition. The manufacturer offers an algae harvesting program, which capitalizes on the wasted algae to provide revenue that can partially or completely offset capital and

annual costs. The phosphorus is "recovered" in the form of the waste algae, which can be used to produce bio-plastics. An ABNR process treating all or a fraction of the secondary effluent would allow the Facility to comply with the impending low-level phosphorus limit.

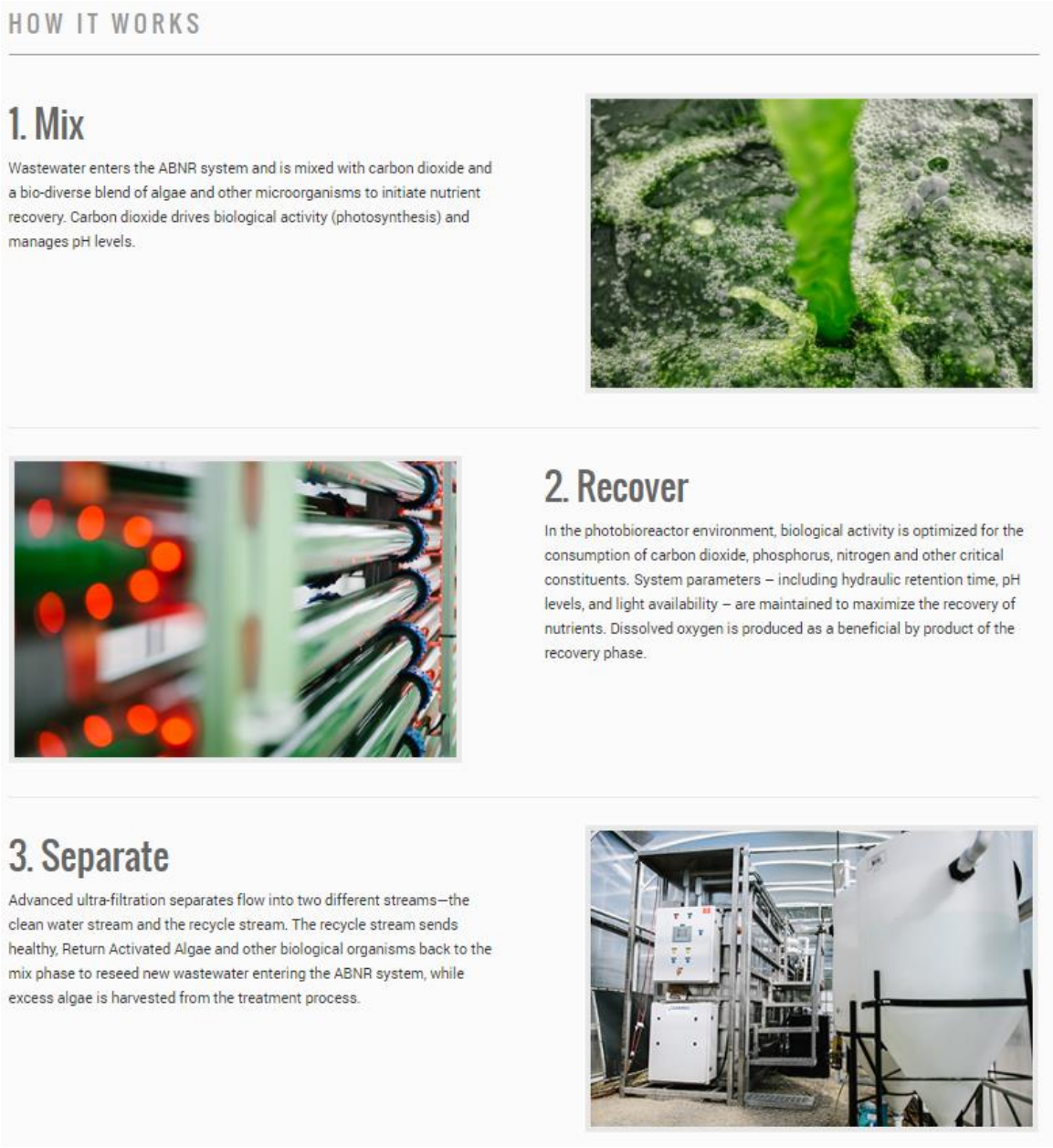


Figure 5-8 Overview of ABNR Process

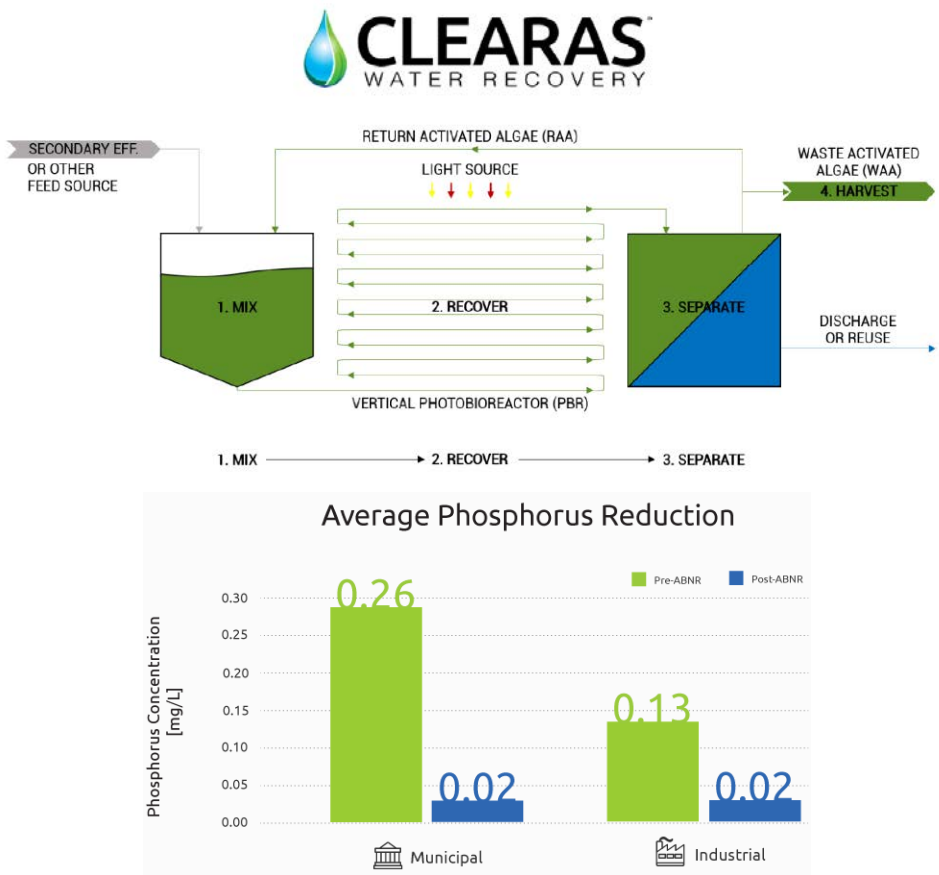


Figure 5-9 Schematic of and Potential Effluent Quality from an ABNR System

Consistent with the phosphorus recovery of the ABNR system, planning efforts also considered struvite-recovery technologies. Struvite is a phosphorus-containing mineral (magnesium ammonium phosphate with formula: NH4MgPO. 4· 6H2O). These recovery strategies deliberately form and remove struvite from the biosolids train. Figure 5-10 shows several competing manufacturers and their struvite recovery systems. Figure 5-11 shows a potential strategy employed with WAS from an enhanced biological phosphorus removal activated sludge system. Struvite recovery from the biosolids will reduce effluent phosphorus concentrations but not enough to meet the impending low-level phosphorus limit. It can, however, protect anaerobic digestion and other solids train processes from problematic struvite formation. Unintentional struvite formation in the solids train can be problematic at some facilities. It is not at this Facility.

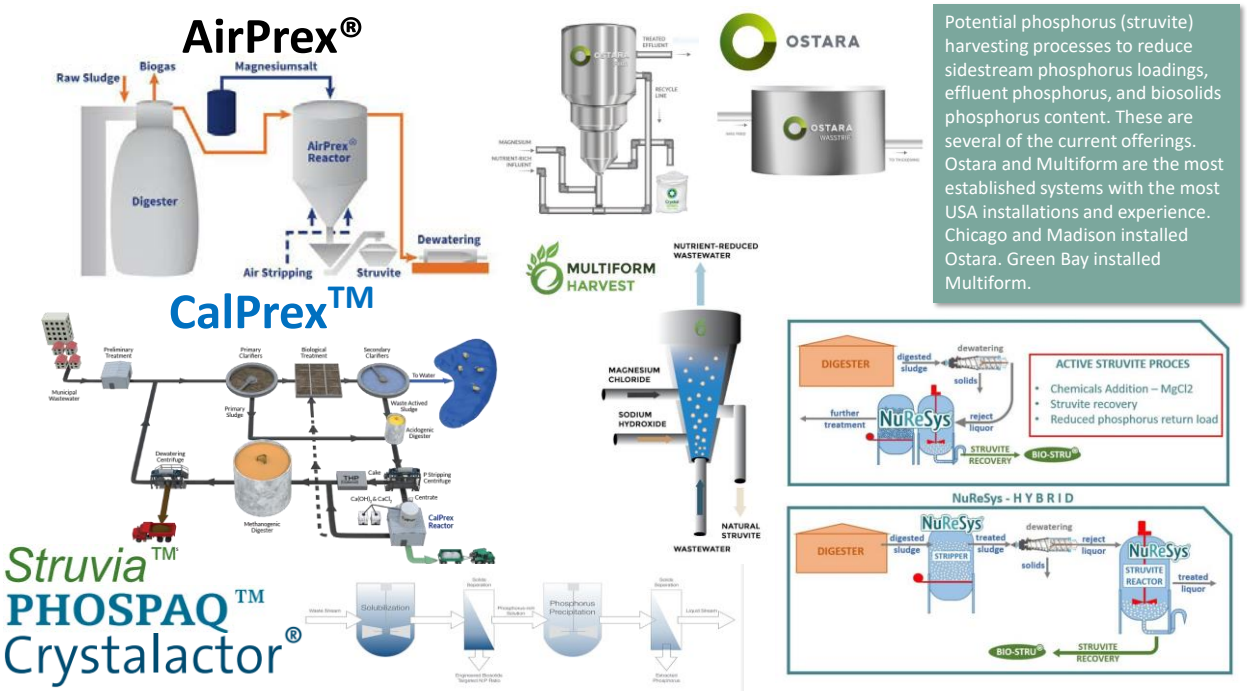


Figure 5-10 Overview of Several Struvite Recovery Systems and Manufacturers

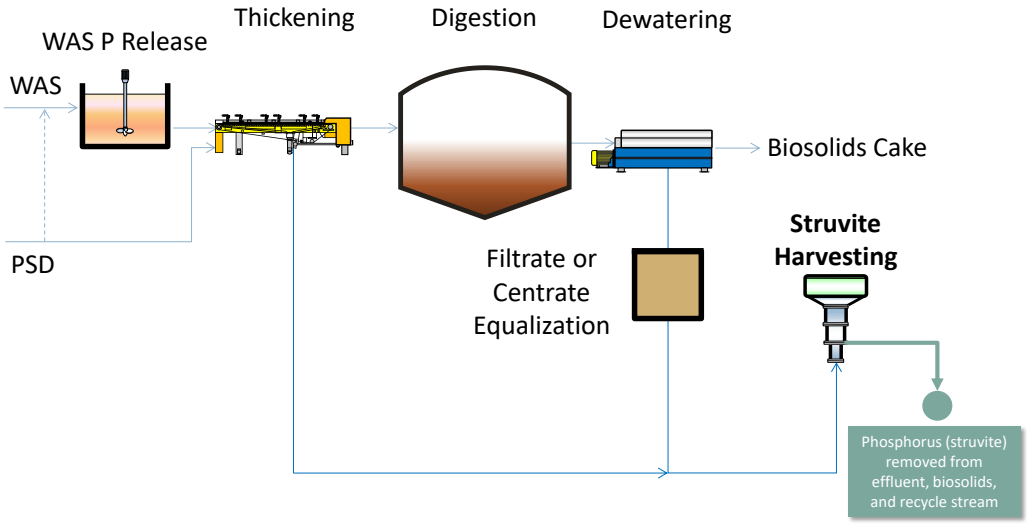


Figure 5-11 Example Struvite Recovery Flow Schematic

PFL-1 | Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]

This Alternative Compartment (PFL-1 | Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]) addresses the issues associated with the existing Filtration Building and provides a chemical

addition system and filtration system suitable to consistently and cost-effectively comply with both the impending low-level phosphorus limit and the existing daily BOD WLA limit. The chemical mixing, flocculation, and coagulation process will fit within the existing Filter Building. The cloth-media disk filters will also fit within the existing Filter Building, roughly double the hydraulic capacity of the existing sand filters. The capacity of the existing sand filters is 9 mgd. The capacity of the cloth-media filters will be at least 16 mgd, providing capacity to treat the design maximum-day flow. Figure 5-12 shows a planning-level layout of the chemical-addition and filtration system within the existing Filter Building. This alternative will also improve the secondary effluent and reclaimed effluent pumping systems. The continued use of the existing infrastructure maximizes the return on previous infrastructure spending. Costs are provided in the table below.

Table 5-12 Capital and Associated User Costs for Phosphorus and Filtration Alternative PFL-1

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
Total	8.671	1.32	1.76

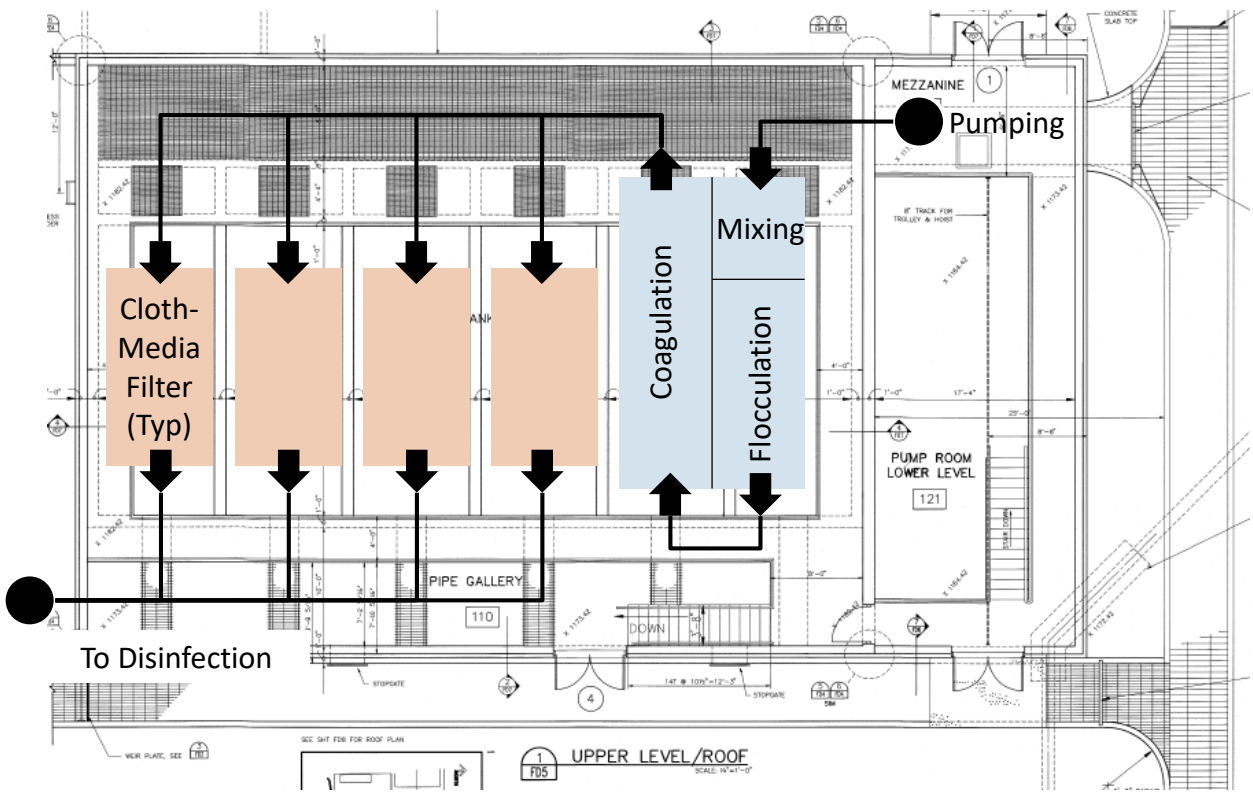


Figure 5-12 Planning-Level Layout of a Cloth-Media Filtration System (PFL-1)

PFL-2 | Add Nutrient Recovery Systems [Algae Effluent Polishing and Struvite Recovery]

This Alternative Compartment (PFL-1 | Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]) includes the construction of an ABNR phosphorus recovery system and a struvite recovery

system. It does not address the various other issues in the Filter Building. Costs are provided in the table below. This Alternative was included to demonstrate that these emerging phosphorus recovery strategies are not cost effective for this Facility and its situation. Although both systems provide revenue streams through the sale of algae and struvite pellets, these relatively small revenue streams, in this instance, did not offset the annual cost to operate the systems. Stated differently, this alternative does not provide a simple payback or yield a total present worth more favorable then PFL-1.

Table 5-13 Capital and Associated User Costs for Phosphorus and Filtration Alternative PFL-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
PFL-2	24.286	3.72	4.97

Recommendation

Implement PFL-1 | Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]. This alternative address the issues and concerns related to the phosphorus-removing and filtration processes, is capable of providing a generation or more of reliable performance, maximizes the return on previous infrastructure spending, and costs significantly less than the competing alternative: PFL-2. Given the disparity in capital costs and the lack of an annual cost-benefit for the far more capital-intensive PFL-2, a total present worth cost comparison is irrelevant. Costs are provided in the table below.

Table 5-14 Costs for the Phosphorus and Filtration Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
PFL-1	8.671	0	0	8.671	1.32	1.76

5.7.6 DISINFECTION

This Alternative Compartment (DIS | Increase Disinfection Capacity) addresses the issues associated with the disinfection process by increasing its capacity to treat the design peak hour flow rate (22 mgd). The continued use of the existing infrastructure maximizes the return on previous infrastructure spending. There are no competing cost-effective alternatives.

Recommendation

Implement DIS | Increase Disinfection Capacity. Costs are provided in the table below.

Table 5-15 Costs for the Disinfection Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
DIS	1.623	0	1.623	0	0.25	0.33

5.7.7 ANAEROBIC DIGESTION

This alternative addresses the issues associated with the anaerobic digestion unit process. It rehabilitates the existing mesophilic digestion system and complex. It converts the two existing secondary digesters to primary digesters, addresses the NFPA 820 issues within the complex, replaces or improves aging building systems, and replaces biogas equipment and piping. This alternative addresses the issues and concerns, uses existing tankage to increase the existing primary digestion capacity and enhance system reliability during periodic cleaning and maintenance, is capable of providing a generation or more of reliable performance, and maximizes the return on previous infrastructure spending.

Recommendation

Implement DIG-1 | Rehabilitate Mesophilic Digestion Complex. Costs are provided in the table below.

Table 5-16 Costs for the Anaerobic Digestion Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
DIG-1	9.480	9.480	0	0	1.44	1.92

5.7.8 SOLIDS PROCESSING

This Alternative Compartment addresses the issues associated with the solids train unit processes upstream and downstream of anaerobic digestion: WAS thickening, DSD dewatering, biosolids storage, and end-product reuse or land application/disposal. There are three competing alternatives listed below.

- SOL-1 | Improve Thickening, Improve Dewatering, and Produce Dry Class A Biosolids
- SOL-2 | Improve Thickening, Improve Dewatering, and Expand Class A Wet-Cake Storage
- SOL-3 | Improve Thickening, Improve Dewatering, and Expand Class B Wet-Cake Storage

To facilitate a comparison of similar alternatives, SOL-2 includes improvements to the anaerobic digestion system that would allow the digestion complex to operate as a batch Temperature Phased Anaerobic Digestion (TPAD) system. A batch TPAD system meets the Class A time-temperature requirements. Considering the detention time provided by alternative DIG-1, this alternative would not enhance volatile solids destruction and reduce biosolids production. It would, however, produce a Class A wet caje biosolids product. Consequently, two competing Solids Processing alternatives, SOL-1 and SOL-2, produce or are capable of producing a Class A product.

Concise Summary of Pertinent Biosolids Regulations

The 40 CFR Part 503 (Part 503) biosolids regulations are complicated. This Section attempts to summarize the salient requirements for the purposes of this analysis of Solids Processing alternatives. Land application includes the use of biosolids in agriculture, silviculture, land reclamation, or the distribution and marketing of biosolids that will be applied to land. For biosolids that do not meet Class A EQ requirements, land application is prohibited:

- If application is likely to adversely affect the habitat of a threatened or endangered species
- If the land is flooded, frozen, or snow-covered
- Within 10 meters of waters of the United States
- At application rates exceeding the agronomic rates, unless on a reclamation site and approved by the regulating agency

Again, Class A EQ biosolids are exempt from the above restrictions. Land applied biosolids are regulated on three fronts: metals (pollutant) concentrations, pathogens, and vector attraction. Vector refers to organisms that have the potential to carry disease – e.g., flies and rodents. The wastewater industry has developed and the USEPA recognizes a host of stabilization strategies that can satisfy the pathogen and vector attraction requirements.

The existing anaerobic digestion system satisfies Class B requirements, producing an end product that contains fecal coliform concentrations below 2 million MPN per gram of total solids (TS), employing a digestion process that reduces volatile solids (VS) concentrations by at least 38%, and exhibiting metals concentrations below the ceiling limits. Class A requirements and relevant strategies to achieve Class A status are listed below. Class A solids must satisfy two pathogen requirements and one vector attraction reduction requirement. Class A EQ biosolids must satisfy the metal concentration limits and also the Class A pathogen and vector attraction reduction requirements.

- Pathogens – Produce an end-product with fecal coliform concentrations below 1,000 MPN per gram of TS.
- Pathogens – Subject the biosolids to a treatment process that satisfies the necessary time-temperature requirement. Biosolids drying and batch TPAD can satisfy this requirement.
- Vector Attraction Reduction | Drying – Dry the biosolids so the solids content is 90% TS.
- Vector Attraction Reduction | TPAD – Reduce VS by at least 38% across the digestion process.

Land-applied biosolids also have permitting, record-keeping, and reporting requirements. Class B solids must be applied to crops that are not harvested for at least 30 days and up to 38 months, depending on the type of crop. Class A EQ solids can be distributed to the public and, therefore, are exempt from the site restrictions and permitting requirements. Class A EQ biosolids do not require a land application permit from the WDNR. Land application of non-EQ Class A solids may need site approval because the metals concentrations exceed the EQ limits.

Biosolids drying and batch TPAD are capable of meeting the Class A and Class A EQ requirements; however, biosolids drying is a more conventional and certain method to meet these requirements. Dried Class A EQ biosolids would eliminate many of the current and potential future challenges the existing Class B program faces: permitting requirements, reporting requirements, site restrictions, the narrow spring/fall hauling and application windows, and a potential future requirement to limit application rates based on the phosphorus agronomic rate. A wet cake Class A EQ product does not address these issues in the same way. The City would likely continue to store, haul, and land apply the cake material in a manner similar or identical to the current manner.

Biosolids Drying

Biosolids drying removes the overwhelming majority of the water from dewatered solids, increasing its solids content from roughly 20% solids before drying to approximately 90% solids after the drying process is considered complete. This dramatically reduces the volume and weight of the biosolids, and renders the end product more suitable and desirable for reuse by agricultural land owners, landscapers, and, in some instances, the general public. Drying does not affect the nutrient content of the biosolids. Dried biosolids have, in limited instances, been used as a carbon-neutral biofuel.

At the most fundamental level, drying systems fall into three broad categories: air drying, solar drying, and supplemental-heat or thermal drying. The latitude, climate, and confined site of the Facility make air and solar drying impractical. Drying from this point forward refers exclusively to thermal drying. Dewatered biosolids are conveyed to a thermal dryer where the wet cake sludge is heated to evaporate a large fraction of the water. The municipal biosolids drying industry offers multiple thermal drying systems and strategies; however, these systems can be generally categorized as either direct (convection) dryers or indirect (conduction) dryers. Within these categories lie multiple specific styles of dryers. Some of these styles include fluidized bed, drum, paddle, belt, and vacuum-assisted dryers.

Medium-temperature belt dryers are considered the simplest and safest to operate. They are also, because of their simplicity, safety, and scalability, the most common thermal drying system at facilities similar in size to the Wausau WWTF. They are inherently safer because they operate at temperatures (<300°F or 150°C) below the ignition temperature of biosolids and biosolids dust (335°C). Many competing dryers operate at considerably higher temperatures (800 - 900°F). The temperature regime of medium-temperature belt dryers offers the potential to use waste heat from combined heat and power (CHP) systems. Figure 5-13 shows example medium-temperature belt drying system schematics. Figure 5-14 is a configuration drawing. Figure 5-15 is a photograph of product from a medium-temperature belt dryer. Because of their simplicity and relative safety, SOL-1 includes a medium-temperature belt dryer.

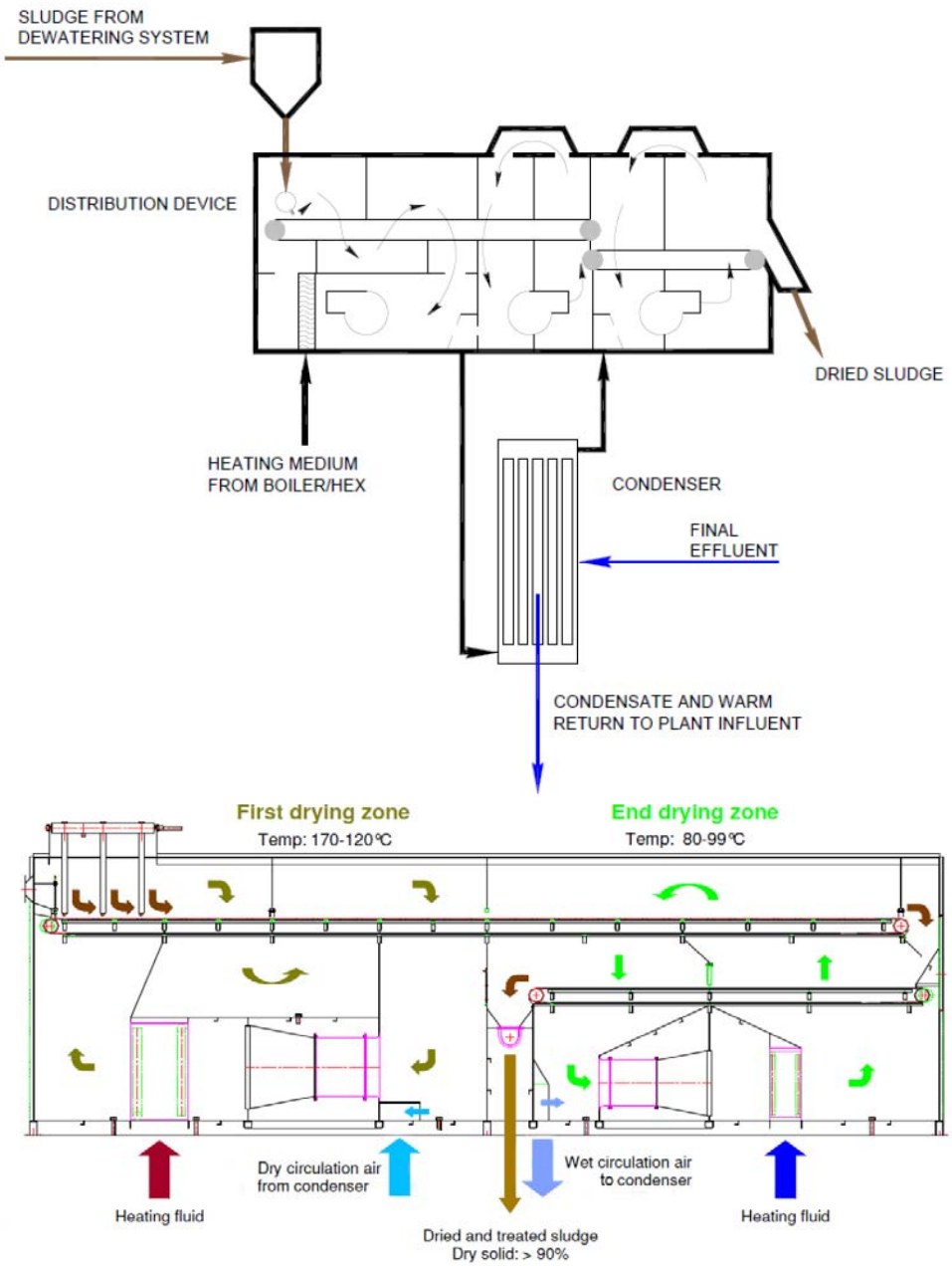


Figure 5-13 Medium-Temperature Belt-Dryer System Schematics

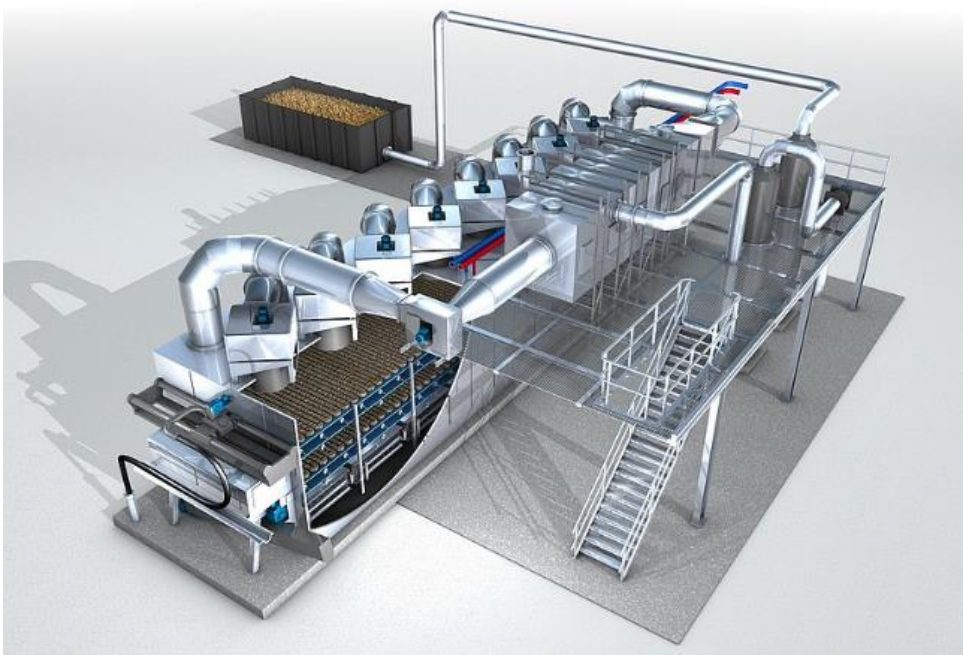


Figure 5-14 Medium-Temperature Belt Dryer Configuration Drawing

Figure 5-15 Example Biosolids Product from Medium-Temperature Belt Dryer

Process Sizing

WAS Thickening

Design Year WAS production is 6,869 ppd, 8,966 ppd, and 12,202 ppd at average, maximum month, and maximum week conditions, respectively. Assuming WAS concentrations will be 8,000 mg-WAS/L and WAS thickening will occur 5 days per week, these mass productions correspond to WAS flow rates of approximately 144,000 gpd, 188,000 gpd, and 256,000 gpd, respectively. The Solids Processing alternatives assume the WAS thickening process will include two 2-m gravity belt thickeners with individual capacities of 24,000 gph and a total capacity of 48,000 gph. One GBT will have capacity to thicken average and maximum month WAS flows in less than 8 hours. Two GBTs will have capacity to thicken maximum week WAS flows in less than 8 hours. This is a critical unit process and this proposed arrangement provides adequate redundancy and robustness.

Biosolids Drying

Design Year DSD production is 10,409 ppd-TS and 14,662 ppd-TS at average and maximum month conditions, respectively. Assuming digested biosolids entering the dryer average 20% TS, the DSD production rates correspond to wet cake production rates of approximately 52,000 ppd and 73,300 ppd, respectively. The Solids Processing alternative that includes a dryer assumes the dryer will have a wet-cake throughput capacity of 134,000 ppd, requiring the dryer to operate 40% of the time at average-day and 55% of the time at maximum-month conditions. The DSD storage capacity in the digestion complex coupled with the proposed dryer capacity will allow the Facility to dry solids 40-55% of the time in a roughly week-on, week-off manner. During weeks when the Facility is drying biosolids, the dryer will operate 24/7 until the required volume is withdrawn from the digestion complex, dewatered, and dried.

Digested Solids Dewatering

The dewatering system will be sized to feed the drying system and include two 1.5-m belt filter presses with individual wet-cake throughput capacities of approximately 160,000 ppd, exceeding the capacity of the downstream drying system. This is a critical unit process and this proposed arrangement provides adequate redundancy and robustness.

End Product production

At average Design Year conditions, the Facility will produce on 52,000 ppd of wet cake (20% TS) if biosolids are not dried and 11,300 ppd of dried cake (92% TS) if biosolids are dried. Drying reduces the final biosolids mass to roughly 20% or 1/5 of that without drying.

SOL-1 | Improve Thickening, Improve Dewatering, and Produce Dry Class A Biosolids

This alternative addresses the issues associated with the thickening process, the dewatering process, and adds a medium-temperature belt dryer to produce a dry Class A EQ product and remedy the challenges posed today and tomorrow by a Class B land application program. It involves construction of a new Solids Building that would house a new WAS thickening process, a DSD dewatering process, associated pumping systems, and the drying process.

Table 5-17 Capital and Associated User Costs for Alternative SOL-1

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SOL-1	22.528	3.42	4.57

SOL-2 | Improve Thickening, Improve Dewatering, and Expand Class A Wet-Cake Storage

This alternative addresses the issues associated with the thickening process and the dewatering process. It also rehabilitates the existing wet cake storage structure, adds capacity to store 365-days of wet cake, and includes improvements that would allow the digestion complex to operate as a batch TPAD system. A batch TPAD system meets the Class A time-temperature requirements. Considering the detention time provided by the digestion complex, this alternative would not enhance volatile solids destruction and reduce biosolids production. However, it would produce a Class A EQ wet cake biosolids product. Nevertheless, the City would likely continue to store, haul, and land apply the material and face the same logistic challenges posed by the narrow spring/fall land application seasons. Agricultural land owners are unlikely to drive to the Facility and haul the material away for stockpiling at their facility. The cost of replacing the existing land application equipment (roughly $750,000) is not included in this alternative. Many facilities replace this equipment every 10 years.

Table 5-18 Capital and Associated User Costs for Alternative SOL-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SOL-2	19.042	2.89	3.87

SOL-3 | Improve Thickening, Improve Dewatering, and Expand Class B Wet-Cake Storage

This alternative is the same as SOL-2 without the TPAD improvements. This alternative would produce the same Class B wet cake that the Facility currently produces. The cost of replacing the existing land application equipment (roughly $750,000) is not included in this alternative. Many facilities replace this equipment every 10 years.

Table 5-19 Capital and Associated User Costs for Alternative SOL-3

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SOL-3	17.027	2.59	3.56

Present Worth and User Rate Cost Analysis

This Section investigates the present worth and residential user costs for the competing alternatives and several operating scenarios for those alternatives. This analysis assumes Design Year conditions, 14,163 residential users, and the parameters in Table 5-20.

Table 5-21 provides costs for multiple scenarios. Figures 5-16 and 5-17 show the 20-year total present worth costs and the typical monthly residential user costs for these scenarios, respectively. Scenarios A

and B correspond to SOL-1 and assume all biosolids are dried to Class A EQ quality. Scenario A is intended to represent the lowest-cost and most-probable SOL-1 situation and assumes all dried biosolids are given to local agricultural landowners. Scenario B is attended to represent the highest-cost SOL-1 situation and assumes 100% of the dried biosolids are landfilled.

Scenarios C, D, and E correspond to SOL-2 and assume all biosolids are converted to a Class A EQ wet cake and 0%, 50%, and 100% of the cake is deposited in a local landfill, respectively. Scenario C is intended to represent the best-case near-term situation. Scenarios D and E are intended to represent potential future situations as land application logistics become increasingly difficult, particularly if/when biosolids land application is governed by agronomic phosphorus loadings. Scenario E is also representative of a future situation that, because of regulatory changes or logistical hurdles, no longer allows or accommodates land application.

Scenarios F, G, and H correspond to SOL-3 and assume all biosolids are converted to a Class B wet cake and 0%, 50%, and 100% of the cake is deposited in a local landfill, respectively. Scenario F is intended to represent the best-case near-term situation. Scenarios G and H are intended to represent potential future situations as land application logistics become increasingly difficult, particularly when biosolids land application is governed by agronomic phosphorus loadings. Scenario H is also representative of a future situation that, because of regulatory changes or logistical hurdles, no longer allows or accommodates land application of Class B biosolids.

Table 5-20 Solids Processing Present Worth Conditions and Assumptions

Average Dry Solids	10,409	ppd		
Average Wet Cake (20%)	52,045	ppd		
Average Dry Cake (92%)	11,314	ppd		
Annual Dry Solids	3,799,285	ppy	1,900	DT/yr
Annual Wet Cake (20%)	18,996,425	ppy	9,498	DT/yr
Annual Dry Cake (92%)	4,129,658	ppy	2,065	DT/yr
Bulk Density of Wet Cake (20%)	55	lb/cf		
Bulk Density of Dry Cake (92%)	30	lb/cf		
Annual Bulk Wet Cake Volume (20%)	345,390	cf/yr	12,792	cy/yr
Annual Bulk Dry Cake Volume (92%)	137,655	cf/yr	5,098	cy/yr
Volume per Hauling Trip	18	cy		
Total Bulk Wet Cake Trips (20%)	711	trips		
Total Bulk Dry Cake Trips (92%)	283	trips		
Natural Gas	$0.60	$/therm		
Electricity	$0.08	$/kWh		
Landfill Disposal	$44	$/DT		
Landfill Hauling	$160	$/Trip		
Annual City Land Application	$150,000	$/yr		

Table 5-21 Solids Processing Present Worth and User Costs

Scenarios	A	B	C	D	E	F	G	H
	SOL-1 Free Distribution	SOL-1 0% City 100% Landfill	SOL-2 100% City 0% Landfill	SOL-2 50% City 50% Landfill	SOL-2 0% City 100% Landfill	SOL-3 100% City 0% Landfill	SOL-3 50% City 50% Landfill	SOL-3 0% City 100% Landfill
Annual Costs								
Electricity	$40,000	$40,000	$0	$0	$0	$0	$0	$0
Heat	$135,000	$135,000	$0	$0	$0	$0	$0	$0
City Disposal	$0	$0	$150,000	$75,000	$0	$150,000	$75,000	$0
Landfill Tip	$0	$91,000	$0	$209,000	$418,000	$0	$209,000	$418,000
Landfill Haul	$0	$45,000	$0	$57,000	$114,000	$0	$57,000	$114,000
Total	$175,000	$311,000	$150,000	$341,000	$532,000	$150,000	$341,000	$532,000
20-Year Present Worth Cost								
Annual	$2,459,000	$4,370,000	$2,108,000	$4,792,000	$7,476,000	$2,108,000	$4,792,000	$7,476,000
Capital	$22,528,000	$22,528,000	$19,043,000	$19,043,000	$19,043,000	$17,027,000	$17,027,000	$17,027,000
Total	$24,987,000	$26,898,000	$21,151,000	$23,835,000	$26,519,000	$19,135,000	$21,819,000	$24,503,000
Monthly Residential Cost								
Capital	$3.42	$3.42	$2.89	$2.89	$2.89	$2.59	$2.59	$2.59
Annual	$0.53	$0.95	$0.46	$1.04	$1.63	$0.46	$1.04	$1.63
Total	$3.96	$4.37	$3.35	$3.94	$4.52	$3.05	$3.63	$4.21

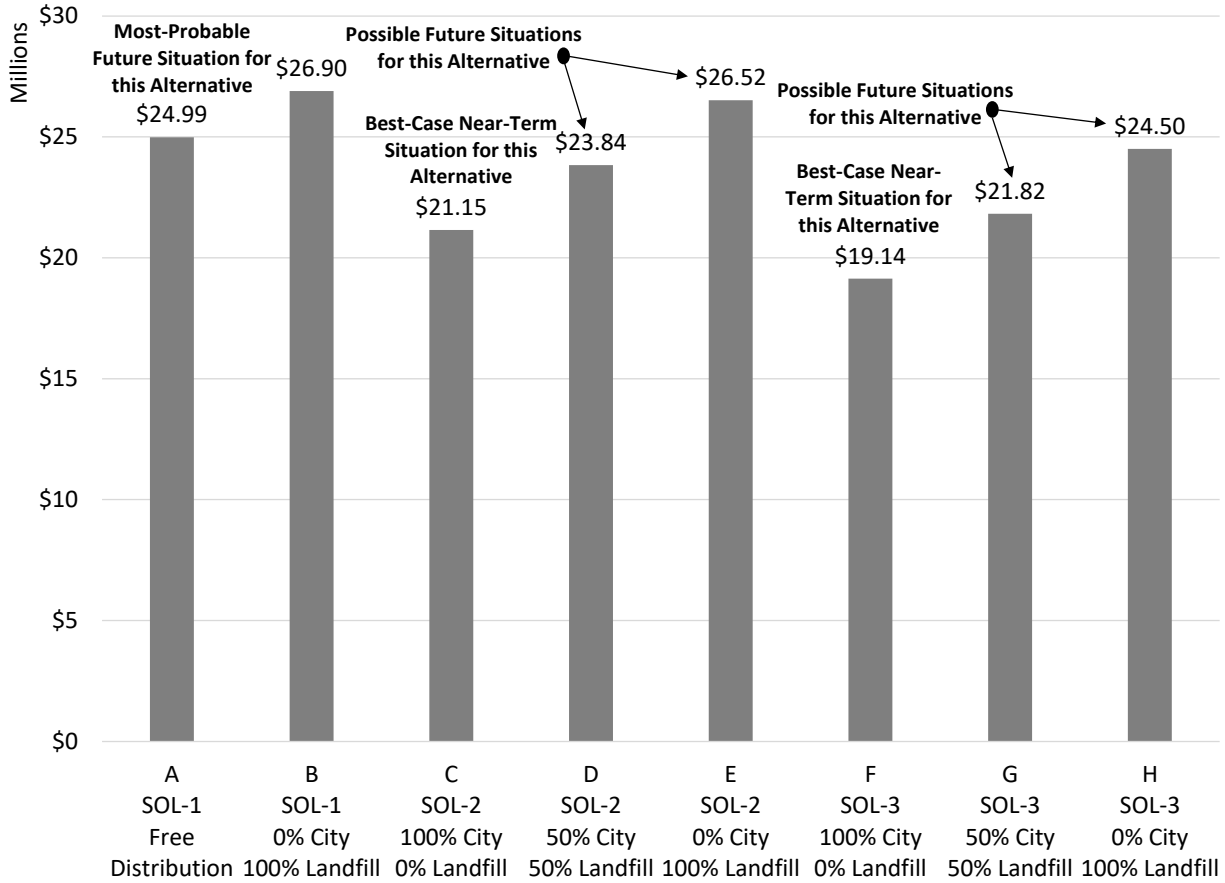


Figure 5-16 20-Year Total Present Worth Cost Opinions for Solids Processing Alternative Scenarios

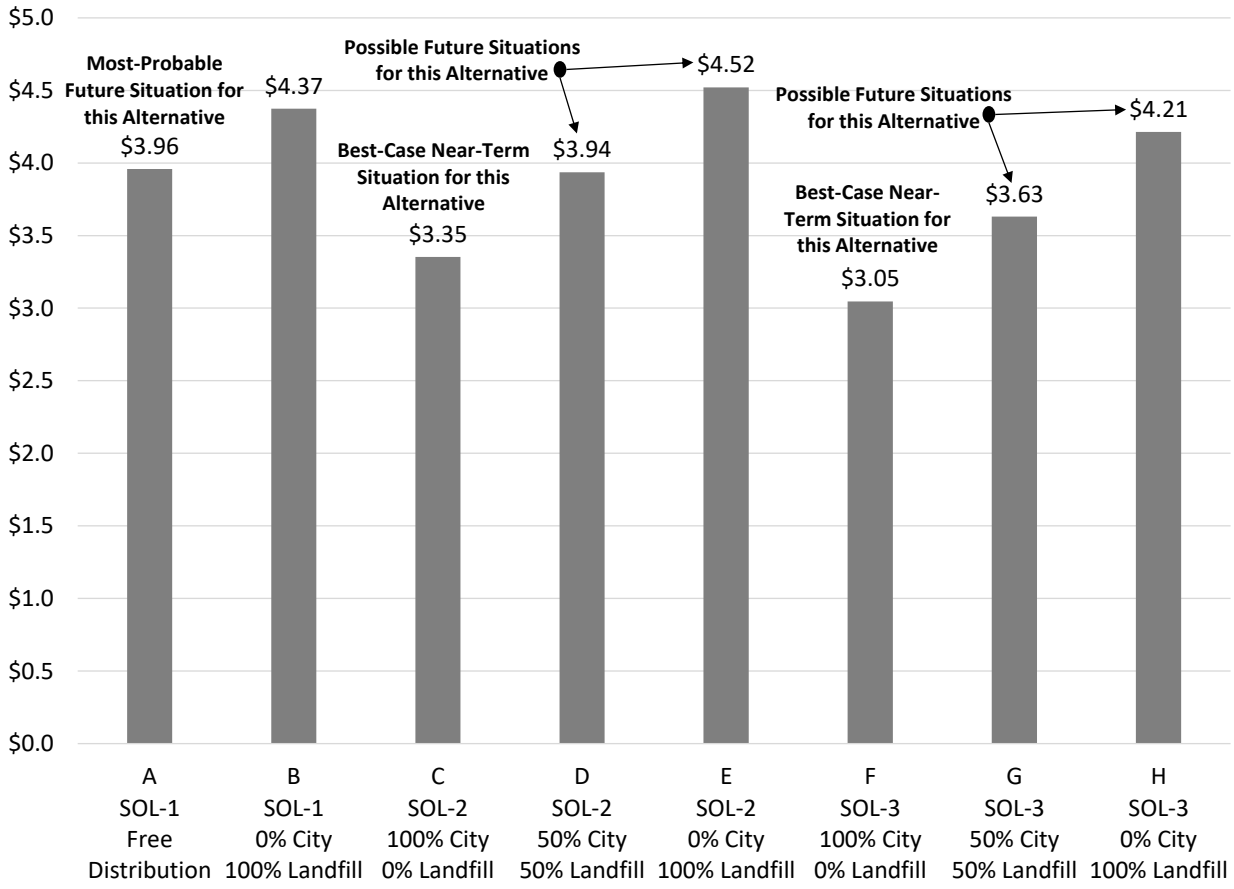


Figure 5-17 Opinion of Monthly Residential User Costs for Solids Processing Alternative Scenarios

Recommendation

Implement SOL-1 | Improve Thickening, Improve Dewatering, and Produce Dry Class A Biosolids to address the issues associated with the solids thickening, solids dewatering, biosolids storage, and end product utilization. This alternative will immediately eliminate the logistical challenges inherent with the current Class B wet-cake biosolids land application program. This alternative also guards against evolving regulatory and/or public perceptions that could dramatically hinder land application (phosphorus agronomic loadings) or completely preclude land application (micropollutants).

Table 5-22 Costs for the Solids Processing Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
SOL-1	22.528	13.517	9.011	0	3.42	4.57

5.7.9 SITE FEATURES

This Alternative Compartment addresses the issues associated with Facility site infrastructure that are not directly connected to a unit process but are essential for a well performing, operating, and maintained WWTF. This Compartment was divided into three alternatives to better reveal where the costs are. These individual alternatives are complementary to one another and are not competing alternatives. The continued use of the existing infrastructure maximizes the return on previous infrastructure spending. The three complementary alternatives are listed below.

- STE-1 | Improve Non-Electrical Distribution Site Infrastructure
- STE-2 | Implement Site-Wide Electrical Improvements
- STE-3 | Improve Site-Wide Tunnel System

STE-1 | Improve Non-Electrical Distribution Site Infrastructure

This alternative addresses issues and concerns related to the Site entrance, security, vehicle traffic, and parking; pavement and sidewalks; site lighting; stormwater control; and yard process piping.

Table 5-23 Capital and Associated User Costs for Alternative STE-1

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
STE-1	2.710	0.41	0.55

STE-2 | Implement Site-Wide Electrical Improvements

This alternative addresses issues and concerns related to the Site-wide electrical distribution system. The existing Facility has two electric services. One at the Main Building for the north half of the Site and one at the Blower Building for the south half of the Site. A diesel standby generator in the Main Building provides standby power to the north half of the Site and the Filtration Building on the south half of the Site. The blowers in the Blower Building currently are not powered from the standby generator. Both electric services and the standby generator will be removed.

The new Solids Building will become the main electrical distribution point for the entire Site and contain the new incoming electric service. A new standby or emergency generator will be housed in the new Solids Building or the Main Building. Underground concrete-encased conduit duct banks from the Solids Building will back feed power to the existing buildings. Backup power from the standby generator will be available to the entire plant and the control system will limit/lock out certain loads during a power outage to reduce the generator size. The blowers in the Blower Building will be connected to the standby generator and the control system will limit the number of blowers that can run during a power outage.

Table 5-24 Capital and Associated User Costs for Alternative STE-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
STE-2	4.905	0.75	1.00

STE-3 | Improve Site-Wide Tunnel System

This alternative addresses shortcomings in the Site-wide tunnel system including the primary effluent piping, RAS/WAS piping and valving, HVAC systems, lighting systems, plumbing systems, and NFPA 820 issues.

Table 5-25 Capital and Associated User Costs for Alternative STE-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
STE-3	3.096	0.47	0.63

Recommendation

Implement the three Site Features alternatives: STE-123 | Improve Site Features. This alternative addresses existing issues and concerns. Costs are provided in the table below.

Table 5-26 Costs for the Site Features Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
STE-123	10.711	10.711	0	0	1.63	2.17

5.7.10 ADMINISTRATION-MAINTENANCE-STORAGE

This Alternative Category addresses the issues associated with the existing Main Building. This Building was originally constructed in 1939 and expanded in 1967 and 1988. This Building houses the laboratory, administration spaces, maintenance spaces, equipment storage, vehicle storage, standby power, raw wastewater screening, raw wastewater pumping, solids thickening, and solids dewatering. There are two competing alternatives: AMS-1 | Construct Extensive Main Building Improvements and Supplemental Vehicle Storage Building and AMS-2 | Build New Administration and Vehicle Storage Buildings, Repurpose Main Building.

AMS-1 | Construct Extensive Main Building Improvements and Supplemental Vehicle Storage Building

This alternative rehabilitates, improves, and repurposes the Main Building. Improvements include laboratory upgrades, office space and administration improvements, male/female restrooms and locker rooms, lighting, HVAC, plumbing, doors, windows, exterior brick/block, coatings, flooring, parts and equipment storage, roof ladders, and other improvements. This alternative does not include any process improvements within this Structure. Those costs are reflected elsewhere. This alternative includes improvements to address NFPA 820 issues. It also includes a supplemental vehicle and equipment storage building.

Table 5-27 Costs for Administration-Maintenance-Storage Alternative AMS-1

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
AMS-1	6.680	1.02	1.36

AMS-2 | Build New Administration and Vehicle Storage Buildings, Repurpose Main Building

This alternative constructs a new Administration Building that includes offices (3), a staff "bullpen", SCADA/control room, laboratory, small conference room, break room, male locker room, female locker room, and restrooms. It also constructs a supplemental vehicle storage building. This alternative includes minimal rehabilitation (relative to AMS-1) and repurposing of the Main Building to improve maintenance spaces; storage spaces; and aging lighting, HVAC, and plumbing systems. Other Main Building improvements address doors, windows, exterior brick/block, and coatings. This alternative does not include any process improvements within the Main Building. Those costs are reflected elsewhere. This alternative includes improvements to address NFPA 820 issues in the Main Building.

Table 5-28 Costs for Administration-Maintenance-Storage Alternative AMS-2

Alternative	Capital Cost ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
AMS-2	7.193	1.09	1.46

Recommendation

Implement AMS-2 | Build New Administration and Vehicle Storage Buildings, Repurpose Main Building. This alternative uses the Main Building (1939, 1967, and 1988) to house unit processes, maintenance, and equipment storage. The Main Building could also house the standby generator system. The new Administration Building would be well-configured for modern laboratory and administration functions. Modern-day WWTF designs deliberately separate administrative, laboratory, and control rooms from the hazardous and odorous Preliminary Treatment system. This alternative would do that. Costs are provided in the table below.

Table 5-29 Costs for the Administration-Maintenance-Storage Recommendation

Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
AMS-1	7.193	7.193	0	0	1.09	1.46

6. RECOMMENDED PLAN | TREATMENT FACILITY

This Section assembles the individual recommendations for each Alternative Compartment into a Facility-wide recommendation. Table 6-1 itemizes the recommended alternative and shows the cumulative cost. Figures 6-1 through 6-3 show how costs are distributed around the Facility and between the condition categories.

Table 6-1 Capital Costs and User Rate Perspectives for the Recommended Treatment Facility Plan

Compartments	Alternative	Capital Cost ($M)	Safety, Reliability, Performance ($M)	Capacity ($M)	Regulations ($M)	30-Yr Rate Increase ($/mo)	20-Yr Rate Increase ($/mo)
Preliminary Treatment	PRT-1	8.850	7.080	1.770	0	1.35	1.80
Primary Settling	SET-1	1.671	1.671	0	0	0.25	0.34
Activated Sludge System	AS	8.299	6.639	1.660	0	1.26	1.68
Secondary Settling	SET-2	0.974	0.974	0	0	0.15	0.20
Phosphorus and Filtration	PFL-1	8.671	0	0	8.671	1.32	1.76
Disinfection	DIS	1.623	0	1.623	0	0.25	0.33
Anaerobic Digestion	DIG-1	9.480	9.480	0	0	1.44	1.92
Solids Processing	SOL-1	22.528	13.517	9.011	0	3.42	4.57
Site Features	STE-123	10.711	10.711	0	0	1.63	2.17
Administration-Maintenance-Storage	AMS-2	7.193	7.193	0	0	1.09	1.46
Total		80.000	57.265	14.064	8.671	12.16	16.24

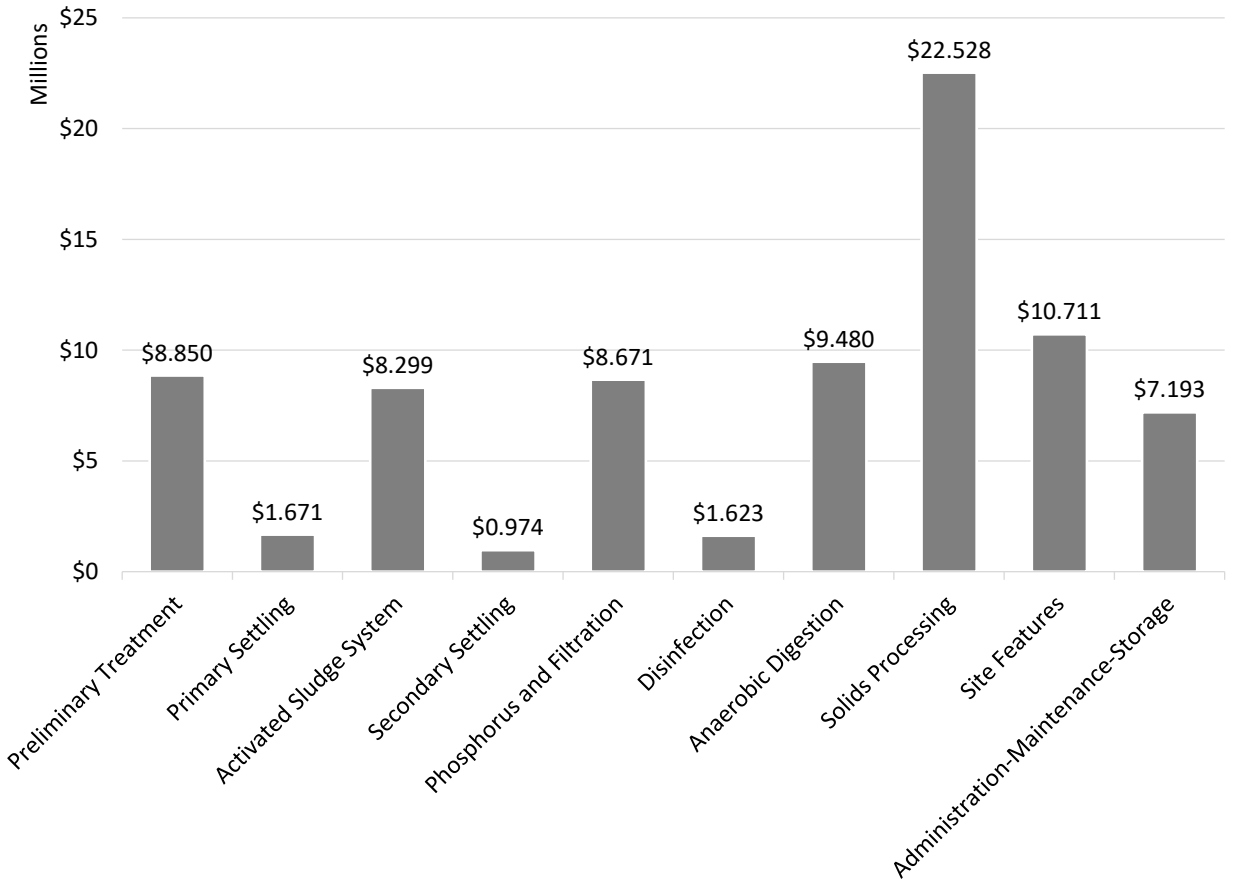


Figure 6-1 Capital Cost Distribution by Unit Process or Facility Function

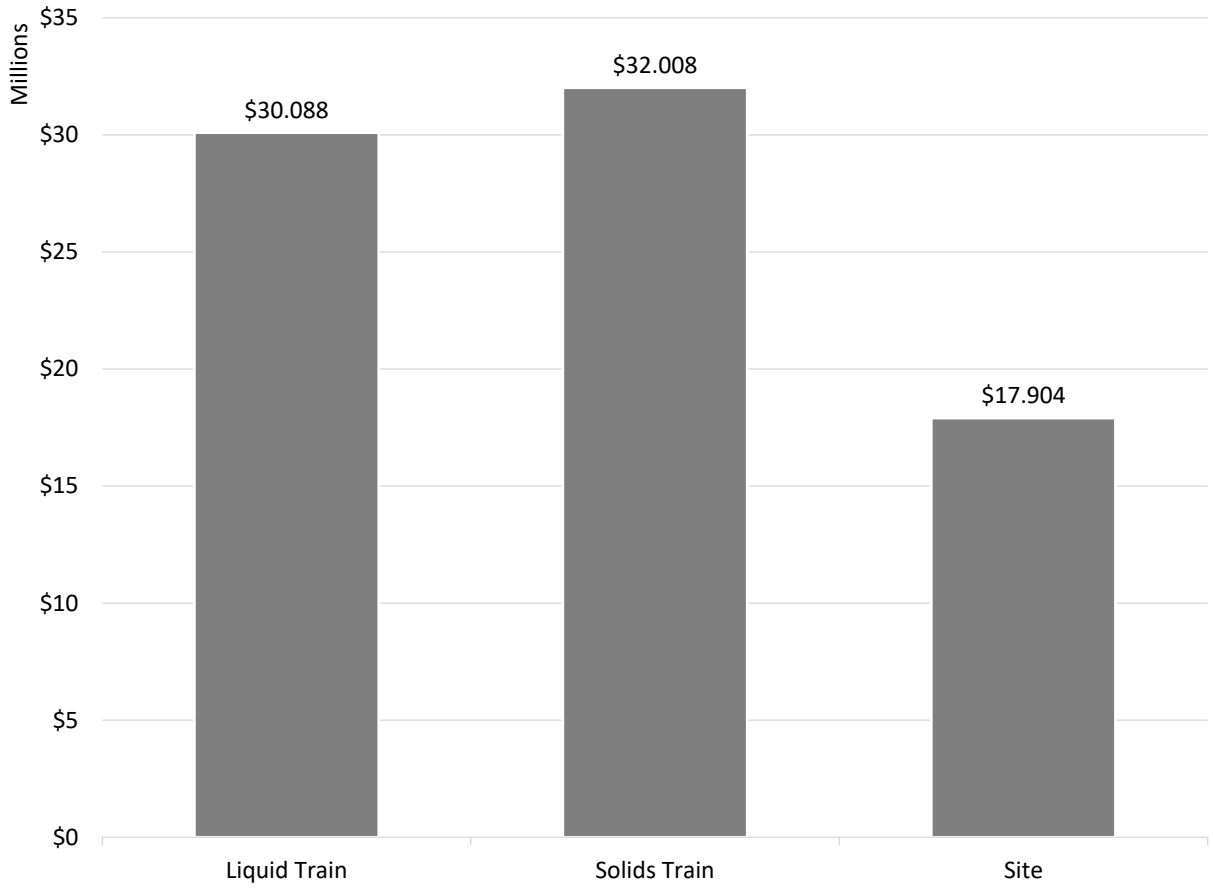


Figure 6-2 Capital Cost Distribution by Train or Facility Function

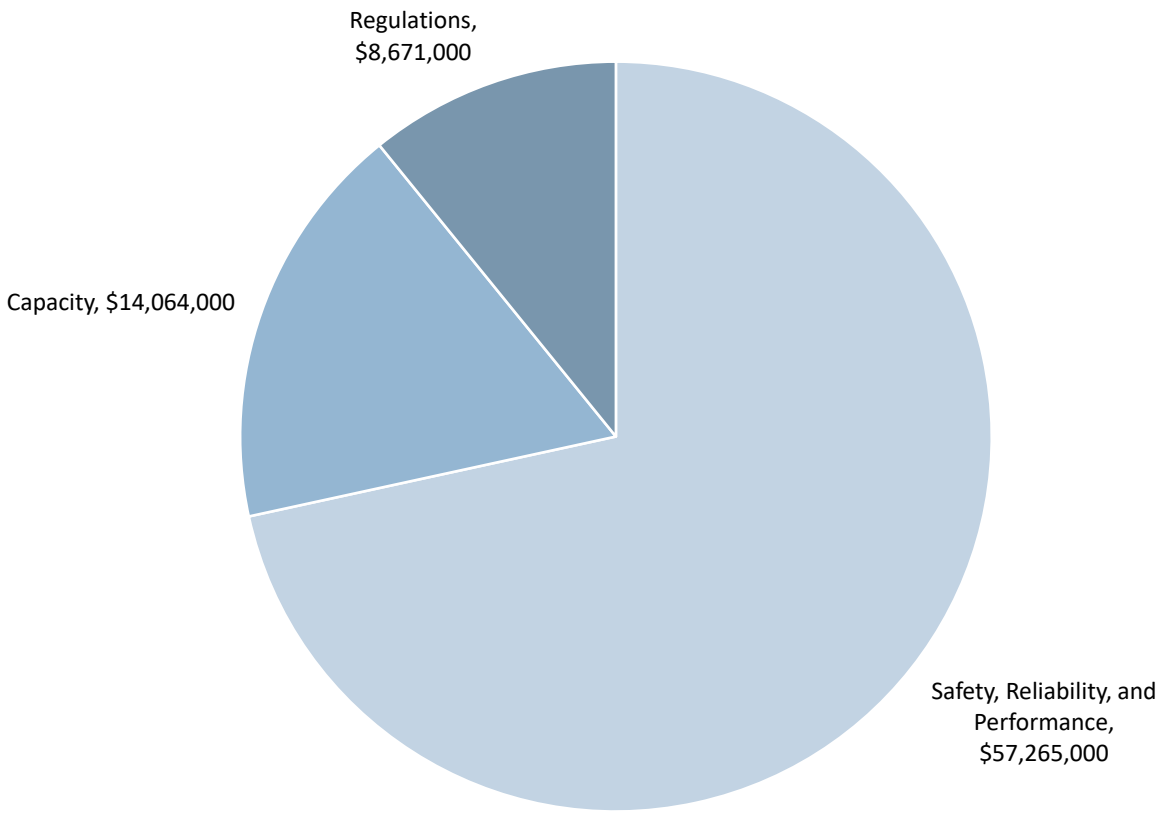
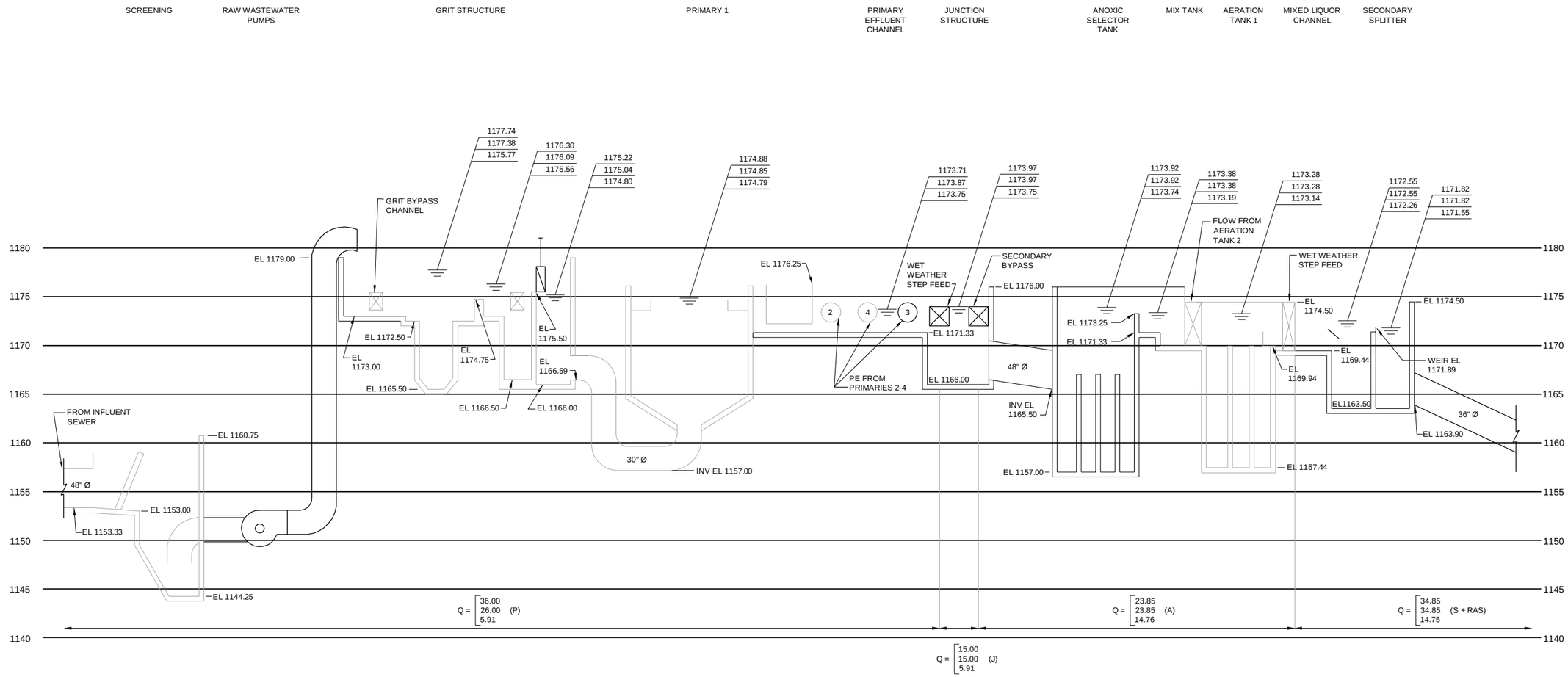


Figure 6-3 Capital Cost Distribution by Condition Category

Subsequent to completing the Planning Phase work to produce this Plan, the City authorized Donohue and Becher Hoppe to advance the concepts developed during the Planning Phase to the Preliminary Layout Design Phase to confirm the Planning Phase capital cost opinion. That effort advanced the process design and produced Preliminary Layout Drawings (November 21, 2018), a Preliminary Design Report (November 21, 2018), and a detailed Preliminary Layout Design Cost Opinion (November 21, 2018). The Preliminary Layout Drawings, Design Report, and Detailed Cost Opinion were provided to the City under separate cover. A copy of the Preliminary Design Basis and Preliminary Operational Strategies are included in Appendix E. Figures 6-4 and 6-5 show the hydraulic profile for the Recommended Plan. Figures 6-6 and 6-7 are liquid and solids train schematics for the Recommended Plan, respectively. Figure 6-8 shows a site plan and Figure 6-9 shows an aerial photograph with simple renderings of the proposed new structures. Structure 540 – Secondary 4 was included in the Preliminary Layout Design to accommodate the potential regionalization of Marathon City and Edgar. The City would be wise to include the Work associated with this Structure in the Bidding Documents as an Alternate bid item. Figure 6-10 shows the property boundary for the Facility, confirming that the Facility improvements associated with the Recommended Plan lie entirely inside the existing property boundary.

Table 6-2 provides a summary comparison of the Planning and Preliminary Design cost opinions. The Preliminary Layout Design effort confirmed, with a much higher cost resolution and greater cost



GENERAL NOTES:

1. FEMA 100 YEAR FLOOD EL 1,168.00

2. WATER LEVELS SHOWN AT THE UPSTREAM END OF THE GRIT BASIN INFLUENT CHANNEL ARE BASED ON ALL THE FLOW GOING THROUGH THE GRIT BASIN. IN ORDER TO PROVIDE ADDITIONAL FREEBOARD AT THE UPSTREAM END OF THE GRIT BASIN INFLUENT CHANNEL, AUTOMATICALLY BYPASSING A PORTION OF FLOWS AROUND THE GRIT BASIN WILL BE EVALUATED DURING DETAILED DESIGN.

3. WATER SURFACE ELEVATION LEGEND BELOW

LEGEND:

X.XX WATER LEVEL AT
X.XX WATER LEVEL AT
X.XX WATER LEVEL AT

P	J	A	S	F	E	RAS
36.00	15.00	23.85	26.00	19.00	36.00	8.85
26.00	15.00	23.85	26.00	19.00	26.00	8.85
5.91	5.91	14.76	5.91	5.91	5.91	8.85

FLOW BREAKDOWN

P = PRELIMINARY AND PRIMARY TREATMENT FLOW
J = FLOW THROUGH JUNCTION STRUCTURE
A = FLOW THROUGH AERATION
S = SECONDARY TREATMENT FLOW
F = DISC FILTERS FLOW
E = EFFLUENT FLOW
RAS = RETURN ACTIVATED SLUDGE FLOW

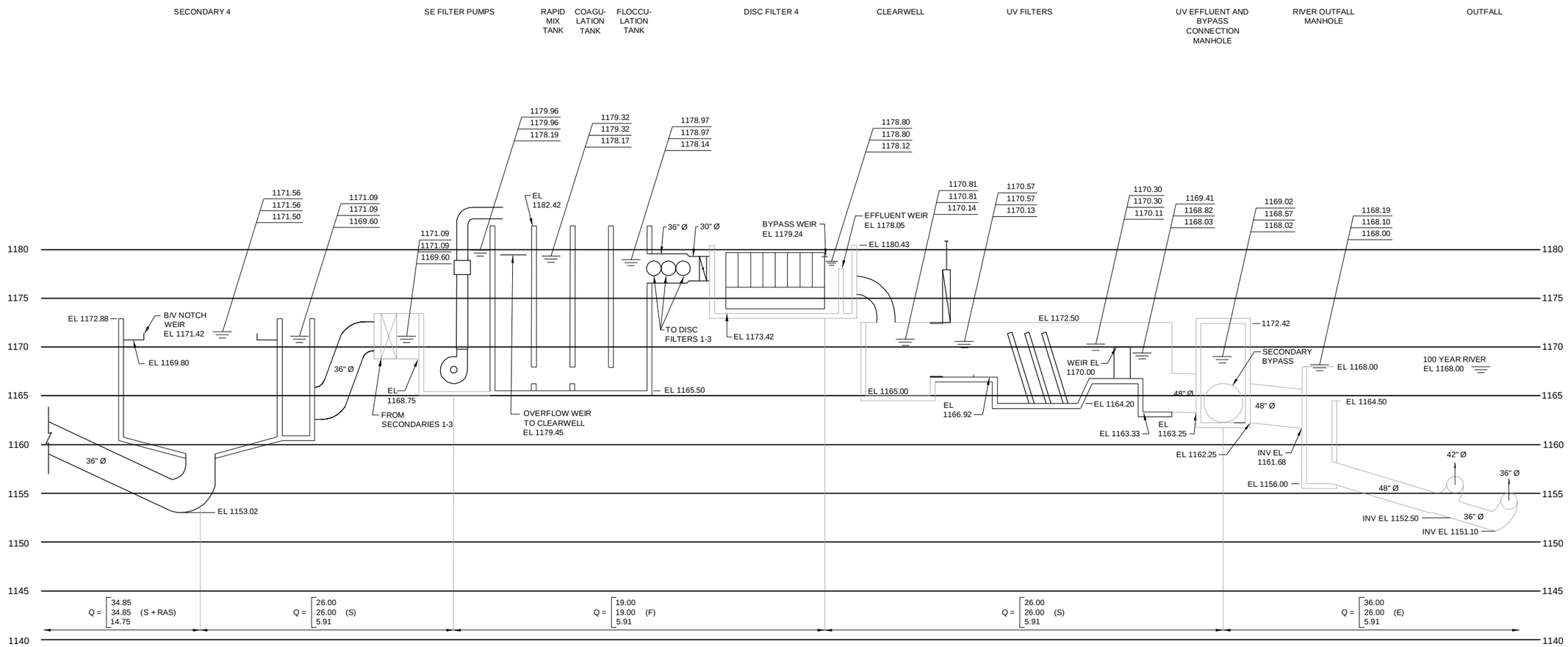
FIGURE 6-4
Hydraulic Profile 1

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2019

13229



GENERAL NOTES:

1. FEMA 100 YEAR FLOOD EL 1168.00

2. WATER LEVELS SHOWN AT THE UPSTREAM END OF THE GRIT BASIN INFLUENT CHANNEL ARE BASED ON ALL THE FLOW GOING THROUGH THE GRIT BASIN. IN ORDER TO PROVIDE ADDITIONAL FREEBOARD AT THE UPSTREAM END OF THE GRIT BASIN INFLUENT CHANNEL, AUTOMATICALLY BYPASSING A PORTION OF FLOWS AROUND THE GRIT BASIN WILL BE EVALUATED DURING DETAILED DESIGN.

3. WATER SURFACE ELEVATION LEGEND BELOW

LEGEND:

X.XX WATER LEVEL AT
X.XX WATER LEVEL AT
X.XX WATER LEVEL AT

P	J	A	S	F	E	RAS
36.00	15.00	23.85	26.00	19.00	36.00	8.85
26.00	15.00	23.85	26.00	19.00	26.00	8.85
5.91	5.91	14.76	5.91	5.91	5.91	8.85

FLOW BREAKDOWN

P = PRELIMINARY AND PRIMARY TREATMENT FLOW
J = FLOW THROUGH JUNCTION STRUCTURE
A = FLOW THROUGH AERATION
S = SECONDARY TREATMENT FLOW
F = DISC FILTERS FLOW
E = EFFLUENT FLOW
RAS = RETURN ACTIVATED SLUDGE FLOW

FIGURE 6-5
Hydraulic Profile 2

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2019

13229

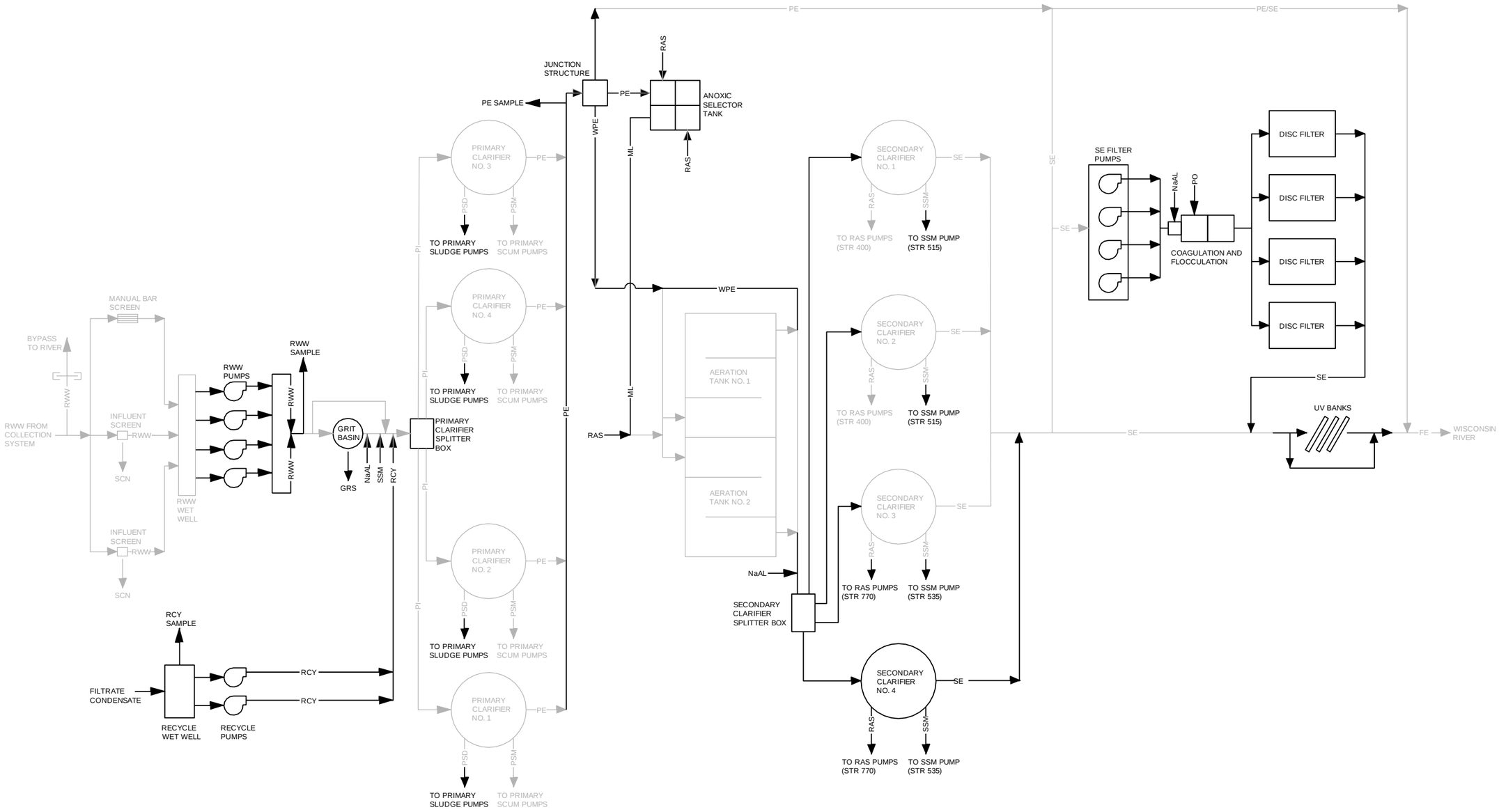


FIGURE 6-6
Liquids Treatment Train

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2019

13229

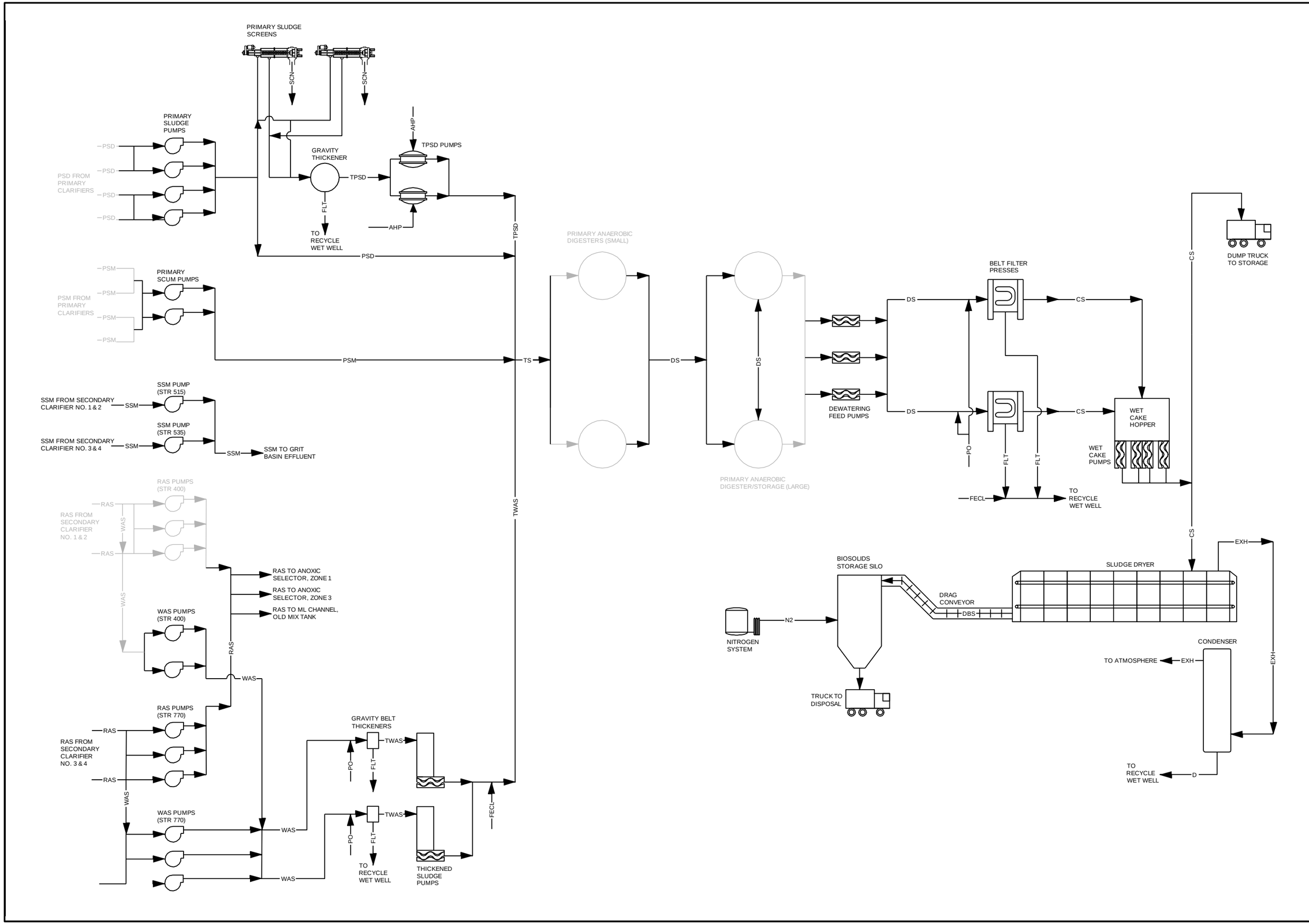


FIGURE 6-7
Solids Treatment Train

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2819

13229

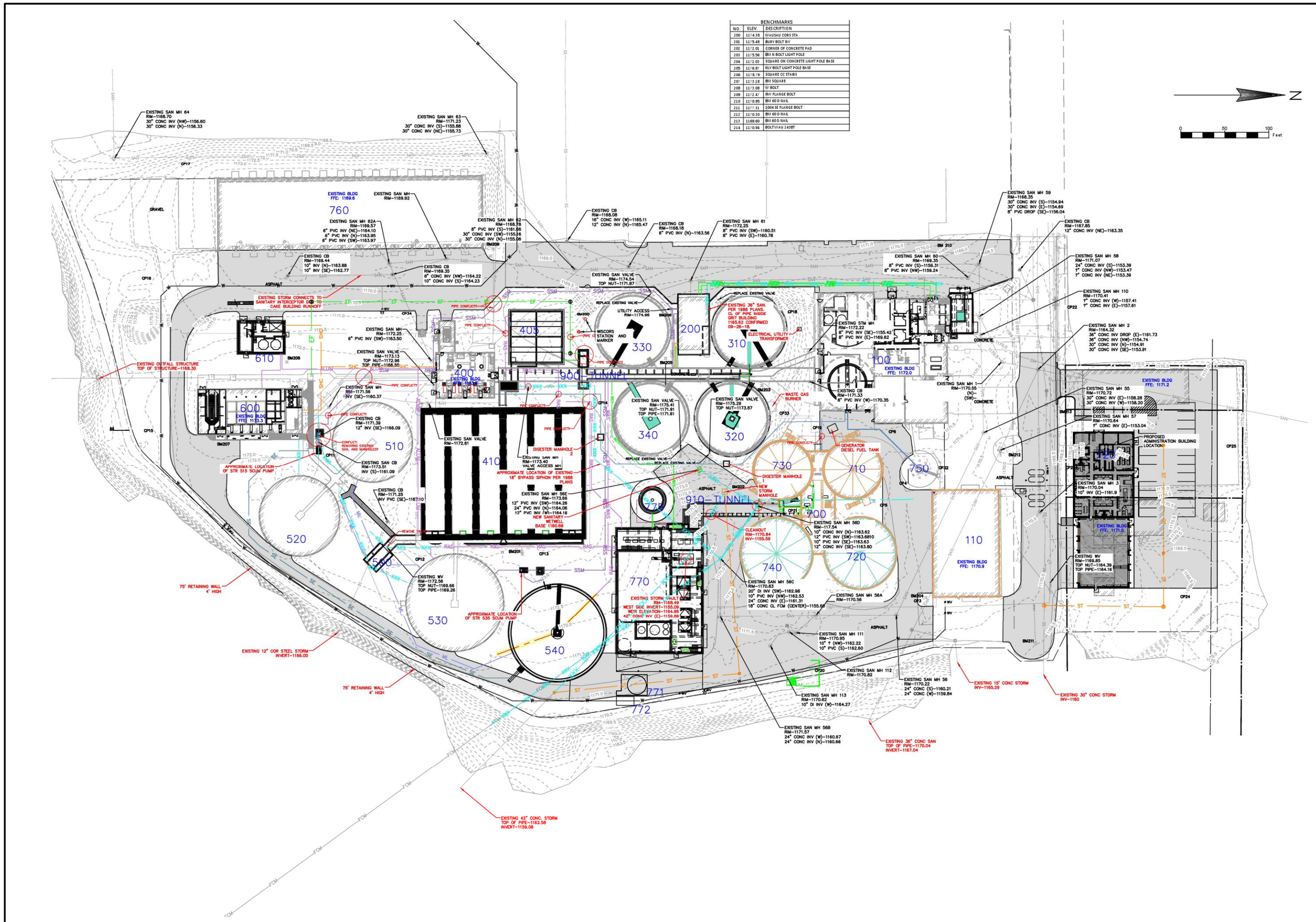


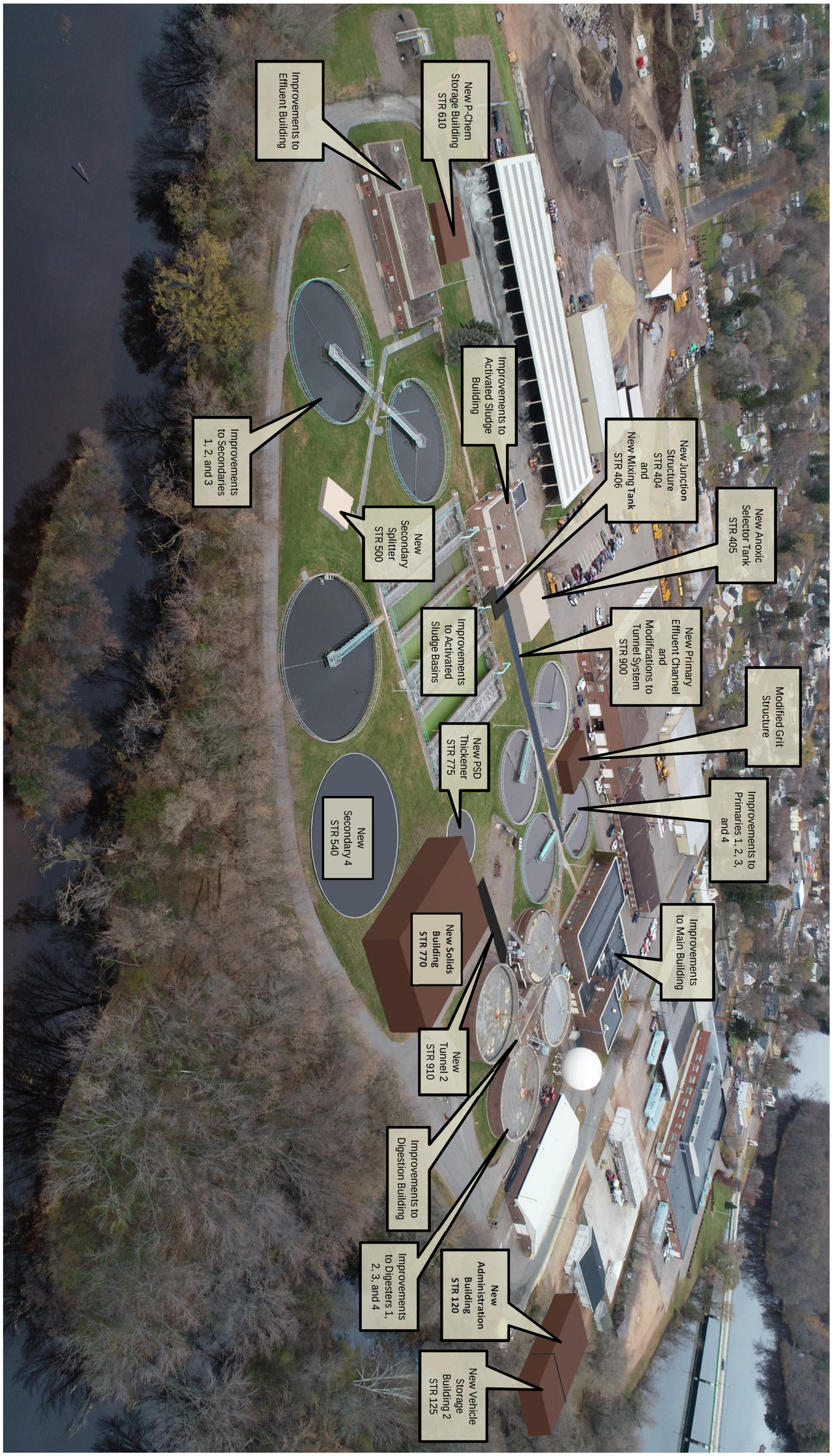
FIGURE 6-8
Proposed Site Plan

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

2019

13229



DONOHUE

13229 2019

FIGURE 6-9
Simple Rendering of Recommended Plan

2040 Wastewater Facility Plan
Wausau, WI

DONOHUE

13229 2019

FIGURE 6-10
Treatment Facility Property Boundary

2040 Wastewater Facility Plan
Wausau, WI

certainty, the cumulative total of the Planning Phase capital cost opinion. In other words, the Preliminary Layout Design Cost Opinion validated the Recommended Plan capital budget that was established during the Planning Phase.

The allowance for undefined or poorly defined design detail is 20% in the Preliminary Layout Design Cost Opinion. This value was 30% during the Planning Phase. The cost comparison in Table 6-2 shows that the Preliminary Layout Design costs were lower for some unit processes and Facility functions and higher for others. These differences were expected and are, in many instances, a product of the inherently different methods used to produce Planning Phase cost opinions and Preliminary Layout Design cost opinions. The Site Features line item has the most significant difference between the two cost opinions. This is largely attributed to that fact than many Site Feature costs are included in the individual line items in the Planning Phase Cost Opinion and accounted for separately in the Preliminary Layout Design Cost Opinion. For this particular Project, some of the differences are attributed to several Project-specific scope items. The Planning Phase Cost Opinion did not include or anticipate the need for a nearly $0.75M groundwater recharge system that is required because of off-site groundwater contamination. The Site Features line item includes site-wide electrical distribution and site piping costs. The Preliminary Layout Design identified additional work and costs that were not anticipated during the Planning Phase: roughly $1.5M for additional electrical work and $1M for additional site piping work.

Table 6-2 Comparison of Planning Phase and Preliminary Layout Design Cost Opinions

Unit Process or Function	Planning	Preliminary Layout Design	Difference: Preliminary Layout Design - Planning
Preliminary Treatment	$8,850,000	$9,261,000	$411,000
Primary Settling	$1,671,000	$1,515,000	($156,000)
Activated Sludge System	$8,299,000	$8,025,000	($274,000)
Secondary Settling	$974,000	$1,371,000	$397,000
Phosphorus and Filtration	$8,671,000	$7,153,000	($1,518,000)
Disinfection	$1,623,000	$1,610,000	($13,000)
Anaerobic Digestion	$9,480,000	$7,235,000	($2,245,000)
Solids Processing	$22,528,000	$19,569,000	($2,959,000)
Site Features	$10,711,000	$16,893,000	$6,182,000
Administration-Maintenance-Storage	$7,193,000	$7,297,000	$104,000
Total	**$80,000,000**	**$79,930,000**	**($71,000)**

The City intends to Bid the Work associated with the proposed Facility improvements in late 2019 or the first quarter of 2020. Construction is expected to require 24 months. A proposed implementation schedule is shown in Figure 6-11. In conformance with the requirements of the Wisconsin Clean Water Fund Program, reviewable plans and specifications will be submitted to the WDNR by September 30, 2019. The City recently adopted its first phased rate increase to help fund the impending Facility upgrade.

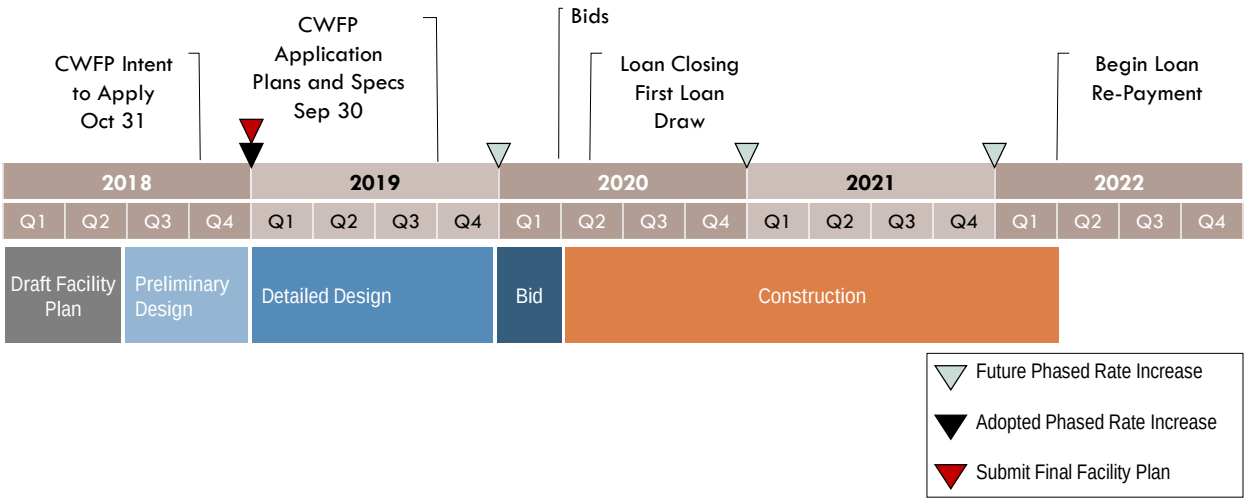


Figure 6-11 Proposed Implementation Schedule for the Recommended Plan | WWTF

Appendix A

WPDES Permit Effective Prior to January 2019

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew J. Frank, Secretary
Scott A. Humrickhouse, Regional Director

West Central Region Headquarters
1300 W. Clairemont Ave.
P.O. Box 4001
Eau Claire, WI 54702-4001
Telephone (715) 839-3700
FAX (715) 839-6076
TTY Access via relay - 711

MAYOR
DEC 15 2010
CITY OF WAUSAU

James Tipple
Mayor
Wausau Water Works
407 Grant Street
City Hall
Wausau, WI 54403

SUBJECT: WPDES Permit Reissuance No. WI-0025739-08-0
Wausau Water Works WW Treatment Facility, 435 Adrian Street, Wausau, WI 54403

Dear Permittee:

Your Wisconsin Pollutant Discharge Elimination System (WPDES) Permit is enclosed. The conditions of the enclosed permit reissuance were determined using the permit application, information from your WPDES permit file, other information available to the Department, comments received during the public notice period, and applicable Wisconsin Administrative Codes. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of the enclosed permit.

This enclosed permit requires you to submit monitoring results to the Department on a periodic basis. Blank copies of the appropriate monitoring forms and instructions for completing them will be mailed to you under separate cover. Any forms you are submitting electronically will be updated and available on the web.

The WPDES permit program has been approved by the Administrator of the U.S. Environmental Protection Agency pursuant to Section 402(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1342 (b)). The terms and conditions of the enclosed permit are accordingly subject to enforcement under ss. 283.89 and 283.91, Stats., and Section 309 of the Federal Act (33 U.S.C. Section 1319).

The Department has the authority under chs. 160 and 283, Stats., to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwater and surface waters of the State. The Department also has the authority to issue, reissue, modify, suspend, or revoke WPDES permits under ch. 283, Stats.

The enclosed permit contains water quality-based effluent limitations that are necessary to ensure the water quality standards for the Wisconsin River are met. You may apply for a variance from the water quality standard used to derive the limitations pursuant to s. 283.15, Stats., by submitting an application to the Director of the Bureau of Watershed Management, P.O. Box 7921, Madison, Wisconsin 53707 within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). Subchapter III of ch. NR 200, Wis. Adm. Code, specifies the procedures that must be followed and the information that must be included when submitting an application for a variance.

To challenge the reasonableness of or necessity for any term or condition of the enclosed permit, s. 283.63, Stats., and ch. NR 203, Wis. Adm. Code, require that you file a verified petition for review with the Secretary of the

Department of Natural Resources within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). For permit-related decisions that are not reviewable pursuant to s. 283.63, Stats., it may be possible for permittees or other persons to obtain an administrative review pursuant to s. 227.42, Stats., and s. NR 2.05(5), Wis. Adm. Code, or a judicial review pursuant to s. 227.52, Stats. If you choose to pursue one of these options, you should know that Wisconsin Statutes and Administrative Code establish time periods within which requests to review Department decisions must be filed.

Sincerely,

Harry Heldstab for

Scott Watson
Central Wisconsin Watershed Program Supervisor

Dated: 12 / 13 / 2010

cc: Cyndi Barr, WT/3
U.S. Fish and Wildlife Service (Electronic Copy via Email)
Eric Donaldson – WAU
Jeanne Calhoun – BRF
EPA – Region V (Electronic Copy via Email)

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES

NOTICE OF FINAL DETERMINATION TO REISSUE A WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES) PERMIT No. WI-0025739-08-0

Permittee: Wausau Water Works, City Hall, Wausau, WI, 54403

Facility Where Discharge Occurs: Wausau Water Works WW Treatment Facility, 435 Adrian Street, Wausau, WI 54403

Receiving Water And Location: the Wisconsin River located in the Lower Eau Claire River Watershed of the Central Wisconsin River Basin in Marathon County

Brief Facility Description: The Wausau Wastewater Treatments Facility treats wastewater from the City of Wausau, the City of Schofield, and the Town of Stettin, as well as industrial wastewater from Green Bay Packaging, Graphic Packaging, Kraft, Marathon Electric, and 3M. They also accept and treat digested sludge from the Village of Brokaw, domestic holding tank wastes, septic tank wastes, grease trap-interceptor waste, commercial septage and landfill leachate. The facility has an annual average design flow of 8.2 million gallons per day (MGD). The actual annual average flow was 3.584 MGD in 2009. Effluent is first treated via two mechanical bar screens, followed by a PISTA grit removal system. Subsequent wastewater treatment consists of primary clarification, conventional activated sludge, final clarification and sand filtration. Effluent is disinfected seasonally via ultraviolet light prior to discharge to the Wisconsin River. Waste activated sludge is thickened by a gravity belt prior to anaerobic digestion, which is dewatered using two belt filter presses. Sludge is then recycled via landspreading on Department approved sites. No major operational changes occurred during the last permit term. Significant permit changes proposed for the upcoming permit term are as follows: 1) Addition of a mercury variance limit & two associated compliance schedules (which is contingent on EPA review and approval after the 30 day public comment period), 2) All effluent pretreatment monitoring is monthly throughout the permit term, 3) No ammonia limit is needed, ammonia monitoring will only be required Nov-April, and the frequency will increase during those months in 2013, 4) The sludge monitoring frequency has been reduced from bimonthly to quarterly, and 5) A priority pollutant scan is required for sludge during this term per NR 215.

Permit Drafter's Name, Address and Phone: Holly Heldstab, DNR, WCR Headquarters, 1300 W. Clairemont Ave, Eau Claire, WI, 54702, (715) 839-1634

Basin Engineer's Name, Address, and Phone: Eric Donaldson, 5301 Rib Mountain Drive, Wausau, WI 54401, (715) 359-5866

Date Permit Signed/Issued: December 13, 2010
Date of Effectiveness: January 1, 2011
Date of Expiration: December 30, 2015

Following the public notice period the Department has made a final determination to reissue the WPDES permit for the above-named permittee for this existing discharge. The permit application information from the WPDES permit file, comments received on the proposed permit and applicable Wis. Adm. Codes were used as a basis for this final determination.

The Department has the authority to issue, modify, suspend, or revoke WPDES permits and to establish effluent limitations and permit conditions under ch. 283, Stats.

Following is a summary of significant comments and any significant changes which have been made in the terms and conditions set forth in the draft permit:

Comments Received from the Applicant, Individuals or Groups and Any Permit Changes as Applicable
Midwest Environmental Advocates (MEA) submitted comments requesting the effluent mercury limit be set at 1.3 ng/L.

Changes made to the permit since public notice are as follows: 1) An additional compliance schedule was added into the permit requiring them to investigate potential sources of mercury, 2) The permit effective date and expiration date were changed to later dates and 3) The required quarters for acute and chronic WET testing had to be adjusted due to the changed effective and expiration dates.

Comments Received from EPA or Other Government Agencies and Any Permit Changes as Applicable
The following comments from the EPA review of the permit and mercury variance precipitated changes to both mercury compliance schedules: 1) The first required action in Section 5.1, "Implementation", should reference the updated contract signed on Jan. 15, 2010, between the Marathon County Health Department and the City of Wausau. 2) The first required action in Section 5.2, "Identify Sources", should include language to explain that this action is to identify sources in addition to the ones that are being addressed in the PMP. The compliance schedules were changed accordingly.

The EPA approved the mercury variance on December 9, 2010.

As provided by s. 283.63, Stats., and ch. 203, Wis. Adm. Code, persons desiring further adjudicative review of this final determination may request a public adjudicatory hearing. A request shall be made by filing a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was signed (see permit signature date above). Further information regarding the conduct and nature of public adjudicatory hearings may be obtained by contacting the Department of Natural Resources, Bureau of Watershed Management, WPDES Permits, Box 7921, Madison, Wisconsin 53707 and by review of ch. NR 203, Wis. Adm. Code, s. 283.63 Stats., and applicable code law.

Information on file for this permit action may be inspected and copied at either the above named permit drafter's address or the above named basin engineer's address, Monday through Friday (except holidays), between 9:00 a.m. and 3:30 p.m. Information on this permit action may also be obtained by calling the permit drafter at (715) 839-1634 or by writing to the Department. Reasonable costs (usually 20 cents per page) will be charged for copies of information in the file other than the public notice and fact sheet. Pursuant to the Americans with Disabilities Act, reasonable accommodation, including the provision of informational material in an alternative format, will be made to qualified individuals upon request.

WISCONSIN
DEPT. OF NATURAL RESOURCES

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

Wausau Water Works

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility
located at
Wausau Wastewater Treatment Facility, 435 Adrian Street, Wausau, WI 54403
to
the Wisconsin River located in the Lower Eau Claire River Watershed
of the Central Wisconsin River Basin in Marathon County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By Tracy Heldstab for
Scott Watson
Central Wisconsin Watershed Program Supervisor

12/13/2010
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE – January 1, 2011 **EXPIRATION DATE – December 30, 2015**

TABLE OF CONTENTS

1 INFLUENT REQUIREMENTS 1

1.1 SAMPLING POINT(S) 1
1.2 MONITORING REQUIREMENTS 1
1.2.1 Sampling Point 701 - INFLUENT TO PLANT 1

2 IN-PLANT REQUIREMENTS 3

2.1 SAMPLING POINT(S) 3
2.2 MONITORING REQUIREMENTS AND LIMITATIONS 3
2.2.1 Sampling Point 104 - Mercury field blank 3

3 SURFACE WATER REQUIREMENTS 4

3.1 SAMPLING POINT(S) 4
3.2 MONITORING REQUIREMENTS AND EFFLUENT LIMITATIONS 4
3.2.1 Sampling Point (Outfall) 001 - EFFLUENT TO WISCONSIN RIVER 4
3.2.2 Sampling Point 601 - WISCONSIN RIVER 9

4 LAND APPLICATION REQUIREMENTS 11

4.1 SAMPLING POINT(S) 11
4.2 MONITORING REQUIREMENTS AND LIMITATIONS 11
4.2.1 Sampling Point (Outfall) 002 - CAKE SLUDGE 11

5 SCHEDULES OF COMPLIANCE 16

5.1 MERCURY POLLUTANT MINIMIZATION PROGRAM 16
5.2 MERCURY SOURCE REDUCTION COMPLIANCE SCHEDULE 16

6 STANDARD REQUIREMENTS 17

6.1 REPORTING AND MONITORING REQUIREMENTS 17
6.1.1 Monitoring Results 17
6.1.2 Sampling and Testing Procedures 17
6.1.3 Pretreatment Sampling Requirements 17
6.1.4 Recording of Results 18
6.1.5 Reporting of Monitoring Results 18
6.1.6 Compliance Maintenance Annual Reports 18
6.1.7 Records Retention 18
6.1.8 Other Information 19
6.2 SYSTEM OPERATING REQUIREMENTS 19
6.2.1 Noncompliance Notification 19
6.2.2 Flow Meters 19
6.2.3 Raw Grit and Screenings 19
6.2.4 Sludge Management 19
6.2.5 Prohibited Wastes 20
6.2.6 Unscheduled Bypassing 20
6.2.7 Scheduled Bypassing 20
6.2.8 Ammonia Limit Not Needed - Continue to Optimize Removal of Ammonia 21
6.2.9 Proper Operation and Maintenance 21
6.3 SURFACE WATER REQUIREMENTS 21
6.3.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit 21
6.3.2 Appropriate Formulas for Effluent Calculations 21
6.3.3 Visible Foam or Floating Solids 21
6.3.4 Percent Removal 22
6.3.5 Fecal Coliforms 22
6.3.6 Seasonal Disinfection 22
6.3.7 Whole Effluent Toxicity (WET) Monitoring Requirements 22

6.3.8 Whole Effluent Toxicity (WET) Identification and Reduction 22
6.4 PRETREATMENT PROGRAM REQUIREMENTS 23
6.4.1 Inventories 23
6.4.2 Regulation of Industrial Users 23
6.4.3 Annual Pretreatment Program Report 24
6.4.4 Pretreatment Program Modifications 24
6.4.5 Program Resources 25
6.5 LAND APPLICATION REQUIREMENTS 25
6.5.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations 25
6.5.2 General Sludge Management Information 25
6.5.3 Sludge Samples 25
6.5.4 Land Application Characteristic Report 25
6.5.5 Calculation of Water Extractable Phosphorus 26
6.5.6 Monitoring and Calculating PCB Concentrations in Sludge 26
6.5.7 Land Application Report 26
6.5.8 Other Methods of Disposal or Distribution Report 27
6.5.9 Approval to Land Apply 27
6.5.10 Soil Analysis Requirements 27
6.5.11 Land Application Site Evaluation 27
6.5.12 Class B Sludge: Anaerobic Digestion 27
6.5.13 Vector Control: Volatile Solids Reduction 27
7 SUMMARY OF REPORTS DUE **29**

1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	Representative composite influent samples shall be taken from the influent pump discharge pipe.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total		mg/L	5/Week	24-Hr Comp	
Suspended Solids, Total		mg/L	5/Week	24-Hr Comp	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Comp	See footnote 1.2.1.1 and 1.2.1.2 below
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Copper, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Cyanide, Total		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Lead, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Silver, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Comp	See footnote 1.2.1.2 below

1.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of

intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

1.2.1.2 Pretreatment Parameters

These are pretreatment parameters. Sampling for pretreatment parameters shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the effluent for these parameters shall be coordinated with the sampling of influent.
Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

2 In-Plant Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
104	The field blank shall be collected using standard handling procedures every day that mercury samples are collected at influent and effluent.

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point 104 - Mercury field blank

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Mercury, Total Recoverable		ng/L	Monthly	Blank	

2.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3 Surface Water Requirements

3.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Representative effluent samples, except those for fecal coliform, shall be collected at the disinfection channel prior to disinfection; samples for fecal coliform shall be collected after disinfection.
601	Temperature and flow of the Wisconsin River shall be monitored for determination of Wasteload Allocated (WLA) limits at Outfall 001. See footnotes below for specific monitoring information.

3.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 001 - EFFLUENT TO WISCONSIN RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
BOD_5, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
WLA BOD_5 Discharged	Daily Max - Variable	lbs/day	5/Week	Calculated	See footnote 3.2.1.2 below
WLA Value		lbs/day	5/Week	See Table	Report applicable variable limit on DMR. See footnote 3.2.1.2 below
Suspended Solids, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.0 mg/L	5/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
Fecal Coliform	Geometric Mean	400 #/100 ml	Weekly	Grab	Limit and monitoring apply May-Sept
Nitrogen, Ammonia (NH_3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	Monthly monitoring required Nov-April in all years other than 2013
Nitrogen, Ammonia (NH_3-N) Total		mg/L	Weekly	24-Hr Flow Prop Comp	Weekly monitoring required Jan-Dec in 2013

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Hardness, Total as $CaCO_3$		mg/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Lead, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Silver, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Cyanide, Total		µg/L	Monthly	24-Hr Flow Prop Comp	See footnote 3.2.1.3 below
Mercury, Total Recoverable	Daily Max	32 ng/L	Monthly	Grab	See footnote 3.2.1.3 & 3.2.1.4 below
Pentachloro- phenol		µg/L	Monthly	Grab	
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See footnote 3.2.1.5 below
Chronic WET		rTU_c	See Listed Qtr(s)	24-Hr Flow Prop Comp	See footnote 3.2.1.5 below

3.2.1.1 Average Annual Design Flow

The average annual design flow of the permittee's wastewater treatment facility is 8.2 MGD.

3.2.1.2 Waste Load Allocation (WLA) Limits for BOD5

WASTELOAD ALLOCATED (WLA) LIMITS IN LBS/DAY FOR BOD5

RIVER MILE 265.0 TO 260.0

MAY-JUNE

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	← A →		← B →			← C →												
≥78	1314	1275	1321	1422	1494	1541	1624	1729	1862	2002	2179	2406	2709	3051	3415	3822	4103	4597
74 to 77	1213	1228	1339	1462	1617	1610	1736	1898	2078	2287	2507	2806	3195	3620	4103	4456	5097	5811
70 to 73	1152	1213	1350	1476	1552	1700	1880	2089	2147	2586	2864	3235	3728	4103	4716	5433	6236	6982
66 to 69	1170	1253	1412	1534	1696	1905	2143	2413	2712	3029	3372	3840	4244	4961	5757	6640	7616	7706
62 to 65	1195	1394	1534	1721	1959	2240	2557	2907	3278	3685	4103	4525	5353	6279	7317	7706	7706	7706
58 to 61	1350	1538	1761	2046	2384	2773	3195	3656	4103	4492	5105	5944	7065	7706	7706	7706	7706	7706
54 to 57	1541	1804	2165	2590	3069	3599	4103	4622	5339	6131	7000	7706	7706	7706	7706	7706	7706	7706
50 to 53	1844	2291	2838	3454	4103	4708	5577	6546	7605	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2413	3123	3959	4658	5721	6928	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3404	4298	5598	7112	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	4921	6787	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

JULY-AUGUST

River Tempera-ture (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	A	← B →			← C →													
≥78	1426	1415	1498	1617	1696	1732	1822	1930	2067	2215	2381	2611	2910	3242	3606	4017	4254	4784
74 to 77	1332	1383	1509	1617	1685	1790	1927	2089	2269	2474	2698	2986	3375	3808	4103	4643	5274	5977
70 to 73	1278	1365	1516	1617	1721	1876	2060	2273	2503	2763	3040	3408	3908	4244	4885	5595	6387	7259
66 to 69	1289	1397	1566	1689	1858	2064	2309	2579	2871	3191	3530	4009	4406	5115	5908	6776	7706	7706
62 to 65	1314	1534	1675	1869	2111	2392	2712	3058	3429	3847	4103	4679	5508	6423	7447	7706	7706	7706
58 to 61	1476	1671	1898	2193	2536	2921	3346	3815	4103	4651	5260	6092	7209	7706	7706	7706	7706	7706
54 to 57	1664	1941	2305	2737	3220	3757	4128	4784	5497	6290	7155	7706	7706	7706	7706	7706	7706	7706
50 to 53	1974	2435	2986	3606	4103	4874	5750	6719	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2557	3278	4103	4834	5905	7115	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3573	4103	5804	7328	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	5133	7025	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

SEPTEMBER

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	← A →		← B →			← C →												
≥78	1062	1062	1062	1062	1062	1062	1174	1293	1448	1610	1786	2038	2370	2723	3109	3516	3977	4294
74 to 77	1062	1062	1062	1062	1062	1195	1350	1523	1725	1938	2183	2503	2896	3336	3829	4168	4827	5555
70 to 73	1062	1062	1062	1062	1167	1343	1545	1768	2017	2287	2575	2964	3465	4031	4452	5195	6016	6921
66 to 69	1062	1062	1076	1185	1376	1595	1851	2132	2446	2777	3127	3588	4103	4737	5551	6452	7447	7706
62 to 65	1062	1062	1203	1419	1675	1966	2298	2662	3044	3454	3912	4305	5151	6092	7144	7706	7706	7706
58 to 61	1062	1210	1466	1772	2132	2528	2964	3429	3948	4276	4896	5746	6888	7706	7706	7706	7706	7706
54 to 57	1195	1505	1891	2334	2831	3368	3977	4402	5123	5926	6802	7706	7706	7706	7706	7706	7706	7706
50 to 53	1520	2002	2572	3206	3912	4467	5346	6322	7393	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2093	2831	3663	4388	5458	6672	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3073	4103	5292	6812	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	4535	6413	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

OCTOBER

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	← A →		← B →			← C →												
≥78	1062	1062	1062	1062	1062	1062	1062	1138	1275	1448	1621	1866	2190	2550	2925	3332	3775	4103
74 to 77	1062	1062	1062	1062	1062	1062	1206	1379	1566	1779	2028	2334	2737	3177	3653	4103	4618	5342
70 to 73	1062	1062	1062	1062	1062	1203	1408	1631	1880	2143	2428	2820	3318	3865	4283	5011	5825	6722
66 to 69	1062	1062	1062	1062	1249	1473	1721	2006	2312	2644	2997	3454	4092	4579	5386	6279	7270	7706
62 to 65	1062	1062	1087	1303	1559	1855	2186	2543	2925	3332	3775	4168	5004	5937	6985	7706	7706	7706
58 to 61	1062	1102	1358	1667	2020	2420	2853	3314	3818	4146	4759	5602	6737	7706	7706	7706	7706	7706
54 to 57	1091	1401	1783	2226	2719	3256	3750	4276	4993	5789	6658	7706	7706	7706	7706	7706	7706	7706
50 to 53	1419	1898	2464	3098	3790	4341	5213	6186	7245	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	1984	2723	3545	4258	5324	6528	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	2950	4089	5148	6658	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	6388	6250	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

Definitions

Point source allocation values (pounds per day BOD) in the above tables represent water quality related effluent limitations. The flow and temperature conditions (reported at Sample Point 601) used to determine a point source allocation value for a given day shall be the representative measurements of the flow and temperature. River flows

used should be those collected and reported by Wisconsin Valley Improvement Company (WVIC) for the period beginning at 7 a.m. of the previous day and ending at 7 a.m. of the current day. Temperature values used should be those collected and reported by Wisconsin Public Service Corporation for the period beginning at 12 midnight of the previous day and ending 12 midnight of the current day. Wasteload Allocation (WLA) limits shall be calculated with BOD_5 values of samples collected for the current day, which are collected by Wausau for the period from 7 a.m. of the current day to 7 a.m. of the following day.

Monitoring Requirements: The same 24-hour period shall be utilized for the collection of composite and continuous samples for river flow and temperature and all effluent characteristics including effluent flow and BOD_5. Presently, the WVIC utilizes the 24-hour monitoring period ending at 7 a.m. for river flow.

Reporting Requirements: During the months of May through October inclusive the permittee shall report the following information:

The daily river flow (cfs);

The daily river temperature (oF);

The daily point source allocation value (lbs BOD_5 per day);

The actual daily discharge value of BOD_5 (lbs BOD_5 per day);

WLA Water Quality Related Effluent Limitations Restriction: In no case shall the WLA water quality related effluent limitations be less stringent than the applicable categorical effluent limitations contained in the effluent limits and monitoring table.

3.2.1.3 Sample Analysis for Pretreatment Parameters

These are pretreatment parameters that shall be done during a day in each month when industrial discharges are occurring at normal to maximum levels. This monthly sampling shall be coordinated with the sampling of the influent.

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

3.2.1.4 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports. See the Mercury Pollutant Minimization Compliance Schedule in Section 5.1 and the Mercury Source Reduction Compliance Schedule in Section 5.2 for more information.

3.2.1.5 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Wisconsin River

Instream Waste Concentration (IWC): 6%

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.
- **Chronic:** 100, 30, 10, 3, 1% (if the IWC ≤30%) or 100, 75, 50, 25, 12.5% (if the IWC >30%) and any additional selected by the permittee.

WET Testing Frequency: Acute and Chronic WET Tests are required during the following quarters.

- 1st quarter (Jan-March) 2011
- 2nd quarter (April-June) 2012
- 3rd quarter (July-Sept) 2013
- 4th quarter (Oct-Dec) 2014
- 1st quarter (Jan-March) 2015

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Watershed Management, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The original Discharge Monitoring Report (DMR) form and one copy shall be sent to the contact and location provided on the DMR by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: If $LC_{50} \geq 100$, then $TU_a = 1.0$. If LC_{50} is < 100, then $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Relative Toxic Unit - Chronic (rTU_c) is greater than 1.0 for either species. The rTU_c shall be calculated as follows: If $IC_{25} \geq IWC$, then $rTU_c = 1.0$. If $IC_{25} < IWC$, then $rTU_c = IWC \div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

3.2.2 Sampling Point 601 - WISCONSIN RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
WLA Previous Day River Flow		cfs	5/Week	Measure	See footnote 3.2.2.1 below
WLA Previous Day River Temp		deg F	5/Week	Measure	See footnote 3.2.2.1 below

3.2.2.1 Definitions

River flow shall be defined as the daily average flow value derived from continuous river flow monitoring data for the Wisconsin River collected at the Rothschild Dam. If such flow data is unavailable for any day, flow shall be calculated by multiplying by 1.3 the daily average flow value derived from continuous stream flow monitoring data for the Wisconsin River collected at the Merrill Dam to correspond to the flow at Rothschild Dam. Daily average flow values reported by the Wisconsin Valley Improvement Co. for the Rothschild Dam and Merrill Dam locations are acceptable.

Temperature shall be defined as the daily average temperature value derived from continuous river temperature monitoring data for the Wisconsin River collected at the Wisconsin Public Service Corporation, Weston Generating Station. If such temperature data is unavailable for any day, a single grab sample for river temperature collected at the Domtar raw river water intake may be substituted for continuous river temperature monitoring. Daily average temperature values, or alternately, daily temperatures, reported by the Wisconsin Valley Improvement Company for the Weston Generating Station and Domtar locations are acceptable.

4 Land Application Requirements

4.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Representative sludge samples shall be collected from cake sludge storage quarterly and monitored for Lists 1, 2, 3 and 4. Representative samples shall be collected once in 2011 and be monitored for PCBs and a priority pollutant scan shall also be conducted.
003	Permittee shall obtain Departmental approval prior to landspreading liquid sludge (and therefore commencing use of Outfall 003).

4.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

4.2.1 Sampling Point (Outfall) 002 - CAKE SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Quarterly	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Quarterly	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Quarterly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH_4-N) Total		Percent	Quarterly	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2011
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2011
Priority Pollutant Scan			Once	Grab	As specified in ch. NR 215.03 (1-6), Wis. Adm. Code (excluding asbestos).

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**Quarterly**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**Quarterly**

4.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

4.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

4.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

4.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

4.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2011**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

4.2.1.6 Lists 1, 2, 3, and 4

List 1 **TOTAL SOLIDS AND METALS** See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 **NUTRIENTS** See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

* The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

4.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations		
The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements.		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

5 Schedules of Compliance

5.1 Mercury Pollutant Minimization Program

Required Action	Date Due
Implementation: The permittee shall implement the pollutant minimization program as initially submitted on October 31, 2006 and reviewed & approved by the Department on March 9, 2007. The permittee should also continue to implement the Mercury Reduction Program identified in the January 15, 2010 Contract Agreement between the Marathon County Health Department and the City of Wausau.	
Submit Annual Status Report: The permittee shall submit to the Department, an annual status report on the progress of the mercury pollutant minimization plan (PMP). Submittal of the first annual status report is required by the January 31, 2011 and annually by January 31 thereafter. Note: If the permittee wishes to apply for an alternative mercury effluent limitation, that application is due with the application for permit reissuance by 6 months prior to permit expiration. The permittee should submit or reference the PMP plan as updated by the Annual Status Report or more recent developments as part of that application.	01/31/2011
Submit Annual Status Report #2: Permittee shall submit annual status report #2.	01/31/2012
Submit Annual Status Report #3: Permittee shall submit annual status report #3.	01/31/2013
Submit Annual Status Report #4: Permittee shall submit annual status report #4.	01/31/2014
Submit Annual Status Report #5: Permittee shall submit annual status report #5.	01/31/2015

5.2 Mercury Source Reduction Compliance Schedule

Required Action	Date Due
Identify Sources: Review potential sources of mercury in the collection system and identify which ones should be sent a letter to determine what sources of mercury they use. Sources reviewed shall be in addition to those addressed in the mercury pollutant minimization plan (PMP).	01/31/2011
Send Letters: Send letters to identified sources requesting information on what sources of mercury they use.	03/31/2011
Action Plan: Develop an action plan for responding to the identified sources of mercury. Plan shall be reviewed by the Department.	09/30/2011
Ordinance Revision: Update or pass any required ordinance changes to enforce the action plan.	06/30/2013

6 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

6.1 Reporting and Monitoring Requirements

6.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. When submitting a paper Discharge Monitoring Report form, the original and one copy of the Wastewater Discharge Monitoring Report Form shall be submitted to the return address printed on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

All Wastewater Discharge Monitoring Reports submitted to the Department should be submitted using the electronic Discharge Monitoring Report system. Permittees who may be unable to submit Wastewater Discharge Monitoring Reports electronically may request approval to submit paper DMRs upon demonstration that electronic reporting is not feasible or practicable.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

An Electronic Discharge Monitoring Report Certification sheet shall be signed and submitted with each electronic Discharge Monitoring Report submittal. This certification sheet, which is not part of the electronic report form, shall be signed by a principal executive officer, a ranking elected official or other duly authorized representative and shall be mailed to the Department at the time of submittal of the electronic Discharge Monitoring Report. The certification sheet certifies that the electronic report form is true, accurate and complete. Paper reports shall be signed by a principal executive officer, a ranking elected official, or other duly authorized representative.

6.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

6.1.3 Pretreatment Sampling Requirements

Sampling for pretreatment parameters (cadmium, chromium, copper, lead, nickel, zinc, and mercury) shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the influent and effluent for these parameters shall be coordinated. All 24 hour composite samples shall be flow proportional.

6.1.4 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

6.1.5 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

6.1.6 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

A separate CMAR certification document, that is not part of the electronic report form, shall be mailed to the Department at the time of electronic submittal of the CMAR. The CMAR certification shall be signed and submitted by an authorized representative of the permittee. The certification shall be submitted by mail. The certification shall verify the electronic report is complete, accurate and contains information from the owner's treatment works.

6.1.7 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

6.1.8 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

6.2 System Operating Requirements

6.2.1 Noncompliance Notification

- The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:
  - any noncompliance which may endanger health or the environment;
  - any violation of an effluent limitation resulting from an unanticipated bypass;
  - any violation of an effluent limitation resulting from an upset; and
  - any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.

- A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at **1-800-943-0003**

6.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

6.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-536, Wis. Adm. Code.

6.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

6.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and
- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

6.2.6 Unscheduled Bypassing

Any unscheduled bypass or overflow of wastewater at the treatment works or from the collection system is prohibited, and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats., unless:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- The permittee notified the Department as required in this Section.

Whenever there is an unscheduled bypass or overflow occurrence at the treatment works or from the collection system, the permittee shall notify the Department <u>within 24 hours</u> of initiation of the bypass or overflow occurrence by telephoning the wastewater staff in the regional office as soon as reasonably possible (FAX, email or voice mail, if staff are unavailable).

In addition, the permittee shall <u>within 5 days</u> of conclusion of the bypass or overflow occurrence report the following information to the Department in writing:

- Reason the bypass or overflow occurred, or explanation of other contributing circumstances that resulted in the overflow event. If the overflow or bypass is associated with wet weather, provide data on the amount and duration of the rainfall or snow melt for each separate event.
- Date the bypass or overflow occurred.
- Location where the bypass or overflow occurred.
- Duration of the bypass or overflow and estimated wastewater volume discharged.
- Steps taken or the proposed corrective action planned to prevent similar future occurrences.
- Any other information the permittee believes is relevant.

6.2.7 Scheduled Bypassing

Any construction or normal maintenance which results in a bypass of wastewater from a treatment system is prohibited unless authorized by the Department in writing. If the Department determines that there is significant public interest in the proposed action, the Department may schedule a public hearing or notice a proposal to approve the bypass. Each request shall specify the following minimum information:

- proposed date of bypass;
- estimated duration of the bypass;

- estimated volume of the bypass;
- alternatives to bypassing; and
- measures to mitigate environmental harm caused by the bypass.

6.2.8 Ammonia Limit Not Needed - Continue to Optimize Removal of Ammonia

Applying the procedures in s. NR 106.05, Wis. Adm. Code, to ammonia data that is representative of the current operations of the wastewater treatment plant resulted in a determination that ammonia effluent limits are not necessary in this permit. Pursuant to NR 106.33, throughout the term of this permit, the wastewater treatment plant shall continue to be operated in a manner that optimizes the removal of ammonia within the design capabilities of the wastewater treatment plant.

6.2.9 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

6.3 Surface Water Requirements

6.3.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

6.3.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average limits and mass limits:

Weekly/Monthly average concentration = the sum of all daily results for that week/month, divided by the number of results during that time period.

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

6.3.3 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

6.3.4 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD_5 and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

6.3.5 Fecal Coliforms

The limit for fecal coliforms shall be expressed as a monthly geometric mean.

6.3.6 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitation for fecal coliforms apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

6.3.7 Whole Effluent Toxicity (WET) Monitoring Requirements

In order to determine the potential impact of the discharge on aquatic organisms, static-renewal toxicity tests shall be performed on the effluent in accordance with the procedures specified in the *"State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition" (PUB-WT-797*, November 2004) as required by NR 219.04, Table A, Wis. Adm. Code). All of the WET tests required in this permit, including any required retests, shall be conducted on the *Ceriodaphnia dubia* and fathead minnow species. Receiving water samples shall not be collected from any point in contact with the permittee's mixing zone and every attempt shall be made to avoid contact with any other discharge's mixing zone.

6.3.8 Whole Effluent Toxicity (WET) Identification and Reduction

Within 60 days of a retest which showed positive results, the permittee shall submit a written report to the Biomonitoring Coordinator, Bureau of Watershed Management, 101 S. Webster St., PO Box 7921, Madison, WI 53707-7921, which details the following:

- A description of actions the permittee has taken or will take to remove toxicity and to prevent the recurrence of toxicity;

- A description of toxicity reduction evaluation (TRE) investigations that have been or will be done to identify potential sources of toxicity, including some or all of the following actions:

  (a) Evaluate the performance of the treatment system to identify deficiencies contributing to effluent toxicity (e.g., operational problems, chemical additives, incomplete treatment)
  (b) Identify the compound(s) causing toxicity
  (c) Trace the compound(s) causing toxicity to their sources (e.g., industrial, commercial, domestic)
  (d) Evaluate, select, and implement methods or technologies to control effluent toxicity (e.g., in-plant or pretreatment controls, source reduction or removal)

- Where corrective actions including a TRE have not been completed, an expeditious schedule under which corrective actions will be implemented;

- If no actions have been taken, the reason for not taking action.

The permittee may also request approval from the Department to postpone additional retests in order to investigate the source(s) of toxicity. Postponed retests must be completed after toxicity is believed to have been removed.

6.4 Pretreatment Program Requirements

The permittee is required to operate an industrial pretreatment program as described in the program initially approved by the Department of Natural Resources including any subsequent program modifications approved by the Department, and including commitments to program implementation activities provided in the permittee's annual pretreatment program report, and that complies with the requirements set forth in 40 CFR Part 403 and ch. NR 211, Wis. Adm. Code. To ensure that the program is operated in accordance with these requirements, the following general conditions and requirements are hereby established:

6.4.1 Inventories

The permittee shall implement methods to maintain a current inventory of the general character and volume of wastewater that industrial users discharge to the treatment works and shall provide an updated industrial user listing annually and report any changes in the listing to the Department by March 31 of each year as part of the annual pretreatment program report required herein.

6.4.2 Regulation of Industrial Users

6.4.2.1 Limitations for Industrial Users:

The permittee shall develop, maintain, enforce and revise as necessary local limits to implement the general and specific prohibitions of the state and federal General Pretreatment Regulations.

6.4.2.2 Control Documents for Industrial Users (IUs)

The permittee shall control the discharge from each significant industrial user through individual discharge permits as required by s. NR 211.235, Wis. Adm. Code and in accordance with the approved pretreatment program procedures and the permittee's sewer use ordinance. The discharge permits shall be modified in a timely manner during the stated term of the discharge permits according to the sewer use ordinance as conditions warrant. The discharge permits shall include at a minimum the elements found in s. NR 211.235(1), Wis. Adm. Code and references to the approved pretreatment program procedures and the sewer use ordinance.

The permittee shall provide a copy of all newly issued, reissued, or modified discharge permits to the Department.

6.4.2.3 Review of Industrial User Reports, Inspections and Compliance Monitoring

The permittee shall require the submission of, receive, and review self-monitoring reports and other notices from industrial users in accordance with the approved pretreatment program procedures. The permittee shall randomly sample and analyze industrial user discharges and conduct surveillance activities to determine independent of information supplied by the industrial users, whether the industrial users are in compliance with pretreatment standards and requirements. The inspections and monitoring shall also be conducted to maintain accurate knowledge of local industrial processes, including changes in the discharge, pretreatment equipment operation, spill prevention control plans, slug control plans, and implementation of solvent management plans.

At least one time per year the permittee shall inspect and sample the discharge from each significant industrial user, or more frequently if so specified in the permittee's approved pretreatment program. At least once every 2 years the permittee shall evaluate whether each significant industrial user needs a slug control plan. If a slug control plan is needed, the plan shall contain at a minimum the elements specified in s. NR 211.235(4)(b), Wis. Adm. Code.

6.4.2.4 Enforcement and Industrial User Compliance Evaluation & Violation Reports

The permittee shall enforce the industrial pretreatment requirements including the industrial user discharge limitations of the permittee's sewer use ordinance. The permittee shall investigate instances of noncompliance by collecting and analyzing samples and collecting other information with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Investigation and response to instances of noncompliance shall be in accordance with the permittee's sewer use ordinance and approved Enforcement Response Plan.

The permittee shall make a semiannual report on forms provided or approved by the Department. The semiannual report shall include an analysis of industrial user significant noncompliance (i.e. the Industrial User Compliance Evaluation, also known as the SNC Analysis) as outlined in s.NR 211.23(1)(j), Wis. Adm. Code, and a summary of the permittee's response to all industrial noncompliance (i.e. the Industrial User Violation Report). The Industrial User Compliance Evaluation Report shall include monitoring results received from industrial users pursuant to s. NR 211.15(1)-(5), Wis. Adm. Code. The Industrial User Violation Report shall include copies of all notices of noncompliance, notices of violation and other enforcement correspondence sent by the permittee to industrial users, together with the industrial user's response. The Industrial User Compliance Evaluation and Violation Reports for the period January through June shall be provided to the Department by September 30 of each year and for the period July through December shall be provided to the Department by March 31 of the succeeding year, unless alternate submittal dates are approved.

6.4.2.5 Publication of Violations

The permittee shall publish a list of industrial users that have significantly violated the municipal sewer use ordinance during the calendar year, in the largest daily newspaper in the area by March 31 of the following year pursuant to s. NR 211.23(1)(j), Wis. Adm. Code. A copy of the newspaper publication shall be provided as part of the annual pretreatment report specified herein.

6.4.2.6 Multijurisdictional Agreements

The permittee shall establish agreements with all contributing jurisdictions as necessary to ensure compliance with pretreatment standards and requirements by all industrial users discharging to the permittee's wastewater treatment system. Any such agreement shall identify who will be responsible for maintaining the industrial user inventory, issuance of industrial user control mechanisms, inspections and sampling, pretreatment program implementation, and enforcement.

6.4.3 Annual Pretreatment Program Report

The permittee shall evaluate the pretreatment program, and submit the Pretreatment Program Report to the Department on forms provided or approved by the Department by March 31 annually, unless an alternate submittal date is approved. The report shall include a brief summary of the work performed during the preceding calendar year, including the numbers of discharge permits issued and in effect, pollution prevention activities, number of inspections and monitoring surveys conducted, budget and personnel assigned to the program, a general discussion of program progress in meeting the objectives of the permittee's pretreatment program together with summary comments and recommendations.

6.4.4 Pretreatment Program Modifications

- Future Modifications: The permittee shall within one year of any revisions to federal or state General Pretreatment Regulations submit an application to the Department in duplicate to modify and update its approved pretreatment program to incorporate such regulatory changes as applicable to the permittee. Additionally, the Department or the permittee may request an application for program modification at any time where necessary to improve program effectiveness based on program experience to date.

- Modifications Subject to Department Approval: The permittee shall submit all proposed pretreatment program modifications to the Department for determination of significance and opportunity for comment in accordance with the requirements and conditions of s. NR 211.27, Wis. Adm. Code. Any substantial proposed program modification shall be subject to Department public noticing and formal approval prior to implementation. A substantial program modification includes, but is not limited to, changes in enabling legal authority to administer and enforce pretreatment conditions and requirements; significant changes in program administrative or operational procedures; significant reductions in monitoring frequencies; significant reductions in program resources including personnel commitments, equipment, and funding levels; changes (including any relaxation) in the local limitations for substances enforced and applied to users of the sewerage treatment works; changes in treatment works sludge disposal or management practices which impact the pretreatment program; or program modifications which increase pollutant loadings to the treatment works. The Department shall use the procedures outlined in s. NR 211.30, Wis. Adm. Code for review and approval/denial of proposed pretreatment program modifications. The permittee shall comply with local public participation requirements when implementing the pretreatment program.

6.4.5 Program Resources

The permittee shall have sufficient resources and qualified personnel to carry out the pretreatment program responsibilities as listed in ss. NR 211.22 and NR 211.23, Wis. Adm. Code.

6.5 Land Application Requirements

6.5.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

6.5.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

6.5.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

6.5.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Form 3400-49 and Lab Report, unless approval for not submitting the lab reports has been given. Both reports shall be submitted by January 31 following each year of analysis.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

6.5.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:
Water Extractable Phosphorus (% of Total P) =
[Water Extractable Phosphorus (mg/kg, dry wt) ÷ Total Phosphorus (mg/kg, dry wt)] x 100

6.5.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note**: It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.
- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

6.5.7 Land Application Report

Land Application Report Form 3400-55 shall be submitted by January 31, following each year non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code.

6.5.8 Other Methods of Disposal or Distribution Report

The permittee shall submit Report Form 3400-52 by January 31, following each year sludge is hauled, landfilled, incinerated, or when exceptional quality sludge is distributed or land applied.

6.5.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (l), Wis. Adm. Code.

6.5.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

6.5.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

6.5.12 Class B Sludge: Anaerobic Digestion

Treat the sludge in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35° C to 55° C and 60 days at 20° C. Straight-line interpolation to calculate mean cell residence time is allowable when the temperature falls between 35° C and 20° C.

6.5.13 Vector Control: Volatile Solids Reduction

The mass of volatile solids in the sludge shall be reduced by a minimum of 38% between the time the sludge enters the digestion process and the time it either exits the digester or a storage facility. For calculation of volatile solids reduction, the permittee shall use the Van Kleeck equation or one of the other methods described in "Determination of Volatile Solids Reduction in Digestion" by J.B. Farrell, which is Appendix C of EPA's *Control of Pathogens in Municipal Wastewater Sludge* (EPA/625/R-92/013). The Van Kleeck equation is:

$$VSR\% = \frac{VS_{IN} - VS_{OUT}}{VS_{IN} - (VS_{OUT} \times VS_{IN})} \times 100$$

Where: VS_{IN} = Volatile Solids in Feed Sludge (g VS/g TS)

VS_{OUT} = Volatile Solids in Final Sludge (g VS/g TS)

VSR% = Volatile Solids Reduction, (Percent)

7 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Mercury PMP -Implementation	See Permit	15
Mercury PMP -Submit Annual Status Report	January 31, 2011	15
Mercury PMP -Submit Annual Status Report #2	January 31, 2012	15
Mercury PMP -Submit Annual Status Report #3	January 31, 2013	15
Mercury PMP -Submit Annual Status Report #4	January 31, 2014	15
Mercury PMP -Submit Annual Status Report #5	January 31, 2015	15
Mercury Source Reduction Compliance Schedule -Identify Sources	January 31, 2011	15
Mercury Source Reduction Compliance Schedule -Send Letters	March 31, 2011	15
Mercury Source Reduction Compliance Schedule -Action Plan	September 30, 2011	15
Mercury Source Reduction Compliance Schedule -Ordinance Revision	June 30, 2013	15
Compliance Maintenance Annual Reports (CMAR)	by June 30, each year	18
Industrial User Compliance Evaluation and Violation Reports	Semiannual	24
Pretreatment Program Report	Annually	24
General Sludge Management Form 3400-48	prior to any significant sludge management changes	25
Characteristic Form 3400-49 and Lab Report	by January 31 following each year of analysis	25
Land Application Report Form 3400-55	by January 31, following each year non-exceptional quality sludge is land applied	26
Report Form 3400-52	by January 31, following each year sludge is hauled, landfilled, incinerated, or when exceptional quality sludge is distributed or land applied	27
Wastewater Discharge Monitoring Report	no later than the date indicated on the form	17

Report forms shall be submitted to the address printed on the report form. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Watershed Management, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to: West Central Region - Wausau, 5301 Rib Mountain Drive, Wausau, WI 54401

Appendix B

WPDES Permit Effective January 2019

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
West Central Region Headquarters
1300 W. Clairemont Ave.
Eau Claire, WI 54701

Scott Walker, Governor
Daniel L. Meyer, Secretary
Telephone (715) 839-3700
Toll Free 1-888-936-7463
TTY Access via relay - 711

Robert Mielke, Mayor
Wausau Water Works
407 Grant Street
Wausau, WI 54403

SUBJECT: WPDES Permit Reissuance No. WI-0025739-09-0
Wausau Water Works WW Treatment Facility, 435 Adrian Street, Wausau, WI 54403

Dear Permittee:

Your Wisconsin Pollutant Discharge Elimination System (WPDES) Permit is enclosed. The conditions of the enclosed permit reissuance were determined using the permit application, information from your WPDES permit file, other information available to the Department, comments received during the public notice period, and applicable Wisconsin Administrative Codes. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of the enclosed permit.

This enclosed permit requires you to submit monitoring results to the Department on a periodic basis. Monitoring forms, which must be submitted electronically, are available on the Department's web page. Go to the DNR Switchboard page at http://dnr.wi.gov/topic/switchboard/ to log in and access your monitoring forms. For your convenience, there is a 'Summary of Reports Due' at the end of the enclosed permit that shows a synopsis of the required reports and monitoring forms.

The WPDES permit program has been approved by the Administrator of the U.S. Environmental Protection Agency pursuant to Section 402(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1342 (b)). The terms and conditions of the enclosed permit are accordingly subject to enforcement under ss. 283.89 and 283.91, Stats., and Section 309 of the Federal Act (33 U.S.C. Section 1319).

The Department has the authority under chs. 160 and 283, Wis. Stats., to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwater and surface waters of the State. The Department also has the authority to issue, reissue, modify, terminate, or revoke and reissue WPDES permits under ch. 283, Wis. Stats.

The enclosed permit contains water quality-based effluent limitations that are necessary to ensure the water quality standards for the Wisconsin River located in the Lower Eau Claire River Watershed of the Central Wisconsin River Basin (NW ¼ of NW ¼ of Section 1, T28N, R7E) are met. You may apply for a variance from the water quality standard used to derive the limitations pursuant to s. 283.15, Stats., by submitting an application to the Director of the Bureau of Water Quality, P.O. Box 7921, Madison, Wisconsin 53707 within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). This statute also allows the permittee to apply for a variance to the water quality standard when applying for reissuance of the permit. Subchapter III of ch. NR 200, Wis. Adm. Code, specifies the procedures that must be followed and the information that must be included when submitting an application for a variance.

If your permit contains a stringent Water Quality Based Effluent Limit for Phosphorus, there is a Compliance Schedule requirement to complete a Phosphorus Operational Evaluation and Optimization Report. To streamline the Report preparation and review process the Department has prepared a Worksheet which should be used to develop the report. The worksheet may be found at : http://dnr.wi.gov/topic/surfacewater/phosphorus.html.
To challenge the reasonableness of or necessity for any term or condition of the enclosed permit, s. 283.63, Stats., and ch. NR 203, Wis. Adm. Code, require that you file a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was issued (see "Date Permit

Signed/Issued" after the signature on the front page of the enclosed permit). For permit-related decisions that are not reviewable pursuant to s. 283.63, Stats., it may be possible for permittees or other persons to obtain an administrative review pursuant to s. 227.42, Stats., and s. NR 2.05(5), Wis. Adm. Code, or a judicial review pursuant to s. 227.52, Stats. If you choose to pursue one of these options, you should know that Wisconsin Statutes and Administrative Code establish time periods within which requests to review Department decisions must be filed.

Sincerely,

Lacey Hillman
Wastewater Field Supervisor

Dated: December 17, 2018

cc: Legal Permit File
U.S. Fish and Wildlife Service (Electronic Copy via Email)
Nicholas Lindstrom
EPA – Region V (Electronic Copy via Email)

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES

NOTICE OF FINAL DETERMINATION TO REISSUE A WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES) PERMIT No. WI-0025739-09-0

Permittee: Wausau Water Works, 407 Grant St, Wausau, WI, 54403

Facility Where Discharge Occurs: Wausau Water Works WW Treatment Facility, 435 Adrian Street, Wausau, WI 54403

Receiving Water and Location: The Wisconsin River located in the Lower Eau Claire River Watershed of the Central Wisconsin River Basin (NW ¼ of NW ¼ of Section 1, T28N, R7E, City of Wausau. Outfall: Lat: 44.94404° N / Lon: 89.62826° W) in Marathon County

Brief Facility Description: The Wausau Wastewater Treatments Facility (WWTF) treats wastewater from the City of Wausau, the City of Schofield, and the Town of Stettin, as well as industrial wastewater from approximately 18 industries that are regulated under a local pretreatment program. They also accept and treat digested sludge from the Village of Brokaw, domestic holding tank wastes, septic tank wastes, grease trap-interceptor waste, commercial septage and landfill leachate. The Wausau WWTF accepts for treatment from REI Engineering approximately 10 gallons per day (gpd) of petroleum-contaminated groundwater. They also accept groundwater that was previously contaminated with mineral spirits and pentachlorophenol from Wauleco/Sentry Insurance (65,000 gpd) that is pumped and treated prior to discharge to the municipal collection system. The facility has an annual average design flow of 8.2 million gallons per day (MGD). The actual annual average effluent flow was 5.3 MGD in 2017.

Influent from the above-named sources is first treated at the Wausau WWTF via two mechanical bar screens, followed by a PISTA grit removal system. Subsequent wastewater treatment consists of primary clarification, conventional activated sludge, final clarification and sand filtration. Effluent is disinfected seasonally via ultraviolet light prior to discharge to the Wisconsin River. Waste activated sludge is thickened by a gravity belt prior to anaerobic digestion, which is dewatered using two belt filter presses. Sludge is then recycled via landspreading on Department approved sites.

Permit Drafter's Name, Address and Phone: Phillip Spranger, DNR, SCR Headquarters, 3911 Fish Hatchery Rd, , Fitchburg, WI, 53711, (608) 273-5969

Basin Engineer's Name, Address, and Phone: Nicholas Lindstrom, 5301 Rib Mountain Drive, , Wausau, WI 54401, (715) 359-5866

Date Permit Signed/Issued: December 12, 2018
Date of Effectiveness: January 1, 2019
Date of Expiration: December 31, 2023

Public Informational Hearing Held On: August 27, 2018

Following the public informational hearing the Department has made a final determination to reissue the WPDES permit for the above-named permittee for this existing discharge. The permit application information from the WPDES permit file, comments received on the proposed permit and applicable Wis. Adm. Codes were used as a basis for this final determination.

The Department has the authority to issue, modify, suspend, revoke and reissue or terminate WPDES permits and to establish effluent limitations and permit conditions under ch. 283, Stats.

Following is a summary of significant comments and any significant changes which have been made in the terms and conditions set forth in the draft permit:

<u>Comments Received from the Applicant, Individuals or Groups and Any Permit Changes as Applicable</u>
Wausau Water Works Wastewater Treatment Facility submitted the following comments on the public noticed permit on August 31, 2018 under the signature of Wausau Mayor and authorized representative Robert B. Mielke.

Wausau Comment #1 – Phosphorus [Limits]: The DNR is proposing final limits for phosphorus of 0.3 mg/L as a monthly average, 0.1 mg/L as a six-month average, and 6.8 lbs/day as a 6-month average mass limit. However, Wausau is also awaiting limits based on the Wisconsin River TMDL that is currently under development. As the WQBEL memo explains, it is likely that the TMDL derived limits will be more stringent than the current limit of 1.0 mg/L, but higher than the proposed final limits. It is preemptive to include final limits in Wausau's permit when those limits are likely to be replaced with different TMDL derived limits. To do so could implicate anti-degradation concerns if the limits become final prior to finalization of the TMDL. While DNR anticipates that the TMDL will be implemented before Wausau's next permit reissuance, it is far from certain that this will be the case given the nature of the TMDL approval process and the continuous delays in the process so far.

The proposed limits of 0.1 mg/l and 0.3 mg/l have not been determined using the requirements of NR217.13. According to NR217.13, phosphorous limits must be calculated based on a formula as described. NR217.13(2) allows WDNR to use other methods/models to calculate phosphorous limits but only if the model were to provide a

"more accurate representation of the conditions." The limits of 0.1 mg/l and 0.3 mg/l proposed by WDNR are not calculated and no fact based calculation has been provided by the WDNR on how these values have been derived; therefore they have not been determined properly according to NR217.13.

In addition, Wausau discharges 13 miles upstream from Lake DuBay, which has phosphorus levels below its 0.1 mg/L criteria. It is unreasonable and unnecessary to set final limits at 0.1 mg/L and 0.3 mg/L with no allowance for dilution given that the receiving waterbody is below criteria. According to your email response on June 15, 2018 to Wausau Waterworks you stated that the modeling shows 92% of the phosphorous from Wausau reaches Lake Petenwell. The WDNR has not provided sufficient justification that Wausau's discharge impacts downstream waters at Lake Petenwell such that the proposed final limits are reasonable and necessary. In fact, there is no data or support that shows the phosphorous discharged from Wausau has any significant impact on Lake Petenwell.

> **Department Response to Wausau Comment # 1 –** Regarding the Wisconsin River TMDL: Although it is undetermined if or when the Wisconsin River TMDL will be approved by EPA, the Department remains optimistic that it will be able to begin implementation efforts before Wausau's next permit reissuance. Furthermore, in the absence of an approved TMDL, ch. NR 217, Wis. Adm. Code, requires that water quality based effluent limitations (WQBELs) for phosphorus be included in permits based on the provisions of that chapter.
>
> Regarding the final effluent limits for phosphorus of 0.100 mg/L as a six-month seasonal average and 0.300 mg/L as a monthly average and protection of downstream waters: The March 29, 2016 memo titled "Water Quality-Based Effluent Limitations for the Wausau Wastewater Treatment Facility (WI-0025739)" states that the United States Geological Survey model "SPARROW Decision Support System Upper Midwest Total Phosphorus in Water Model" estimates that 92% of the phosphorus discharged from the Wausau Treatment Plant is expected to reach Lake Petenwell. The model results are consistent with the observation that there are no intervening features between the discharge and Lake Petenwell that would tend to trap significant amounts of phosphorus. Several provisions in ch. NR 217, Wis. Adm. Code, namely ss. NR 217.12(1)(a) and NR 217.13(1)(b), Wis. Adm. Code, require and allow (respectively) the Department to consider impacts to "downstream waters" when establishing WQBELs for phosphorus. Use of the "dilution formula" in s. NR 217.13, Wis. Adm. Code, would result in a phosphorus limitation for Wausau that is higher than the limit that would be required to achieve the 40 ug/L phosphorus criteria for the protection of Lake Petenwell. Therefore, the phosphorus WQBELs for Wausau were set equal to the limitations in ch. NR 102, Wis. Adm. Code, for the Wisconsin River, which feeds into Lake Petenwell.
>
> No changes to the public noticed permit will be made in response to this comment.

Wausau Comment #2 – TKN: DNR is proposing a requirement that Wausau conduct quarterly monitoring for TKN. There are, however, no state criteria for TKN. Wausau, therefore requests that any sampling be conducted outside of the terms of the permit.

> **Department Response to Wausau Comment # 2 –** The Department is requiring TKN (total Kjeldahl nitrogen) monitoring along with Nitrite + Nitrate Nitrogen monitoring and a calculated value for Total Nitrogen (equal to the sum of TKN and Nitrite + Nitrate Nitrogen) under the authority of s. 283.55(1)(e), Wis. Stats, that the permittee "Provide such other information as the department finds is necessary to identify the type and quantity of any pollutants discharged from the point source" and s. NR 210.04(3), Wis. Adm. Code, that: "Monitoring requirements may be adjusted on a case-by-case basis depending on wastewater characteristics and their potential to degrade water quality."
>
> Per the Department's "Guidance for Total Nitrogen Monitoring in WPDES Permits" the U.S. EPA has requested that states monitor nutrients in surface water effluents to: Support implementation of nutrient criteria; Support TMDL development; Facilitate permitting decisions; and Describe potential contributions to the Gulf Hypoxia problem.
>
> No changes to the public noticed permit will be made in response to this comment.

Wausau Comment #3 – Weekly Fecal Coliform Limit: The newly proposed weekly limit will be more difficult to demonstrate and maintain compliance with because of the sample turn-around time. We will need to submit a second test during the week to calculate a weekly geometric mean because we won't have a result from the first test until it is too late to collect a second sample. We request eliminating the proposed weekly limit to avoid the additional sampling and testing.

> **Department Response to Wausau Comment # 3 –** The weekly geometric mean fecal coliform limit is required due to changes in chs. NR 106 and NR 205, Wis. Adm. Code, that became effective on September 1, 2016. The sample frequency for fecal coliforms is weekly and the weekly geometric mean will be based on this single data point. Additional monitoring will not be required.
>
> No changes to the public noticed permit will be made in response to this comment.

Wausau Comment #4 – Compliance Schedule [Phosphorus]: To the extent DNR retains these proposed [phosphorus] limits in the final WPDES permit, Wausau requests 9 years to come into compliance. Pursuant to Wis. Admin. Code NR 217.17(2), DNR may provide a compliance schedule exceeding 7 years where compliance with final phosphorus limits will require the construction of filtration or a similar phosphorus removal process. Compliance for Wausau will require a major facility upgrade including the installation of chemical coagulation, chemical flocculation, and fine-pore filtration. Wausau therefore requests a 9 year schedule of compliance for final phosphorus limits.

> **Department Response to Wausau Comment # 3 –** The request for a nine-year compliance schedule can be considered and will be determined after sufficient documentation has been submitted to the Department as required by the "Phosphorus Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus" compliance schedule at subsection 5.1 of the public noticed permit. The required actions in this compliance schedule outline required report submittals that demonstrate that all phosphorus WQBEL compliance alternatives have been evaluated and a final compliance alternative has been determined and documented.
>
> No changes to the public noticed permit will be made in response to this comment.

Comments Received from EPA or Other Government Agencies and Any Permit Changes as Applicable

The Department made the following changes to Wausau's public noticed permit, primarily to adjust the dates in the permit because of a delay in reissuing the permit, but also to modify some monitoring table notes.

Department Comment #1 and Action Taken – All dates in the permit were adjusted to reflect a January 1, 2019 effective date and a December 31, 2023 expiration date, including advancing Due Dates for each Required Action in the WQBELs for Total Phosphorus compliance schedule at subsection 5.1 of the public noticed permit by three months.

Department Comment #2 and Action Taken – Several table notes in the effluent monitoring table at subsection 3.2.1 of the public noticed permit were corrected or refined.

The note for "Phosphorus, Total" was modified by changing the reference to subsection 3.2.1.5 to 3.2.1.6 and the last two words of the note were replaced with "more information"

The note for "Nitrogen, Ammonia (NH_3-N) Total" with a sample frequency of Monthly was corrected to read: "Monitor Only – November 1 through April 30 annually". The note for nitrogen, ammonia with a sample frequency of Quarterly was corrected to read: "Monitor Only – May 1 through October 31 annually".

Department Comment #3 and Action Taken – The Chronic and Acute Whole Effluent Toxicity (WET) test schedules at subsection 3.2.1.10 of the public noticed permit were modified to remove the Chronic and Acute WET testing requirement for "4th quarter (Oct-Dec) 2018" because this date is prior to the new effective date of the permit (January 1, 2019). In addition, the Acute and Chronic WET testing that shall continue after permit expiration was changed to "1st quarter (Jan-March) 2024"

Department Comment #4 and Action Taken – The notes in the in-stream sampling point 601 monitoring table at subsection 3.2.2 of the public noticed permit were modified by adding "Monitoring required May through October when Waste Load Allocated BOD_5 limits apply" for both "WLA Previous Day River Flow" and "WLA previous Day River Temp" to make it clear that this monitoring is only required during the months that BOD_5 waste load allocation limits apply.

Department Comment #5 and Action Taken – The first required action in the "Phosphorus Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus" compliance schedule at subsection 5.1 of the public noticed permit contained a reference to "years 3 through 9 of this compliance schedule". Since the permittee is being granted a seven-year compliance schedule, this reference has been changed to "years 3 through 7 of this compliance schedule".

As provided by s. 283.63, Stats., and ch. 203, Wis. Adm. Code, persons desiring further adjudicative review of this final determination may request a public adjudicatory hearing. A request shall be made by filing a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was signed (see permit signature date above). Further information regarding the conduct and nature of public adjudicatory hearings may be found by reviewing ch. NR 203, Wis. Adm. Code, s. 283.63 Stats., and other applicable law, including s. 227.42, Stats.

Information on file for this permit action may be inspected and copied at either the above-named permit drafter's address or the above-named basin engineer's address, Monday through Friday (except holidays), between 9:00 a.m. and 3:30 p.m. Information on this permit action may also be obtained by calling the permit drafter at (608) 273-5969 or by writing to the Department. Reasonable costs (15 cents per page for copies and 7 cents per page for scanning) will be charged for copies of information in the file other than the public notice and fact sheet. Pursuant to the Americans with Disabilities Act, reasonable accommodation, including the provision of informational material in an alternative format, will be made to qualified individuals upon request.

WISCONSIN
DEPT. OF NATURAL RESOURCES

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

Wausau Water Works

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
435 Adrian Street, Wausau, WI 54403
NW ¼ of NW ¼ of Section 1, T28N, R7E, City of Wausau, Marathon County
to
the Wisconsin River located in the Lower Eau Claire River Watershed of the Central Wisconsin River Basin in Marathon County

Outfall: Lat: 44.94404° N / Lon: 89.62826° W

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____
Lacey Hillman
Wastewater Field Supervisor

December 12, 2018
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE – January 01, 2019 **EXPIRATION DATE – December 31, 2023**

TABLE OF CONTENTS

1 INFLUENT REQUIREMENTS **1**

1.1 SAMPLING POINT(S) 1
1.2 MONITORING REQUIREMENTS 1
1.2.1 Sampling Point 701 - INFLUENT TO PLANT *1*

2 IN-PLANT REQUIREMENTS **3**

2.1 SAMPLING POINT(S) 3
2.2 MONITORING REQUIREMENTS AND LIMITATIONS 3
2.2.1 Sampling Point 104 - Mercury field blank *3*

3 SURFACE WATER REQUIREMENTS **4**

3.1 SAMPLING POINT(S) 4
3.2 MONITORING REQUIREMENTS AND EFFLUENT LIMITATIONS 4
3.2.1 Sampling Point (Outfall) 001 - EFFLUENT TO WISCONSIN RIVER *4*
3.2.2 Sampling Point 601 - WISCONSIN RIVER *12*

4 LAND APPLICATION REQUIREMENTS **13**

4.1 SAMPLING POINT(S) 13
4.2 MONITORING REQUIREMENTS AND LIMITATIONS 13
4.2.1 Sampling Point (Outfall) 002 - CAKE SLUDGE and 003- LIQUID SLUDGE *13*

5 SCHEDULES **18**

5.1 WATER QUALITY BASED EFFLUENT LIMITS (WQBELS) FOR TOTAL PHOSPHORUS 18
5.2 MERCURY POLLUTANT MINIMIZATION PROGRAM 20

6 STANDARD REQUIREMENTS **21**

6.1 REPORTING AND MONITORING REQUIREMENTS 21
6.1.1 Monitoring Results *21*
6.1.2 Sampling and Testing Procedures *21*
6.1.3 Pretreatment Sampling Requirements *21*
6.1.4 Recording of Results *21*
6.1.5 Reporting of Monitoring Results *22*
6.1.6 Compliance Maintenance Annual Reports *22*
6.1.7 Records Retention *22*
6.1.8 Other Information *23*
6.1.9 Reporting Requirements – Alterations or Additions *23*
6.2 SYSTEM OPERATING REQUIREMENTS 23
6.2.1 Noncompliance Reporting *23*
6.2.2 Flow Meters *24*
6.2.3 Raw Grit and Screenings *24*
6.2.4 Sludge Management *24*
6.2.5 Prohibited Wastes *24*
6.2.6 Bypass *24*
6.2.7 Scheduled Bypass *24*
6.2.8 Controlled Diversions *25*
6.2.9 Ammonia Limit Not Needed - Continue to Optimize Removal of Ammonia *25*
6.2.10 Proper Operation and Maintenance *25*
6.2.11 Operator Certification *25*
6.3 SEWAGE COLLECTION SYSTEMS 26
6.3.1 Sanitary Sewage Overflows and Sewage Treatment Facility Overflows *26*
6.3.2 Capacity, Management, Operation and Maintenance (CMOM) Program *27*
6.3.3 Sewer Cleaning Debris and Materials *27*
6.4 SURFACE WATER REQUIREMENTS 28

6.4.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit 28
6.4.2 Appropriate Formulas for Effluent Calculations 28
6.4.3 Effluent Temperature Requirements 28
6.4.4 Visible Foam or Floating Solids 29
6.4.5 Surface Water Uses and Criteria 29
6.4.6 Percent Removal 29
6.4.7 Fecal Coliforms 29
6.4.8 Seasonal Disinfection 29
6.4.9 Whole Effluent Toxicity (WET) Monitoring Requirements 29
6.4.10 Whole Effluent Toxicity (WET) Identification and Reduction 30
6.5 PRETREATMENT PROGRAM REQUIREMENTS 30
6.5.1 Inventories 30
6.5.2 Regulation of Industrial Users 30
6.5.3 Annual Pretreatment Program Report 32
6.5.4 Pretreatment Program Modifications 32
6.5.5 Program Resources 32
6.6 LAND APPLICATION REQUIREMENTS 33
6.6.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations 33
6.6.2 General Sludge Management Information 33
6.6.3 Sludge Samples 33
6.6.4 Land Application Characteristic Report 33
6.6.5 Calculation of Water Extractable Phosphorus 33
6.6.6 Monitoring and Calculating PCB Concentrations in Sludge 33
6.6.7 Annual Land Application Report 34
6.6.8 Other Methods of Disposal or Distribution Report 34
6.6.9 Approval to Land Apply 35
6.6.10 Soil Analysis Requirements 35
6.6.11 Land Application Site Evaluation 35
6.6.12 Class B Sludge: Fecal Coliform Limitation 35
6.6.13 Vector Control: Volatile Solids Reduction 36

7 SUMMARY OF REPORTS DUE **37**

1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	Representative composite influent samples shall be taken from the influent pump discharge pipe.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	See subsections 1.2.1.1 and 1.2.1.2.
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Cyanide, Total		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Lead, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Silver, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 1.2.1.2.

1.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall

collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

1.2.1.2 Sample Analysis for Pretreatment Parameters

These are pretreatment parameters. Sampling for pretreatment parameters shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the effluent for these parameters shall be coordinated with the sampling of influent.

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

2 In-Plant Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
104	The field blank shall be collected using standard handling procedures every day that mercury samples are collected at influent and effluent.

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point 104 - Mercury field blank

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Blank	See subsection 2.2.1.1 for mercury monitoring requirements.

2.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3 Surface Water Requirements

3.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Representative effluent samples, except those for fecal coliform, shall be collected at the disinfection channel prior to disinfection; samples for fecal coliform shall be collected after disinfection.
601	Temperature and flow of the Wisconsin River shall be monitored for determination of Wasteload Allocated (WLA) limits at Outfall 001. See subsections below for specific monitoring information.

3.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 001 - EFFLUENT TO WISCONSIN RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
BOD_5, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
WLA BOD_5 Discharged	Daily Max - Variable	lbs/day	5/Week	Calculated	See subsection 3.2.1.2.
WLA Value		lbs/day	5/Week	See Table	Report applicable variable limit on DMR. See subsection 3.2.1.2 for variable limits.
Suspended Solids, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.0 mg/L	5/Week	24-Hr Flow Prop Comp	This is an interim limit. The final water quality based effluent limits are 0.1 mg/L (6.8 lbs/day) as a 6-month avg. & 0.3 mg/L as a monthly avg. and go into effect per a compliance schedule. See subsections 3.2.1.3 through 3.2.1.6 for more information.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Weekly	Grab	Monitoring and limits apply May 1 through September 30 annually.
Fecal Coliform	Geometric Mean - Wkly	656 #/100 ml	Weekly	Grab	Monitoring and limits apply May 1 through September 30 annually.
Nitrogen, Ammonia (NH_3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	Monitor Only - November 1 through April 30 annually.
Nitrogen, Ammonia (NH_3-N) Total		mg/L	Quarterly	24-Hr Flow Prop Comp	Monitor Only - May 1 through October 31 annually.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	
Hardness, Total as $CaCO_3$		mg/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Lead, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Silver, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.17.
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Cyanide, Total		µg/L	Monthly	24-Hr Flow Prop Comp	See subsection 3.2.1.7.
Mercury, Total Recoverable	Daily Max	3.8 µg/L	Monthly	Grab	This is an Alternative Mercury Effluent Limit. See subsections 3.2.1.8 for mercury monitoring requirements and 3.2.1.9 for mercury variance information.
Pentachloro- phenol		µg/L	Monthly	Grab	

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See subsection 3.2.1.10 for Whole Effluent Toxicity (WET) testing dates and WET requirements.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See subsection 3.2.1.10 for Whole Effluent Toxicity (WET) testing dates and WET requirements.

3.2.1.1 Annual Average Design Flow

The annual average design flow of the permittee's wastewater treatment facility is 8.2 MGD.

3.2.1.2 Waste Load Allocation (WLA) Limits for BOD5

WASTELOAD ALLOCATED (WLA) LIMITS IN LBS/DAY FOR BOD5

RIVER MILE 265.0 TO 260.0

MAY-JUNE

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	←A→		←B→			←C→												
≥78	1314	1275	1321	1422	1494	1541	1624	1729	1862	2002	2179	2406	2709	3051	3415	3822	4103	4597
74 to 77	1213	1228	1339	1462	1617	1610	1736	1898	2078	2287	2507	2806	3195	3620	4103	4456	5097	5811
70 to 73	1152	1213	1350	1476	1552	1700	1880	2089	2147	2586	2864	3235	3728	4103	4716	5433	6236	6982
66 to 69	1170	1253	1412	1534	1696	1905	2143	2413	2712	3029	3372	3840	4244	4961	5757	6640	7616	7706
62 to 65	1195	1394	1534	1721	1959	2240	2557	2907	3278	3685	4103	4525	5353	6279	7317	7706	7706	7706
58 to 61	1350	1538	1761	2046	2384	2773	3195	3656	4103	4492	5105	5944	7065	7706	7706	7706	7706	7706
54 to 57	1541	1804	2165	2590	3069	3599	4103	4622	5339	6131	7000	7706	7706	7706	7706	7706	7706	7706
50 to 53	1844	2291	2838	3454	4103	4708	5577	6546	7605	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2413	3123	3959	4658	5721	6928	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3404	4298	5598	7112	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	4921	6787	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

JULY-AUGUST

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	A	←B→			←C→													
≥78	1426	1415	1498	1617	1696	1732	1822	1930	2067	2215	2381	2611	2910	3242	3606	4017	4254	4784
74 to 77	1332	1383	1509	1617	1685	1790	1927	2089	2269	2474	2698	2986	3375	3808	4103	4643	5274	5977
70 to 73	1278	1365	1516	1617	1721	1876	2060	2273	2503	2763	3040	3408	3908	4244	4885	5595	6387	7259
66 to 69	1289	1397	1566	1689	1858	2064	2309	2579	2871	3191	3530	4009	4406	5115	5908	6776	7706	7706
62 to 65	1314	1534	1675	1869	2111	2392	2712	3058	3429	3847	4103	4679	5508	6423	7447	7706	7706	7706
58 to 61	1476	1671	1898	2193	2536	2921	3346	3815	4103	4651	5260	6092	7209	7706	7706	7706	7706	7706
54 to 57	1664	1941	2305	2737	3220	3757	4128	4784	5497	6290	7155	7706	7706	7706	7706	7706	7706	7706
50 to 53	1974	2435	2986	3606	4103	4874	5750	6719	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2557	3278	4103	4834	5905	7115	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3573	4103	5804	7328	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	5133	7025	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

SEPTEMBER

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	←A→		←B→			←C→												
≥78	1062	1062	1062	1062	1062	1062	1174	1293	1448	1610	1786	2038	2370	2723	3109	3516	3977	4294
74 to 77	1062	1062	1062	1062	1062	1195	1350	1523	1725	1938	2183	2503	2896	3336	3829	4168	4827	5555
70 to 73	1062	1062	1062	1062	1167	1343	1545	1768	2017	2287	2575	2964	3465	4031	4452	5195	6016	6921
66 to 69	1062	1062	1076	1185	1376	1595	1851	2132	2446	2777	3127	3588	4103	4737	5551	6452	7447	7706
62 to 65	1062	1062	1203	1419	1675	1966	2298	2662	3044	3454	3912	4305	5151	6092	7144	7706	7706	7706
58 to 61	1062	1210	1466	1772	2132	2528	2964	3429	3948	4276	4896	5746	6888	7706	7706	7706	7706	7706
54 to 57	1195	1505	1891	2334	2831	3368	3977	4402	5123	5926	6802	7706	7706	7706	7706	7706	7706	7706
50 to 53	1520	2002	2572	3206	3912	4467	5346	6322	7393	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	2093	2831	3663	4388	5458	6672	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	3073	4103	5292	6812	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	4535	6413	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

OCTOBER

River Temperature (previous day average in °F)	Flow at Rothschild Dam (previous day average in cfs)																	
	980 or Less	981 to 1220	1221 to 1470	1471 to 1730	1731 to 1990	1991 to 2260	2261 to 2540	2541 to 2830	2831 to 3130	3131 to 3430	3431 to 3780	3781 to 4230	4231 to 4730	4731 to 5250	5251 to 5780	5781 to 6340	6341 to 6910	6911 or More
	←A→		←B→			←C→												
≥78	1062	1062	1062	1062	1062	1062	1062	1138	1275	1448	1621	1866	2190	2550	2925	3332	3775	4103
74 to 77	1062	1062	1062	1062	1062	1062	1206	1379	1566	1779	2028	2334	2737	3177	3653	4103	4618	5342
70 to 73	1062	1062	1062	1062	1062	1203	1408	1631	1880	2143	2428	2820	3318	3865	4283	5011	5825	6722
66 to 69	1062	1062	1062	1062	1249	1473	1721	2006	2312	2644	2997	3454	4092	4579	5386	6279	7270	7706
62 to 65	1062	1062	1087	1303	1559	1855	2186	2543	2925	3332	3775	4168	5004	5937	6985	7706	7706	7706
58 to 61	1062	1102	1358	1667	2020	2420	2853	3314	3818	4146	4759	5602	6737	7706	7706	7706	7706	7706
54 to 57	1091	1401	1783	2226	2719	3256	3750	4276	4993	5789	6658	7706	7706	7706	7706	7706	7706	7706
50 to 53	1419	1898	2464	3098	3790	4341	5213	6186	7245	7706	7706	7706	7706	7706	7706	7706	7706	7706
46 to 49	1984	2723	3545	4258	5324	6528	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
42 to 45	2950	4089	5148	6658	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706
≤41	6388	6250	7707	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706	7706

Definitions

Point source allocation values (pounds per day BOD) in the above tables represent water quality related effluent limitations. The flow and temperature conditions (reported at Sample Point 601) used to determine a point source allocation value for a given day shall be the representative measurements of the flow and temperature. River flows used should be those collected and reported by Wisconsin Valley Improvement Company (WVIC) for the period beginning at 7 a.m. of the previous day and ending at 7 a.m. of the current day. Temperature values used should be those collected and reported by Wisconsin Public Service Corporation for the period beginning at 12 midnight of the previous day and ending 12 midnight of the current day. Wasteload Allocation (WLA) limits shall be calculated with BOD_5 values of samples collected for the current day, which are collected by Wausau for the period from 7 a.m. of the current day to 7 a.m. of the following day.

Monitoring Requirements: The same 24-hour period shall be utilized for the collection of composite and continuous samples for river flow and temperature and all effluent characteristics including effluent flow and BOD_5. Presently, the WVIC utilizes the 24-hour monitoring period ending at 7 a.m. for river flow.

Reporting Requirements: During the months of May through October inclusive the permittee shall report the following information:

The daily river flow (cfs);

The daily river temperature (oF);

The daily point source allocation value (lbs BOD_5 per day);

The actual daily discharge value of BOD_5 (lbs BOD_5 per day);

WLA Water Quality Related Effluent Limitations Restriction: In no case shall the WLA water quality related effluent limitations be less stringent than the applicable categorical effluent limitations contained in the effluent limits and monitoring table.

3.2.1.3 Phosphorus Water Quality Based Effluent Limitation(s)

The final water quality based effluent limit for phosphorus are **0.100 mg/L (6.8 lbs/day) as a six-month average and 0.300 mg/L as a monthly average** and will take effect per the Phosphorus Compliance Schedule unless:

(A) As part of the application for the next reissuance, or prior to filing the application, the permittee submits either: 1.) a watershed adaptive management plan and a completed Watershed Adaptive Management Request Form 3200-139; or 2.) an application for water quality trading; or 3.) an application for a variance; or 4.) new information or additional data that supports a recalculation of the numeric limitation; and

(B) The Department modifies, revokes and reissues, or reissues the permit to incorporate a revised limitation before the expiration of the compliance schedule*.

Note: The permittee may also submit an application for a variance within 60 days of this permit reissuance, as noted in the permit cover letter, in accordance with s. 283.15, Stats.

If Adaptive Management or Water Quality Trading is approved as part of the permit application for the next reissuance or as part of an application for a modification or revocation and reissuance, the plan and specifications submittal, construction, and final effective dates for compliance with the total phosphorus WQBEL may change in the reissued or modified permit. In addition, the numeric value of the water quality based effluent limit may change based on new information (e.g. a TMDL) or additional data. If a variance is approved for the next reissuance, interim limits and conditions will be imposed in the reissued permit in accordance with s. 283.15, Stats., and applicable regulations. A permittee may apply for a variance to the phosphorus WQBEL at the next reissuance even if the permittee did not apply for a phosphorus variance as part of this permit reissuance.

Additional Requirements: If a water quality based effluent limit has taken effect in a permit, any increase in the limit is subject to s. NR 102.05(1) and ch. NR 207, Wis. Adm. Code. When a six-month average effluent limit is specified for Total Phosphorus the applicable averaging periods are May through October and November through April.

*Note: The Department will prioritize reissuances and revocations, modifications, and reissuances of permits to allow permittees the opportunity to implement adaptive management or nutrient trading in a timely and effective manner.

3.2.1.4 Alternative Approaches to Phosphorus WQBEL Compliance

Rather than upgrading its wastewater treatment facility to comply with WQBELs for total phosphorus, the permittee may use Water Quality Trading or the Watershed Adaptive Management Option, to achieve compliance under ch. NR 217, Wis. Adm. Code, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. The permittee may also implement an upgrade to its wastewater treatment facility in combination with Water Quality Trading or the Watershed Adaptive Management Option to achieve compliance, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. If the Final Compliance Alternatives Plan concludes that a variance will be pursued, the Plan shall provide information regarding the basis for the variance.

3.2.1.5 Submittal of Permit Application for Next Reissuance and Adaptive Management or Pollutant Trading Plan or Variance Application

The permittee shall submit the permit application for the next reissuance at least 6 months prior to expiration of this permit. If the permittee intends to pursue adaptive management to achieve compliance with the phosphorus water quality based effluent limitation, the permittee shall submit with the application for the next reissuance: a completed Watershed Adaptive Management Request Form 3200-139, the completed Adaptive Management Plan and final plans for any system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the permittee intends to pursue pollutant trading to achieve compliance, the permittee shall submit an application for water quality trading with the application for the next reissuance. If system upgrades

will be used in combination with pollutant trading to achieve compliance with the final water quality-based limit, the reissued permit will specify a schedule for the necessary upgrades. If the permittee intends to seek a variance, the permittee shall submit an application for a variance with the application for the next reissuance.

3.2.1.6 Phosphorus Limits and The Wisconsin River TMDL

A Total Maximum Daily Load (TMDL) is being developed for Wisconsin River to address total phosphorus water quality impairments within the TMDL area. This TMDL will likely result in limitations for total phosphorus that must be included in WPDES permits, which may be different than those calculated for this reissuance. TMDL-derived limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.

3.2.1.7 Sample Analysis for Pretreatment Parameters

These are pretreatment parameters that shall be done during a day in each month when industrial discharges are occurring at normal to maximum levels. This monthly sampling shall be coordinated with the sampling of the influent.

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified at a level of quantitation below the calculated/potential effluent limit, unless not possible using the most sensitive approved method.

3.2.1.8 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3.2.1.9 Mercury Variance – Implement Pollutant Minimization Plan

This permit contains a variance to the water quality-based effluent limit (WQBEL) for mercury granted in accordance with s. 283.15, Stats. As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation specified in the table above, (b) implement the mercury pollutant minimization measures specified in the "Mercury Pollutant Minimization Program, Wausau Water Works, June 2018 Revision", (c) follow the Pollutant Minimization Plan and (d) perform the actions listed in the compliance schedule. (See the Schedules section herein.):

3.2.1.10 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Wisconsin River

Instream Waste Concentration (IWC): 6%

Acute Mixing Zone Concentration: N/A

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.
- **Chronic:** 100, 30, 10, 3, 1% and any additional selected by the permittee.

WET Testing Frequency:

Acute tests shall be conducted once each year in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **Acute:** 3rd quarter (July-Sep) 2019
  2nd quarter (April-June) 2020
  1st quarter (Jan-March) 2021
  3rd quarter (July-Sep) 2022
  1st quarter (Jan-March) 2023

  Acute WET testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the WET requirements specified for the last full calendar year of this permit. For example, the next test would be required in the 1st quarter (Jan-March) 2024.

Chronic tests shall be conducted once each year in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **Chronic:** 3rd quarter (July-Sep) 2019
  2nd quarter (April-June) 2020
  1st quarter (Jan-March) 2021
  3rd quarter (July-Sep) 2022
  1st quarter (Jan-March) 2023

  Chronic WET testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the WET requirements specified for the last full calendar year of this permit. For example, the next test would be required in the 1st quarter (Jan-March) 2024.

Testing: WET testing shall be performed during normal operating conditions. Permittees are not allowed to turn off or otherwise modify treatment systems, production processes, or change other operating or treatment conditions during WET tests.

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion.. The Discharge Monitoring Report (DMR) form shall be submitted electronically by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Toxic Unit - Chronic (TU_c) is greater than 17 for either species. The TU_c shall be calculated as follows: $TU_c = 100 \div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

3.2.2 Sampling Point 601 - WISCONSIN RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
WLA Previous Day River Flow		cfs	5/Week	Measure	Monitoring required May through October when Waste Load Allocated BOD_5 limits apply. See subsection 3.2.2.1.
WLA Previous Day River Temp		deg F	5/Week	Measure	Monitoring required May through October when Waste Load Allocated BOD_5 limits apply. See subsection 3.2.2.1.

3.2.2.1 Definitions

River flow shall be defined as the daily average flow value derived from continuous river flow monitoring data for the Wisconsin River collected at the Rothschild Dam. If such flow data is unavailable for any day, flow shall be calculated by multiplying by 1.3 the daily average flow value derived from continuous stream flow monitoring data for the Wisconsin River collected at the Merrill Dam to correspond to the flow at Rothschild Dam. Daily average flow values reported by the Wisconsin Valley Improvement Co. for the Rothschild Dam and Merrill Dam locations are acceptable.

Temperature shall be defined as the daily average temperature value derived from continuous river temperature monitoring data for the Wisconsin River collected at the Wisconsin Public Service Corporation, Weston Generating Station. If such temperature data is unavailable for any day, a single grab sample for river temperature collected at the Domtar raw river water intake may be substituted for continuous river temperature monitoring. Daily average temperature values, or alternately, daily temperatures, reported by the Wisconsin Valley Improvement Company for the Weston Generating Station and Domtar locations are acceptable.

4 Land Application Requirements

4.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Representative sludge samples shall be collected from cake sludge storage quarterly and monitored for Lists 1, 2, 3 and 4. Representative samples shall be collected once in 2019 and be monitored for PCBs.
003	Permittee shall obtain Departmental approval prior to landspreading liquid sludge (and therefore commencing use of Outfall 003).

4.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

4.2.1 Sampling Point (Outfall) 002 - CAKE SLUDGE and 003- LIQUID SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Quarterly	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Quarterly	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Quarterly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH_4-N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Jan 1, 2019 - Dec 31, 2019
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Jan 1, 2019 - Dec 31, 2019

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**Quarterly**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**Quarterly**

4.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

4.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

4.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

4.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

4.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2019**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

4.2.1.6 Lists 1, 2, 3, and 4

List 1 **TOTAL SOLIDS AND METALS** See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 **NUTRIENTS** See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

* The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

4.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations		
The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements.		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

5 Schedules

5.1 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

The permittee shall comply with the WQBELs for Phosphorus as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Operational Evaluation Report: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in phosphorus discharges from the treatment plant during the period prior to complying with final phosphorus WQBELs and, where possible, enable compliance with final phosphorus WQBELs by December 31, 2021. The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications as soon as possible, but not later than December 31, 2021 and state whether the measures, improvements, and modifications will enable compliance with final phosphorus WQBELs. Regardless of whether they are expected to result in compliance, the permittee shall implement the measures, improvements, and modifications in accordance with the plan and schedule specified in the operational evaluation report. If the operational evaluation report concludes that the facility can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the permittee shall comply with the final phosphorus WQBEL by December 31, 2021 and is not required to comply with the milestones identified below for years 3 through 7 of this compliance schedule ('Preliminary Compliance Alternatives Plan', 'Final Compliance Alternatives Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet WQBELs', 'Complete Construction', 'Achieve Compliance'). STUDY OF FEASIBLE ALTERNATIVES - If the Operational Evaluation Report concludes that the permittee cannot achieve final phosphorus WQBELs with source reduction measures, operational improvements and other minor facility modifications, the permittee shall initiate a study of feasible alternatives for meeting final phosphorus WQBELs and comply with the remaining required actions of this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the Department may reopen and modify the permit to include an implementation schedule for achieving the final phosphorus WQBELs sooner than December 31, 2025.	12/31/2019
Compliance Alternatives, Source Reduction, Improvements and Modifications Status: The permittee shall submit a 'Compliance Alternatives, Source Reduction, Operational Improvements and Minor Facility Modification' status report to the Department. The report shall provide an update on the permittee's: (1) progress implementing source reduction measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, to the extent that such measures, improvements, and modifications will not enable compliance with the WQBELs, (2) status evaluating feasible alternatives for meeting phosphorus WQBELs.	12/31/2020
Preliminary Compliance Alternatives Plan: The permittee shall submit a preliminary compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment facility is necessary to achieve final phosphorus WQBELs, the submittal shall include a preliminary engineering design	12/31/2021

report. If the plan concludes Adaptive Management will be used, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 without the Adaptive Management Plan. If water quality trading will be undertaken, the plan must state that trading will be pursued.	
Final Compliance Alternatives Plan: The permittee shall submit a final compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment is necessary to meet final phosphorus WQBELs, the submittal shall include a final engineering design report addressing the treatment plant upgrades, and a facility plan if required pursuant to ch. NR 110, Wis. Adm. Code. If the plan concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an engineering report addressing any treatment system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the plan concludes water quality trading will be used, the submittal shall identify potential trading partners. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2022
Progress Report on Plans & Specifications: Submit progress report regarding the progress of preparing final plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2023
Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.) Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2024
Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	03/31/2025
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	11/30/2025
Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2025

5.2 Mercury Pollutant Minimization Program

As a condition of the variance to the water quality based effluent limitation(s) for mercury granted in accordance with s. NR 106.145(6), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Mercury Progress Reports: Submit an annual mercury progress report. The annual mercury progress report shall: Indicate which mercury pollutant minimization activities or activities outlined in the approved Pollutant Minimization Plan, "Mercury Pollutant Minimization Program, Wausau Water Works, June 2018 Revision", have been implemented; Include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling; and Include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury such as loads from industries into the collection system. The first annual mercury progress report is to be submitted by the Due Date.	01/31/2019
Annual Mercury Progress Report #2: Submit a mercury progress report as defined above.	01/31/2020
Annual Mercury Progress Report #3: Submit a mercury progress report as defined above.	01/31/2021
Annual Mercury Progress Report #4: Submit a mercury progress report as defined above.	01/31/2022
Final Mercury Report: Submit a final report documenting the success in reducing mercury concentrations in the effluent, as well as the anticipated future reduction in mercury sources and mercury effluent concentrations. The report shall summarize mercury pollutant minimization activities that have been implemented during the current permit term and state which, if any, pollutant minimization activities from the approved pollutant minimization plan were not pursued and why. The report shall include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling during the current permit term. The report shall also include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury such as loads from industries into the collection system. If the permittee intends to reapply for a mercury variance per s. NR 106.145, Wis. Adm. Code, for the reissued permit, a detailed pollutant minimization plan outlining the pollutant minimization activities proposed for the upcoming permit term shall be submitted along with the final report.	01/30/2023
Annual Mercury Reports After Permit Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual mercury reports each year covering pollutant minimization activities implemented and mercury concentration trends.	

6 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

6.1 Reporting and Monitoring Requirements

6.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

Monitoring results shall be reported on an electronic discharge monitoring report (eDMR). The eDMR shall be certified electronically by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

6.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

6.1.3 Pretreatment Sampling Requirements

Sampling for pretreatment parameters (cadmium, chromium, copper, lead, nickel, zinc, and mercury) shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the influent and effluent for these parameters shall be coordinated. All 24 hour composite samples shall be flow proportional.

6.1.4 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;

- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

6.1.5 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For purposes of calculating NR 101 fees, the 2 mg/l lower reporting limits for BOD_5 and Total Suspended Solids shall be considered to be limits of quantitation

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

6.1.6 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted and certified by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

The CMAR shall be certified electronically by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The certification verifies that the electronic report is true, accurate and complete.

6.1.7 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings or electronic data records for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

6.1.8 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

6.1.9 Reporting Requirements – Alterations or Additions

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

- The alteration or addition to the permitted facility may meet one of the criteria for determining whether a facility is a new source.
- The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification requirement applies to pollutants which are not subject to effluent limitations in the existing permit.
- The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use of disposal sites not reported during the permit application process nor reported pursuant to an approved land application plan. Additional sites may not be used for the land application of sludge until department approval is received.

6.2 System Operating Requirements

6.2.1 Noncompliance Reporting

Sanitary sewer overflows and sewage treatment facility overflows shall be reported according to the 'Sanitary Sewer Overflows and Sewage Treatment Facility Overflows' section of this permit.

The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:

- any noncompliance which may endanger health or the environment;
- any violation of an effluent limitation resulting from a bypass;
- any violation of an effluent limitation resulting from an upset; and
- any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.

A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

A scheduled bypass approved by the Department under the 'Scheduled Bypass' section of this permit shall not be subject to the reporting required under this section.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. **The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at 1-800-943-0003.**

6.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

6.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-555, Wis. Adm. Code.

6.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

6.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and
- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

6.2.6 Bypass

This condition applies only to bypassing at a sewage treatment facility that is not a scheduled bypass, approved blending as a specific condition of this permit, a sewage treatment facility overflow or a controlled diversion as provided in the sections titled 'Scheduled Bypass', 'Blending' (if approved), 'SSO's and Sewage Treatment Facility Overflows' and 'Controlled Diversions' of this permit. Any other bypass at the sewage treatment facility is prohibited and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats. The Department may approve a bypass if the permittee demonstrates all the following conditions apply:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance. When evaluating feasibility of alternatives, the department may consider factors such as technical achievability, costs and affordability of implementation and risks to public health, the environment and, where the permittee is a municipality, the welfare of the community served; and
- The bypass was reported in accordance with the Noncompliance Reporting section of this permit.

6.2.7 Scheduled Bypass

Whenever the permittee anticipates the need to bypass for purposes of efficient operations and maintenance and the permittee may not meet the conditions for controlled diversions in the 'Controlled Diversions' section of this permit, the permittee shall obtain prior written approval from the Department for the scheduled bypass. A permittee's written

request for Department approval of a scheduled bypass shall demonstrate that the conditions for bypassing specified in the above section titled 'Bypass' are met and include the proposed date and reason for the bypass, estimated volume and duration of the bypass, alternatives to bypassing and measures to mitigate environmental harm caused by the bypass. The department may require the permittee to provide public notification for a scheduled bypass if it is determined there is significant public interest in the proposed action and may recommend mitigation measures to minimize the impact of such bypass.

6.2.8 Controlled Diversions

Controlled diversions are allowed only when necessary for essential maintenance to assure efficient operation. Sewage treatment facilities that have multiple treatment units to treat variable or seasonal loading conditions may shut down redundant treatment units when necessary for efficient operation. The following requirements shall be met during controlled diversions:

- Effluent from the sewage treatment facility shall meet the effluent limitations established in the permit. Wastewater that is diverted around a treatment unit or treatment process during a controlled diversion shall be recombined with wastewater that is not diverted prior to the effluent sampling location and prior to effluent discharge;
- A controlled diversion does not include blending as defined in s. NR 210.03(2e), Wis. Adm. Code, and as may only be approved under s. NR 210.12. A controlled diversion may not occur during periods of excessive flow or other abnormal wastewater characteristics;
- A controlled diversion may not result in a wastewater treatment facility overflow; and
- All instances of controlled diversions shall be documented in sewage treatment facility records and such records shall be available to the department on request.

6.2.9 Ammonia Limit Not Needed - Continue to Optimize Removal of Ammonia

Applying the procedures in s. NR 106.05, Wis. Adm. Code, to ammonia data that is representative of the current operations of the wastewater treatment plant resulted in a determination that ammonia effluent limits are not necessary in this permit. Pursuant to NR 106.33, throughout the term of this permit, the wastewater treatment plant shall continue to be operated in a manner that optimizes the removal of ammonia within the design capabilities of the wastewater treatment plant.

6.2.10 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

6.2.11 Operator Certification

The wastewater treatment facility shall be under the direct supervision of a state certified operator. In accordance with s. NR 114.53, Wis. Adm. Code, every WPDES permitted treatment plant shall have a designated operator-in-charge holding a current and valid certificate. The designated operator-in-charge shall be certified at the level and in all subclasses of the treatment plant, except laboratory. Treatment plant owners shall notify the department of any changes in the operator-in-charge within 30 days. Note that s. NR 114.52(22), Wis. Adm. Code, lists types of facilities that are excluded from operator certification requirements (i.e. private sewage systems, pretreatment facilities discharging to public sewers, industrial wastewater treatment that consists solely of land disposal, agricultural digesters and concentrated aquatic production facilities with no biological treatment).

6.3 Sewage Collection Systems

6.3.1 Sanitary Sewage Overflows and Sewage Treatment Facility Overflows

6.3.1.1 Overflows Prohibited

Any overflow or discharge of wastewater from the sewage collection system or at the sewage treatment facility, other than from permitted outfalls, is prohibited. The permittee shall provide information on whether any of the following conditions existed when an overflow occurred:

- The sanitary sewer overflow or sewage treatment facility overflow was unavoidable to prevent loss of life, personal injury or severe property damage;
- There were no feasible alternatives to the sanitary sewer overflow or sewage treatment facility overflow such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or preventative maintenance activities;
- The sanitary sewer overflow or the sewage treatment facility overflow was caused by unusual or severe weather related conditions such as large or successive precipitation events, snowmelt, saturated soil conditions, or severe weather occurring in the area served by the sewage collection system or sewage treatment facility; and
- The sanitary sewer overflow or the sewage treatment facility overflow was unintentional, temporary, and caused by an accident or other factors beyond the reasonable control of the permittee.

6.3.1.2 Permittee Response to Overflows

Whenever a sanitary sewer overflow or sewage treatment facility overflow occurs, the permittee shall take all feasible steps to control or limit the volume of untreated or partially treated wastewater discharged, and terminate the discharge as soon as practicable. Remedial actions, including those in NR 210.21 (3), Wis. Adm. Code, shall be implemented consistent with an emergency response plan developed under the CMOM program.

6.3.1.3 Permittee Reporting

Permittees shall report all sanitary sewer overflows and sewage treatment overflows as follows:

- The permittee shall notify the department by telephone, fax or email as soon as practicable, but no later than 24 hours from the time the permittee becomes aware of the overflow;
- The permittee shall, no later than five days from the time the permittee becomes aware of the overflow, provide to the department the information identified in this paragraph using department form number 3400-184. If an overflow lasts for more than five days, an initial report shall be submitted within 5 days as required in this paragraph and an updated report submitted following cessation of the overflow. At a minimum, the following information shall be included in the report:

  - The date and location of the overflow;
  - The surface water to which the discharge occurred, if any;
  - The duration of the overflow and an estimate of the volume of the overflow;
  - A description of the sewer system or treatment facility component from which the discharge occurred such as manhole, lift station, constructed overflow pipe, or crack or other opening in a pipe;
  - The estimated date and time when the overflow began and stopped or will be stopped;
  - The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information;
  - Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
  - A description of the actual or potential for human exposure and contact with the wastewater from the overflow;

◦Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps;
◦To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the sanitary sewer overflow and that were within the same area of the sewage collection system as the sanitary sewer overflow; and
◦The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event. This includes any information available including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.

NOTE: A copy of form 3400-184 for reporting sanitary sewer overflows and sewage treatment facility overflows may be obtained from the department or accessed on the department's web site at http://dnr.wi.gov/topic/wastewater/SSOreport.html. As indicated on the form, additional information may be submitted to supplement the information required by the form.

- The permittee shall identify each specific location and each day on which a sanitary sewer overflow or sewage treatment facility overflow occurs as a discrete sanitary sewer overflow or sewage treatment facility overflow occurrence. An occurrence may be more than one day if the circumstances causing the sanitary sewer overflow or sewage treatment facility overflow results in a discharge duration of greater than 24 hours. If there is a stop and restart of the overflow at the same location within 24 hours and the overflow is caused by the same circumstance, it may be reported as one occurrence. Sanitary sewer overflow occurrences at a specific location that are separated by more than 24 hours shall be reported as separate occurrences; and
- A permittee that is required to submit wastewater discharge monitoring reports under NR 205.07 (1) (r) shall also report all sanitary sewer overflows and sewage treatment facility overflows on that report.

6.3.1.4 Public Notification

The permittee shall notify the public of any sanitary sewer and sewage treatment facility overflows consistent with its emergency response plan required under the CMOM (Capacity, Management, Operation and Maintenance) section of this permit and s. NR 210.23 (4) (f), Wis. Adm. Code. Such public notification shall occur promptly following any overflow event using the most effective and efficient communications available in the community. At minimum, a daily newspaper of general circulation in the county(s) and municipality whose waters may be affected by the overflow shall be notified by written or electronic communication.

6.3.2 Capacity, Management, Operation and Maintenance (CMOM) Program

- The permittee shall have written documentation of the Capacity, Management, Operation and Maintenance (CMOM) program components in accordance with s. NR 210.23(4), Wis. Adm. Code. Such documentation shall be available for Department review upon request. The Department may request that the permittee provide this documentation or prepare a summary of the permittee's CMOM program at the time of application for reissuance of the WPDES permit.
- The permittee shall implement a CMOM program in accordance with s. NR 210.23, Wis. Adm. Code.
- The permittee shall at least annually conduct a self-audit of activities conducted under the permittee's CMOM program to ensure CMOM components are being implemented as necessary to meet the general standards of s. NR 210.23(3), Wis. Adm. Code.

6.3.3 Sewer Cleaning Debris and Materials

All debris and material removed from cleaning sanitary sewers shall be managed to prevent nuisances, run-off, ground infiltration or prohibited discharges.

- Debris and solid waste shall be dewatered, dried and then disposed of at a licensed solid waste facility.
- Liquid waste from the cleaning and dewatering operations shall be collected and disposed of at a permitted wastewater treatment facility.
- Combination waste including liquid waste along with debris and solid waste may be disposed of at a licensed solid waste facility or wastewater treatment facility willing to accept the waste.

6.4 Surface Water Requirements

6.4.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

6.4.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average concentration limits and mass limits and total load limits:

Weekly/Monthly/Six-Month/Annual Average Concentration = the sum of all daily results for that week/month/six-month/year, divided by the number of results during that time period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

Six-Month Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the six-month period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Annual Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the entire year.

Total Monthly Discharge: = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.

Total Annual Discharge: = sum of total monthly discharges for the calendar year.

12-Month Rolling Sum of Total Monthly Discharge: = the sum of the most recent 12 consecutive months of Total Monthly Discharges.

6.4.3 Effluent Temperature Requirements

Weekly Average Temperature – The permittee shall use the following formula for calculating effluent results to determine compliance with the weekly average temperature limit (as applicable): Weekly Average Temperature = the sum of all daily maximum results for that week divided by the number of daily maximum results during that time period.

Cold Shock Standard – Water temperatures of the discharge shall be controlled in a manner as to protect fish and aquatic life uses from the deleterious effects of cold shock. 'Cold Shock' means exposure of aquatic organisms to a rapid decrease in temperature and a sustained exposure to low temperature that induces abnormal behavior or physiological performance and may lead to death.

Rate of Temperature Change Standard – Temperature of a water of the state or discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state.

6.4.4 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

6.4.5 Surface Water Uses and Criteria

In accordance with NR 102.04, Wis. Adm. Code, surface water uses and criteria are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all surface waters including the mixing zone meet the following conditions at all times and under all flow and water level conditions:

a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

d) Substances in concentrations or in combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

6.4.6 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD_5 and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

6.4.7 Fecal Coliforms

The weekly and monthly limit(s) for fecal coliforms shall be expressed as a geometric mean.

6.4.8 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitation for fecal coliforms apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

6.4.9 Whole Effluent Toxicity (WET) Monitoring Requirements

In order to determine the potential impact of the discharge on aquatic organisms, static-renewal toxicity tests shall be performed on the effluent in accordance with the procedures specified in the *"State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition" (PUB-WT-797*, November 2004) as required by NR 219.04, Table A, Wis. Adm. Code). All of the WET tests required in this permit, including any required retests, shall be conducted on the *Ceriodaphnia dubia* and fathead minnow species. Receiving water samples shall not be collected from any point in contact with the permittee's mixing zone and every attempt shall be made to avoid contact with any other discharge's mixing zone.

6.4.10 Whole Effluent Toxicity (WET) Identification and Reduction

Within 60 days of a retest which showed positive results, the permittee shall submit a written report to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., PO Box 7921, Madison, WI 53707-7921, which details the following:

- A description of actions the permittee has taken or will take to remove toxicity and to prevent the recurrence of toxicity;
- A description of toxicity reduction evaluation (TRE) investigations that have been or will be done to identify potential sources of toxicity, including some or all of the following actions:
  - (a) Evaluate the performance of the treatment system to identify deficiencies contributing to effluent toxicity (e.g., operational problems, chemical additives, incomplete treatment)
  - (b) Identify the compound(s) causing toxicity
  - (c) Trace the compound(s) causing toxicity to their sources (e.g., industrial, commercial, domestic)
  - (d) Evaluate, select, and implement methods or technologies to control effluent toxicity (e.g., in-plant or pretreatment controls, source reduction or removal)
- Where corrective actions including a TRE have not been completed, an expeditious schedule under which corrective actions will be implemented;
- If no actions have been taken, the reason for not taking action.

The permittee may also request approval from the Department to postpone additional retests in order to investigate the source(s) of toxicity. Postponed retests must be completed after toxicity is believed to have been removed.

6.5 Pretreatment Program Requirements

The permittee is required to operate an industrial pretreatment program as described in the program initially approved by the Department of Natural Resources including any subsequent program modifications approved by the Department, and including commitments to program implementation activities provided in the permittee's annual pretreatment program report, and that complies with the requirements set forth in 40 CFR Part 403 and ch. NR 211, Wis. Adm. Code. To ensure that the program is operated in accordance with these requirements, the following general conditions and requirements are hereby established:

6.5.1 Inventories

The permittee shall implement methods to maintain a current inventory of the general character and volume of wastewater that industrial users discharge to the treatment works and shall provide an updated industrial user listing annually and report any changes in the listing to the Department by March 31 of each year as part of the annual pretreatment program report required herein.

6.5.2 Regulation of Industrial Users

6.5.2.1 Limitations for Industrial Users:

The permittee shall develop, maintain, enforce and revise as necessary local limits to implement the general and specific prohibitions of the state and federal General Pretreatment Regulations.

6.5.2.2 Control Documents for Industrial Users (IUs)

The permittee shall control the discharge from each significant industrial user through individual discharge permits as required by s. NR 211.235, Wis. Adm. Code and in accordance with the approved pretreatment program procedures and the permittee's sewer use ordinance. The discharge permits shall be modified in a timely manner during the stated term of the discharge permits according to the sewer use ordinance as conditions warrant. The discharge permits shall include at a minimum the elements found in s. NR 211.235(1), Wis. Adm. Code and references to the approved pretreatment program procedures and the sewer use ordinance.

6.5.2.3 Review of Industrial User Reports, Inspections and Compliance Monitoring

The permittee shall require the submission of, receive, and review self-monitoring reports and other notices from industrial users in accordance with the approved pretreatment program procedures. The permittee shall randomly sample and analyze industrial user discharges and conduct surveillance activities to determine independent of information supplied by the industrial users, whether the industrial users are in compliance with pretreatment standards and requirements. The inspections and monitoring shall also be conducted to maintain accurate knowledge of local industrial processes, including changes in the discharge, pretreatment equipment operation, spill prevention control plans, slug control plans, and implementation of solvent management plans.

The permittee shall inspect and sample the discharge from each significant industrial user as specified in the permittee's approved pretreatment program or as specified in NR 211.235(3). The permittee shall evaluate whether industrial users identified as significant need a slug control plan according to the requirements of NR 211.235(4). If a slug control plan is needed, the plan shall contain at a minimum the elements specified in s. NR 211.235(4)(b), Wis. Adm. Code.

6.5.2.4 Enforcement and Industrial User Compliance Evaluation & Violation Reports

The permittee shall enforce the industrial pretreatment requirements including the industrial user discharge limitations of the permittee's sewer use ordinance. The permittee shall investigate instances of noncompliance by collecting and analyzing samples and collecting other information with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Investigation and response to instances of noncompliance shall be in accordance with the permittee's sewer use ordinance and approved Enforcement Response Plan.

The permittee shall make a semiannual report on forms provided or approved by the Department. The semiannual report shall include an analysis of industrial user significant noncompliance (i.e. the Industrial User Compliance Evaluation, also known as the SNC Analysis) as outlined in s.NR 211.23(1)(j), Wis. Adm. Code, and a summary of the permittee's response to all industrial noncompliance (i.e. the Industrial User Violation Report). The Industrial User Compliance Evaluation Report shall include monitoring results received from industrial users pursuant to s. NR 211.15(1)-(5), Wis. Adm. Code. The Industrial User Violation Report shall include copies of all notices of noncompliance, notices of violation and other enforcement correspondence sent by the permittee to industrial users, together with the industrial user's response. The Industrial User Compliance Evaluation and Violation Reports for the period January through June shall be provided to the Department by September 30 of each year and for the period July through December shall be provided to the Department by March 31 of the succeeding year, unless alternate submittal dates are approved.

6.5.2.5 Publication of Violations

The permittee shall publish a list of industrial users that have significantly violated the municipal sewer use ordinance during the calendar year, in the largest daily newspaper in the area by March 31 of the following year pursuant to s. NR 211.23(1)(j), Wis. Adm. Code. A copy of the newspaper publication shall be provided as part of the annual pretreatment report specified herein.

6.5.2.6 Multijurisdictional Agreements

The permittee shall establish agreements with all contributing jurisdictions as necessary to ensure compliance with pretreatment standards and requirements by all industrial users discharging to the permittee's wastewater treatment system. Any such agreement shall identify who will be responsible for maintaining the industrial user inventory, issuance of industrial user control mechanisms, inspections and sampling, pretreatment program implementation, and enforcement.

6.5.3 Annual Pretreatment Program Report

The permittee shall evaluate the pretreatment program, and submit the Pretreatment Program Report to the Department on forms provided or approved by the Department by March 31 annually, unless an alternate submittal date is approved. The report shall include a brief summary of the work performed during the preceding calendar year, including the numbers of discharge permits issued and in effect, pollution prevention activities, number of inspections and monitoring surveys conducted, budget and personnel assigned to the program, a general discussion of program progress in meeting the objectives of the permittee's pretreatment program together with summary comments and recommendations.

6.5.4 Pretreatment Program Modifications

- Future Modifications: The permittee shall within one year of any revisions to federal or state General Pretreatment Regulations submit an application to the Department in duplicate to modify and update its approved pretreatment program to incorporate such regulatory changes as applicable to the permittee. Additionally, the Department or the permittee may request an application for program modification at any time where necessary to improve program effectiveness based on program experience to date.

- Modifications Subject to Department Approval: The permittee shall submit all proposed pretreatment program modifications to the Department for determination of significance and opportunity for comment in accordance with the requirements and conditions of s. NR 211.27, Wis. Adm. Code. Any substantial proposed program modification shall be subject to Department public noticing and formal approval prior to implementation. A substantial program modification includes, but is not limited to, changes in enabling legal authority to administer and enforce pretreatment conditions and requirements; significant changes in program administrative or operational procedures; significant reductions in monitoring frequencies; significant reductions in program resources including personnel commitments, equipment, and funding levels; changes (including any relaxation) in the local limitations for substances enforced and applied to users of the sewerage treatment works; changes in treatment works sludge disposal or management practices which impact the pretreatment program; or program modifications which increase pollutant loadings to the treatment works. The Department shall use the procedures outlined in s. NR 211.30, Wis. Adm. Code for review and approval/denial of proposed pretreatment program modifications. The permittee shall comply with local public participation requirements when implementing the pretreatment program.

6.5.5 Program Resources

The permittee shall have sufficient resources and qualified personnel to carry out the pretreatment program responsibilities as listed in ss. NR 211.22 and NR 211.23, Wis. Adm. Code.

6.6 Land Application Requirements

6.6.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

6.6.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

6.6.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

6.6.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Form 3400-49 and Lab Report. The Characteristic Report Form 3400-49 shall be submitted electronically by January 31 following each year of analysis.

Following submittal of the electronic Characteristic Report Form 3400-49, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report is true, accurate and complete. The Lab Report must be sent directly to the facility's DNR sludge representative or basin engineer unless approval for not submitting the lab reports has been given.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

6.6.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:
Water Extractable Phosphorus (% of Total P) =
[Water Extractable Phosphorus (mg/kg, dry wt) ÷ Total Phosphorus (mg/kg, dry wt)] x 100

6.6.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note**: It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.
- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

6.6.7 Annual Land Application Report

Land Application Report Form 3400-55 shall be submitted electronically by January 31, each year whether or not non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code. Following submittal of the electronic Annual Land Application Report Form 3400-55, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

6.6.8 Other Methods of Disposal or Distribution Report

The permittee shall submit electronically the Other Methods of Disposal or Distribution Report Form 3400-52 by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied. Following submittal of the electronic Report Form 3400-52, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

6.6.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (l), Wis. Adm. Code.

6.6.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

6.6.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

6.6.12 Class B Sludge: Fecal Coliform Limitation

Compliance with the fecal coliform limitation for Class B sludge shall be demonstrated by calculating the geometric mean of at least 7 separate samples. (Note that a Total Solids analysis must be done on each sample). The geometric mean shall be less than 2,000,000 MPN or CFU/g TS. Calculation of the geometric mean can be done using one of the following 2 methods.

Method 1:

Geometric Mean = $(X_1 \times X_2 \times X_3 \ldots \times X_n)^{1/n}$

Where X = Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Method 2:

Geometric Mean = $\text{antilog}[(X_1 + X_2 + X_3 \ldots + X_n) \div n]$

Where X = $\log_{10}$ of Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Example for Method 2

Sample Number	Coliform Density of Sludge Sample	$\log_{10}$
1	6.0×10^5	5.78
2	4.2×10^6	6.62
3	1.6×10^6	6.20
4	9.0×10^5	5.95
5	4.0×10^5	5.60
6	1.0×10^6	6.00
7	5.1×10^5	5.71

The geometric mean for the seven samples is determined by averaging the $\log_{10}$ values of the coliform density and taking the antilog of that value.

$(5.78 + 6.62 + 6.20 + 5.95 + 5.60 + 6.00 + 5.71) \div 7 = 5.98$

The antilog of $5.98 = 9.5 \times 10^5$

6.6.13 Vector Control: Volatile Solids Reduction

The mass of volatile solids in the sludge shall be reduced by a minimum of 38% between the time the sludge enters the digestion process and the time it either exits the digester or a storage facility. For calculation of volatile solids reduction, the permittee shall use the Van Kleeck equation or one of the other methods described in "Determination of Volatile Solids Reduction in Digestion" by J.B. Farrell, which is Appendix C of EPA's *Control of Pathogens in Municipal Wastewater Sludge* (EPA/625/R-92/013). The Van Kleeck equation is:

$$VSR\% = \frac{VS_{IN} - VS_{OUT}}{VS_{IN} - (VS_{OUT} \times VS_{IN})} \times 100$$

Where: VS_{IN} = Volatile Solids in Feed Sludge (g VS/g TS)

VS_{OUT} = Volatile Solids in Final Sludge (g VS/g TS)

VSR% = Volatile Solids Reduction, (Percent)

7 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Operational Evaluation Report	December 31, 2019	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Compliance Alternatives, Source Reduction, Improvements and Modifications Status	December 31, 2020	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Preliminary Compliance Alternatives Plan	December 31, 2021	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Compliance Alternatives Plan	December 31, 2022	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Progress Report on Plans & Specifications	December 31, 2023	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Plans and Specifications	December 31, 2024	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Treatment Plant Upgrade to Meet WQBELs	March 31, 2025	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Complete Construction	November 30, 2025	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Achieve Compliance	December 31, 2025	19
Mercury Pollutant Minimization Program -Annual Mercury Progress Reports	January 31, 2019	20
Mercury Pollutant Minimization Program -Annual Mercury Progress Report #2	January 31, 2020	20
Mercury Pollutant Minimization Program -Annual Mercury Progress Report #3	January 31, 2021	20
Mercury Pollutant Minimization Program -Annual Mercury Progress Report #4	January 31, 2022	20
Mercury Pollutant Minimization Program -Final Mercury Report	January 30, 2023	20
Mercury Pollutant Minimization Program -Annual Mercury Reports After Permit Expiration	See Permit	20
Compliance Maintenance Annual Reports (CMAR)	by June 30, each year	22
Industrial User Compliance Evaluation and Violation Reports	Semiannual	31
Pretreatment Program Report	Annually	32
General Sludge Management Form 3400-48	prior to any significant sludge management changes	33

Characteristic Form 3400-49 and Lab Report	by January 31 following each year of analysis	33
Land Application Report Form 3400-55	by January 31, each year whether or not non-exceptional quality sludge is land applied	34
Other Methods of Disposal or Distribution Report Form 3400-52	by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied	34
Wastewater Discharge Monitoring Report	no later than the date indicated on the form	21

Report forms shall be submitted electronically in accordance with the reporting requirements herein. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Water Quality, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:
West Central Region - Wausau, 5301 Rib Mountain Drive, Wausau, WI 54401

Appendix C

Data from Two-Week Special Sampling Period

Sample Location >	Raw Influent													
Parameter	Flow	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mgd	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17	5.27	240	334	82	602	83	110	60	35	2.63	13	9.68	467	313
07/06/17	5.22	309	302	65	489	99	121	48	39	7.68	11	7.57	547	387
07/07/17	5.20	284	192	47	367	84	124	49	44	6.69	9.24	6.79	455	300
07/08/17	4.55	196	170	46	286	70	101	30	24	4.48	5.37	3.6	362	302
07/09/17	4.62	201	221	78	294	69	93	40	28	4.25	7.13	5.51	292	252
07/10/17	4.97	227	222	73	278	100	125	38	33	2.6	11	8.11	417	353
07/11/17	5.11	302	234	78	497	110	138	52	48	2.13	13	9.58	612	396
07/12/17	5.92	245	200	74	529	99	22	39	28	0.96	9.93	8.46	652	488
07/13/17	5.59	196	251	62	351	100	124	31	24	4.45	9.29	6.15	344	284
07/14/17	5.27	218	125	61	361	91	60	27	24	1.63	11	7.03	128	94
07/15/17	4.77	204	261	93	426	114	73	36	23	2.72	14	9.04	433	350
07/16/17	4.64	195	149	78	615	109	61	31	28	7.61	10	8.36	77	64
07/17/17	4.90	226	195	74	938	103	39	13	40	4.21	12	11	300	230
07/18/17	5.25	314	184	67	1388	101	17	51	39	3.58	12	9.83	466	346
Average	**5.09**	**240**	**217**	**70**	**530**	**95**	**86**	**39**	**33**	**3.97**	**10.6**	**7.9**	**397**	**297**
Min	**4.55**	**195**	**125**	**46**	**278**	**69**	**17**	**13**	**23**	**0.96**	**5.37**	**3.6**	**77**	**64**
Max	**5.92**	**314**	**334**	**93**	**1388**	**114**	**138**	**60**	**48**	**7.68**	**14.0**	**11.0**	**652**	**488**

Sample Location >	Primary Effluent												
Parameter	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17	220	128	60	306	95	225	40	36	1.79	5.05	3.81	145	112
07/06/17	241	199	43	273	91	121	41	34	3.53	5.5	4.03	153	120
07/07/17	262	116	54	286	64	114	45	43	2.45	4.01	3.09	98	75
07/08/17	190	94	53	208	60	92	28	28	2.19	3.32	2.46	80	69
07/09/17	187	109	61	173	53	135	30	29	2.38	3.52	1.05	97	78
07/10/17	213	222	79	241	65	126	33	30	1.64	5.66	4.6	160	128
07/11/17	258	155	77	221	117	160	44	47	1.51	6.05	4.38	103	75
07/12/17	232	190	67	228	82	140	44	28	1.83	4.89	4.66	129	87
07/13/17	191	145	60	286	100	144	32	20	2.05	5.34	4.42	108	95
07/14/17	203	139	75	199	114	134	28	24	1.45	4.56	4.09	132	120
07/15/17	201	123	76	237	99	56	28	24	1.42	5.79	3.95	83	63
07/16/17	191	128	73	427	110	33	30	27	4.79	7.36	6.42	83	64
07/17/17	203	145	84	854	113	28	35	37	4.01	7.91	6.25	89	69
07/18/17	262	169	78	704	106	48	44	35	3.24	6.92	6.08	93	73
Average	**218**	**147**	**67**	**332**	**91**	**111**	**36**	**32**	**2.4**	**5.4**	**4.2**	**111**	**88**
Min	**187**	**94**	**43**	**173**	**53**	**28**	**28**	**20**	**1.4**	**3.3**	**1.1**	**80**	**63**
Max	**262**	**222**	**84**	**854**	**117**	**225**	**45**	**47**	**4.8**	**7.9**	**6.4**	**160**	**128**

Sample Location >	Secondary Effluent														
Parameter	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Nitrite as N	Nitrate as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17	30	19	2	45	22	36	9.03	7.37		24	0.49	0.77	0.6	11	9
07/06/17	26	12	2	39	32	37	6.28	4.35	2.46	26	0.44	0.66	0.6	5	4
07/07/17	56	13	2	39	27	35	10	8.87	2.82	25	0.23	0.37	0.29	6	4
07/08/17	22	6	2	30	21	30	2.17	0.95	0.80	26	0.22	0.3	0.25	4	4
07/09/17	23	7	2	29	21	27	2.04	0.15	0.80	23	0.31	0.51	0.37	5	4
07/10/17	70	5	2	31	15	21	11	0.15		22	0.3	0.56	0.43	4	4
07/11/17	72	17	2	40	27	40	11	5.44		26	0.37	0.56	0.51	5	4
07/12/17	38	11	2	33	23	32	4.27	1.9		28	0.38	0.57	0.56	8	8
07/13/17	36	5	2	43	20	38	1.97	0.15		23	0.81	0.92	0.85	5	4
07/14/17	50	4	2	27	13	21	1.43	0.15		19	0.75	0.97	0.9	4	3
07/15/17	50	4	2	20	24	3.4	1.98	0.15		18	0.54	0.53	0.5	5	4
07/16/17	51	5	2	38	27	27	1.89	0.15		19	1.77	2	1.78	4	4
07/17/17	24	6	2	36	18	35	1.92	0.15		23	2.14	2.79	2.28	5	5
07/18/17	6	18	2	37	25	35	5.6	4.6		30	1.59	2.63	2.12	11	8
Average	**40**	**9**	**2**	**35**	**23**	**30**	**5.0**	**2.5**	**1.7**	**24**	**0.74**	**1.0**	**0.9**	**5.9**	**5**
Min	**6**	**4**	**2**	**20**	**13**	**3**	**1.4**	**0.2**	**0.8**	**18**	**0.22**	**0.3**	**0.3**	**4.0**	**3**
Max	**72**	**19**	**2**	**45**	**32**	**40**	**11.0**	**8.9**	**2.8**	**30**	**2.1**	**2.8**	**2.3**	**11**	**9**

Sample Location >	Final Effluent														
Parameter	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Nitrite as N	Nitrate as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17	34	8	2	40	23	39	12	7.25	24		0.45	0.65	0.52	8	5
07/06/17	29	4	2	32	28	29	5.7	4.32	2.97	26	0.41	0.59	0.51	4	4
07/07/17	66	2	2	34	26	33	9.23	8.87	3.09	25	0.23	0.31	0.26	2	3
07/08/17	20	2	2	33	23	27	2.06	1.1	0.80	26	0.16	0.23	0.19	2	2
07/09/17	26	2	2	27	22	21	2.28	0.15	0.80	23	0.28	0.42	0.34	3	3
07/10/17	70	2	2	27	16	22	5.31	0.15		21	0.56	0.44	0.38	2	1
07/11/17	76	6	2	36	23	26	15	5.35		24	0.41	0.57	0.45	5	6
07/12/17	38	5	2	33	21	30	5.04	1.93		28	0.42	0.54	0.49	3	2
07/13/17	29	2	2	30	21	22	4.21	0.15		23	0.74	0.83	0.78	2	2
07/14/17	46	2	2	21	22	18	1.27	0.15		19	0.76	0.92	0.87	5	5
07/15/17	45	2	2	23	21	19	1.67	0.15		18	0.39	0.51	0.46	4	4
07/16/17	52	2	2	54	22	32	1.88	0.15		18	2.03	2.02	1.76	3	3
07/17/17	25	2	2	33	22	30	3.71	0.15		22	2.19	2.58	2.18	3	3
07/18/17	13	8	2	34	24	33	4.78	4.35		29	2.38	2.26	2.02	7	6
Average	**41**	**3.5**	**2**	**33**	**22**	**27**	**5.3**	**2.4**	**6.3**	**23**	**0.82**	**0.92**	**0.80**	**3.79**	**3.5**
Min	**13**	**2**	**2**	**21**	**16**	**18**	**1.3**	**0.15**	**0.80**	**18**	**0.16**	**0.23**	**0.19**	**2**	**1**
Max	**76**	**8**	**2**	**54**	**28**	**39**	**15**	**8.9**	**24**	**29**	**2.4**	**2.6**	**2.2**	**8**	**6**

Sample Location >	Effluent filter backwash											
Parameter	Alkalinity as CaCO3	Chemical Oxygen Demand	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Nitrite as N	Nitrate as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17												
07/06/17	22	103	44	9.79	1.39	0.80	24	2.72	4.83	3.58	128	90
07/07/17												
07/08/17												
07/09/17												
07/10/17												
07/11/17	83	112	44	7.84	1.39		22	0.34	2.64	1.99	91	69
07/12/17	49	142	18	8.75	0.42		24	0.48	5.03	3.19	152	118
07/13/17												
07/14/17												
07/15/17												
07/16/17												
07/17/17												
07/18/17	23	910	3.4	6.36	0.15		26	2.42	6.02	4.49	102	83
Average	**44**	**317**	**27**	**8.2**	**0.8**	**0.80**	**24**	**1.49**	**4.63**	**3.31**	**118**	**90**
Min	**22**	**103**	**3.4**	**6.4**	**0.2**	**0.80**	**22**	**0.34**	**2.64**	**1.99**	**91**	**69**
Max	**83**	**910**	**44**	**9.8**	**1.4**	**0.80**	**26.0**	**2.72**	**6.02**	**4.49**	**152**	**118**

Sample Location >	GBT Filtrate														
Parameter	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Nitrite as N	Nitrate as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17															
07/06/17	42	111	12	335	49	70	22	1.86	0.80	19	4.62	8.41	6.1	255	198
07/07/17															
07/08/17															
07/09/17															
07/10/17															
07/11/17	123	194	12	321	62	62	25	1.93		18	0.41	8.7	5.91	450	360
07/12/17	76	154	12	312	74	59	34	0.77		20	0.41	19	8.21	317	253
07/13/17															
07/14/17															
07/15/17															
07/16/17															
07/17/17															
07/18/17	54	96	14	271	40	53	13	1.07		22	2.5	10	7.69	138	128
Average	**74**	**139**	**13**	**310**	**56**	**61**	**24**	**1.41**	**0.80**	**20**	**1.99**	**11.53**	**6.98**	**290**	**235**
Min	**42**	**96**	**12**	**271**	**40**	**53**	**13**	**0.77**	**0.80**	**18**	**0.41**	**8.41**	**5.91**	**138**	**128**
Max	**123**	**194**	**14**	**335**	**74**	**70**	**34**	**1.93**	**0.80**	**22**	**4.62**	**19**	**8.21**	**450**	**360**

Sample Location >	Belt Press Filtrate														
Parameter	Alkalinity as CaCO3	Biochemical Oxygen Demand (5 day)	Soluble Biochem Oxy Demand (5 day)	Chemical Oxygen Demand	Floc-Filtered COD	Soluble Chemical Oxygen Demand	Total Kjeldahl Nitrogen	Ammonia as N	Nitrite as N	Nitrate as N	Orthophosphorus	Total Phosphorus as P	Soluble Total Phosphorus	Total Suspended Solids	Total Suspended Volatile Solids
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
07/05/17															
07/06/17	2522	131	84	967	27	416	595	711	0.80	10	32	40	19	1147	667
07/07/17															
07/08/17															
07/09/17															
07/10/17															
07/11/17	257	89	43	464	62	312	632	865		8.51	4.17	27	13	1096	661
07/12/17	2684	127	45	1372	74	286	640	740		9.04	14	52	17	1035	610
07/13/17															
07/14/17															
07/15/17															
07/16/17															
07/17/17															
07/18/17	4900	60	29	1242	24	6.3	654	800		9.8	7.12	19	12	257	223
Average	**2591**	**102**	**50**	**1011**	**47**	**255**	**630**	**779**	**0.80**	**9.34**	**14**	**35**	**15**	**884**	**540**
Min	**257**	**60**	**29**	**464**	**24**	**6.3**	**595**	**711**	**0.80**	**8.51**	**4.2**	**19**	**12**	**257**	**223**
Max	**4900**	**131**	**84**	**1372**	**74**	**416**	**654**	**865**	**0.80**	**10**	**32**	**52**	**19**	**1147**	**667**

Appendix D

Detailed Planning Level Alternative Cost Opinions

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1A
Raw Wastewater Pumping System Improvements

Cost Opinion Summary

General Description

This alternative updates the existing raw wastewater pumping system: new RWW Pumps, new suction and discharge piping, new suction and discharge valves, gear-isolation gates upstream of the wet well, wet well partitioning and isolation, and general re-conditioning of the station. This alternative assumes the existing major electrical components remain in service.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$2,608,451
Contingency	30%	$782,535
Estimated Construction Cost Without Markup		$3,390,986
Contractor Overhead & Profit Markup	25%	$847,746
Estimated Construction Cost		$4,238,732
Engineering	15%	$635,810
Total Initial Cost		**$4,874,542**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$4,874,542**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1A
Raw Wastewater Pumping System Improvements

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$25,000
Metals	See Detailed Worksheet	$0
Buildings	See Detailed Worksheet	$22,000
Demolition	See Detailed Worksheet	$10,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Dry-Pit Submersible Pumps	Ea	**4**	**125,000**	$500,000
20-in Check Valves	Ea	**4**	**25,000**	$100,000
24-in Isolation Valves	Ea	**8**	**30,000**	$240,000
36-in Header Piping	LS	**1**	**200,000**	$200,000
24-in Suction Piping	Ea	**4**	**15,000**	$60,000
20-in Discharge Piping	Ea	**4**	**15,000**	$60,000
Bypass Pumping: Mobilization and Setup	LS	**1**	**75,000**	$75,000
Bypass Pumping: 4 Months	Ea	**4**	**70,000**	$280,000
Bypass Pumping: Labor and Fuel	Ea	**4**	**50,000**	$200,000
Geared Isolation Gates Upstream Wet Well	Ea	**2**	**15,000**	$30,000
Geared Wet Well Isolation Gate	Ea	**1**	**15,000**	$15,000
Remove RWW Sluice Gate at Building Wall	Ea	**1**	**5,000**	$5,000
Remove Pumps and Piping	LS	**1**	**30,000**	$30,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**5%**	$130,423
Electrical % Not Listed Above	%	**10%**	$260,845
Instrumentation and Control % Not Listed Above	%	**7%**	$182,592
Plumbing % Not Listed Above	%	**2%**	$52,169
HVAC % Not Listed Above	%	**5%**	$130,423

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$2,608,451**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1A
Raw Wastewater Pumping System Improvements

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete: Wet Well Isolation Wall (Difficult)	CY	**10**	**2,500**	25,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**25,000**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building: Coatings	CY	**2,000**	**6**	12,000
Building: Doors and Windows	LS	**1**	**10,000**	10,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**22,000**
Demolition: Miscellaneous Structural Removals	LS	**1**	**10,000**	10,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**10,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1B
Upgrade Existing Screening and Grit Removal Systems

Cost Opinion Summary

General Description

This alternative rehabilitates the existing grit removal system: replace fiberglass cover, replace lighting, replace HVAC, replace grit and scum equipment, improve flow splitting, and improve flow measurement. Flow splitting and measurement will be accomplished using flow-control valves and mag-meters on each of the four primary clarifiers. This alternative also rehabilitates the existing screening system by expanding grade-level area, adding a bridge crane, improving screen access, and replace failing screenings conveyors.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$2,127,218
Contingency	30%	$638,165
Estimated Construction Cost Without Markup		$2,765,383
Contractor Overhead & Profit Markup	25%	$691,346
Estimated Construction Cost		$3,456,729
Engineering	15%	$518,509
Total Initial Cost		**$3,975,238**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$3,975,238**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1B
Upgrade Existing Screening and Grit Removal Systems

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$13,000
Concrete	See Detailed Worksheet	$150,375
Metals	See Detailed Worksheet	$8,000
Buildings	See Detailed Worksheet	$210,000
Demolition	See Detailed Worksheet	$0

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Grit Washing Equipment	LS	**1**	**162,500**	$162,500
Grit Pumping	LS	**1**	**15,000**	$15,000
Grit Vortex Mechanism	LS	**1**	**100,000**	$100,000
Scum Concentrator	LS	**1**	**30,000**	$30,000
30-in Mag Meters	Ea	**4**	**20,000**	$80,000
30-in Modulating Control Valves	Ea	**4**	**25,000**	$100,000
Screening Handling Equipment	LS	**1**	**100,000**	$100,000
Screening Gates and Actuators	LS	**1**	**65,000**	$65,000
Screen Area Bridge Crane	LS	**1**	**45,000**	$45,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Remove Grit Equipment	LS	**1**	**30,000**	$30,000
Remove Screen Equipment	LS	**1**	**10,000**	$10,000
Screen Area Building Addition	LS	**1,000**	**200**	$200,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**2%**	$42,544
Process-Mechanical Piping % Not Listed Above	%	**10%**	$212,722
Electrical % Not Listed Above	%	**10%**	$212,722
Instrumentation and Control % Not Listed Above	%	**7%**	$148,905
Plumbing % Not Listed Above	%	**2%**	$42,544
HVAC % Not Listed Above	%	**7%**	$148,905

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$2,127,218**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-1B
Upgrade Existing Screening and Grit Removal Systems

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Excavation (confined conditions)	CY	**300**	**25**	7,500
Earthwork: Structural Backfill (confined conditions)	CY	**50**	**50**	2,500
Earthwork: Backfill (confined conditions)	CY	**300**	**10**	3,000
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**13,000**
Concrete: Slabs (confined conditions)	CY	**40**	**638**	25,500
Concrete: Walls (confined conditions)	CY	**90**	**1,388**	124,875
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**150,375**
Metals: Hatch	Ea	**4**	**2,000**	8,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**8,000**
Building: Cover/Building Enclosure	LS	**1**	**210,000**	210,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**210,000**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-2
Construct a New Preliminary Treatment System

Cost Opinion Summary

General Description

This alternative includes the replacement of the existing preliminary treatment with a new headworks structure and new equipment which includes: Raw wastewater pumping, screening, grit removal, grit washing and pumping. Relocating the influent sampler and improving influent flow measurement are also included in this alternative.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$11,375,617
Contingency	30%	$3,412,685
Estimated Construction Cost Without Markup		$14,788,302
Contractor Overhead & Profit Markup	25%	$3,697,076
Estimated Construction Cost		$18,485,378
Engineering	15%	$2,772,807
Total Initial Cost		**$21,258,185**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$21,258,185**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-2
Construct a New Preliminary Treatment System

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$2,400,000
Concrete	See Detailed Worksheet	$2,145,000
Metals	See Detailed Worksheet	$132,000
Buildings	See Detailed Worksheet	$900,000
Demolition	See Detailed Worksheet	$970,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Grit Washing Equipment	LS	**1**	**148,750**	$148,750
Grit Pumping	LS	**2**	**24,000**	$48,000
Grit Vortex Mechanism	LS	**1**	**100,000**	$100,000
Scum Concentrator	LS	**1**	**30,000**	$30,000
Fine Screens	Ea	**3**	**287,300**	$861,900
Sluice Gates	Ea	**2**	**30,000**	$60,000
Slide Gates	Ea	**6**	**35,000**	$210,000
Stop Gate	Ea	**1**	**15,000**	$15,000
Dry-pit Submersible Pumps	Ea	**5**	**112,769**	$563,844
Stop Log	Ea	**1**	**15,000**	$15,000
Relocate Sampler	Ea	**1**	**1,000**	$1,000
PE Influent Pipe to Primary Clarifiers	LF	**1,000**	**500**	$500,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**1%**	$113,756
Process-Mechanical Piping % Not Listed Above	%	**5%**	$568,781
Electrical % Not Listed Above	%	**7%**	$796,293
Instrumentation and Control % Not Listed Above	%	**3%**	$341,269
Plumbing % Not Listed Above	%	**1%**	$113,756
HVAC % Not Listed Above	%	**3%**	$341,269

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$11,375,617**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PRT-2
Construct a New Preliminary Treatment System

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	LS	**1**	**100,000**	100,000
Earthwork: Excavation	CY	**20,000**	**20**	400,000
Earthwork: Structural Fill	CY	**50,000**	**25**	1,250,000
Earthwork: Earth Fill	CY	**15,000**	**5**	75,000
Earthwork: Haul Excess Fill	CY	**15,000**	**5**	75,000
Earthwork: Sheeting and Shoring	LS	**1**	**500,000**	500,000
Earthwork:	unit			
Earthwork Total				**2,400,000**
Concrete: Base Slab	CY	**800**	**400**	320,000
Concrete: Walls	CY	**2,000**	**800**	1,600,000
Concrete: Slab	CY	**250**	**900**	225,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**2,145,000**
Metals: Grating / Plank	SF	**1,500**	**35**	52,500
Metals: Stairs	Treads	**100**	**450**	45,000
Metals: Railing	Feet	**200**	**60**	12,000
Metals: Hatches	SF	**150**	**150**	22,500
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**132,000**
Building: Headworks Building	SF	**6,000**	**150**	900,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**900,000**
Demolition: Removals (phase I)	LS	**1**	**500,000**	500,000
Demolition: Concrete Fill (phase I)	CY	**1,000**	**200**	200,000
Demolition: Backfill (phase I)	CY	**15,000**	**10**	150,000
Demolition: Dewatering (phase I)	LS	**1**	**25,000**	25,000
Demolition: Removals (phase II)	LS	**1**	**50,000**	50,000
Demolition: Concrete Fill (phase II)	CY	**100**	**200**	20,000
Demolition: Backfill (phase II)	CY	**2,500**	**10**	25,000
Demoltion Total				**970,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-1
Rehabilitate Primary Settling System

Cost Opinion Summary

General Description

This alternative updates the existing primary clarifier complex: two new drives and mechanisms, two new drives, repair concrete, and replace railings.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$894,122
Contingency	30%	$268,237
Estimated Construction Cost Without Markup		$1,162,359
Contractor Overhead & Profit Markup	25%	$290,590
Estimated Construction Cost		$1,452,949
Engineering	15%	$217,942
Total Initial Cost		**$1,670,891**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$1,670,891**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-1
Rehabilitate Primary Settling System

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$0
Metals	See Detailed Worksheet	$48,945
Buildings	See Detailed Worksheet	$0
Demolition	See Detailed Worksheet	$0

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Drives and Mechanisms: Installed and Painted	Ea	**4**	**150,000**	$600,000
Weir and Baffle Package	Ea	**4**	**30,000**	$120,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**10%**	$89,412
Electrical % Not Listed Above	%	**2%**	$17,882
Instrumentation and Control % Not Listed Above	%	**2%**	$17,882
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$894,122**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-1
Rehabilitate Primary Settling System

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals: Aluminum Handrail	LF	**1,056**	**35**	36,945
Metals: Stairs	EA	**4**	**3,000**	12,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**48,945**
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**0**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AS

Rehabilitate and Enhance Activated Sludge System

Cost Opinion Summary

General Description

This alternative enhances the activated sludge system and addressing issues within the Blower Building. The alternative adds a selector upstream of the activated sludge sytem, converts the aeration basins to two three-pass trains, replacing diffusers, replaces aeration piping, adds secondary settling flow balancing, and adds the ability to route extreme wet-weather flows to the effluent-side mixed liquor channel. In effect, these modifications will improve effluent quality, improve stability, and enhance total nitrogen removal. In the future, the system could be readily modified and operated to meet a 10 mg-TN/L effluent limit.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$4,440,812
Contingency	30%	$1,332,244
Estimated Construction Cost Without Markup		$5,773,056
Contractor Overhead & Profit Markup	25%	$1,443,264
Estimated Construction Cost		$7,216,319
Engineering	15%	$1,082,448
Total Initial Cost		**$8,298,767**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$8,298,767**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AS
Rehabilitate and Enhance Activated Sludge System

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$181,250
Concrete	See Detailed Worksheet	$665,778
Metals	See Detailed Worksheet	$381,600
Buildings	See Detailed Worksheet	$95,000
Demolition	See Detailed Worksheet	$40,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Fine Bubble Diffusers	LS	**1**	**275,000**	$275,000
ALP Piping in Basins - 304SST	LS	**1**	**330,000**	$330,000
ALP Header Piping Outside Bldg - 304SST	LS	**1**	**55,000**	$55,000
Secondary Splitter Gates	EA	**3**	**20,000**	$60,000
ML Pipe to Clarifiers	LF	**300**	**600**	$180,000
Sawcut Concrete for Piping and Repair	EA	**3**	**75,000**	$225,000
Aeration Basin Weir Walls	EA	**6**	**20,000**	$120,000
Diffuser Grid	Ea	**300**	**146**	$43,800
Anoxic Zone Mixers (Submersible)	Ea	**6**	**28,600**	$171,600
ML Recycle Pump	Ea	**1**	**32,500**	$32,500

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Tank Leak Testing	LS	**1**	**30,000**	$30,000

Discipline %s Do Not Apply to This Alternative			
Civil % Not Listed Above	%	**2%**	$88,816
Process-Mechanical Piping % Not Listed Above	%	**10%**	$444,081
Electrical % Not Listed Above	%	**10%**	$444,081
Instrumentation and Control % Not Listed Above	%	**7%**	$310,857
Plumbing % Not Listed Above	%	**2%**	$88,816
HVAC % Not Listed Above	%	**4%**	$177,632

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$4,440,812**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AS
Rehabilitate and Enhance Activated Sludge System

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Secondary Splitter Excavation/Bfill	LS	**1**	**30,000**	30,000
Earthwork: Dewatering	LS	**1**	**25,000**	25,000
Earthwork: Excavation	CY	**6,000**	**15**	90,000
Earthwork: Structural Fill	CY	**250**	**25**	6,250
Earthwork: Earth Fill	CY	**2,500**	**5**	12,500
Earthwork: Haul Excess Fill	CY	**3,500**	**5**	17,500
Earthwork:	unit			
Earthwork Total				**181,250**
Concrete: Aeration Basins Concrete Repair	LS	**6**	**10,000**	60,000
Concrete: Base Slab	CY	**475**	**400**	190,000
Concrete: Walls	CY	**450**	**800**	360,000
Concrete: Walkway	CY	**20**	**900**	18,000
Concrete: ML Channel	CY	**19**	**400**	7,778
Concrete: ML Channel Walls	CY	**22**	**900**	20,000
Concrete: Cut-In	LS	**1**	**10,000**	10,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**665,778**
Metals: Grating Replacement	SF	**5,700**	**30**	171,000
Metals: Aluminum Handrail for A/B	LF	**2,160**	**60**	129,600
Metals: Weirs - SST	EA	**6**	**10,000**	60,000
Metals: Aluminum Railing	LF	**200**	**60**	12,000
Metals: Aluminum Stairs	Treads	**20**	**450**	9,000
Metals:	unit			
Metals:	unit			
Metals Total				**381,600**
Building: Doors	LS	**1**	**20,000**	20,000
Building: Windows	LS	**1**	**10,000**	10,000
Building: Coatings	LS	**1**	**20,000**	20,000
Building: Masonry Repairs	LS	**1**	**10,000**	10,000
Building: Roof	SF	**3,500**	**10**	35,000
Building:	unit			
Building:	unit			
Building Total				**95,000**
Demolition: Removals	LS	**1**	**40,000**	40,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**40,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-2
Rehabilitate Secondary Settling System

Cost Opinion Summary

General Description

This alternative adds launder covers on the secondary clarifiers to reduce manual cleaning labor, adds FEDWA energy-dissipating inlets to improve secondary settling system performance, replaces fall protection, and adds modified inlet/effluent piping to improve flow distribution and the hydrualic profile.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$521,145
Contingency	30%	$156,343
Estimated Construction Cost Without Markup		$677,488
Contractor Overhead & Profit Markup	25%	$169,372
Estimated Construction Cost		$846,860
Engineering	10%	$84,686
Total Initial Cost		**$931,546**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$931,546**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-2
Rehabilitate Secondary Settling System

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$0
Metals	See Detailed Worksheet	$50,000
Buildings	See Detailed Worksheet	$0
Demolition	See Detailed Worksheet	$0

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Clarifier Launder Covers (installed)	LF	**1,257**	**208**	$261,145
FEDWA Baffles	EA	**3**	**20,000**	$60,000
Large-Diameter Process Piping	LS	**1**	**150,000**	$150,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

Discipline %s Do Not Apply to This Alternative			
Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$521,145**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SET-2
Rehabilitate Secondary Settling System

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals: Fall Protection and Grating	LS	**1**	**50,000**	50,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**50,000**
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**0**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-1
Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]

Cost Opinion Summary

General Description

This alternative adds a tertiary chemical storage, mixing, coagulation, and flocculation system to enhance chemical phosphorus polishing upstream of filtration. This alternative also retrofits the existing Filter Building with cloth-media filters that have adequate capacity to process the entire maximum day flow. These improvements will allow the Facility to consistently comply with the impending low-level phosphorus limit was well as the WLA limit for BOD. The alternative also rehabilitates the reclaimed effluent system and other Filter Building shortcomings.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$4,640,000
Contingency	30%	$1,392,000
Estimated Construction Cost Without Markup		$6,032,000
Contractor Overhead & Profit Markup	25%	$1,508,000
Estimated Construction Cost		$7,540,000
Engineering	15%	$1,131,000
Total Initial Cost		**$8,671,000**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$8,671,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-1
Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$60,600
Concrete	See Detailed Worksheet	$405,000
Metals	See Detailed Worksheet	$8,250
Buildings	See Detailed Worksheet	$168,000
Demolition	See Detailed Worksheet	$65,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Cloth-Media Disc Filters	EA	**4**	**377,000**	$1,508,000
Orthophosphate Analyzer	EA	**2**	**25,000**	$50,000
Gates	EA	**4**	**30,000**	$120,000
Pumping System Improvements	EA	**2**	**40,000**	$80,000
Tank Mixers	Ea	**5**	**18,750**	$93,750
Ferric Feed System	LS	**1**	**30,000**	$30,000
Polymer Feed System	LS	**1**	**30,000**	$30,000
Baffles	SF	**300**	**30**	$9,000
Motorized Strainers	EA	**2**	**25,000**	$50,000
Basket Strainer	EA	**2**	**5,000**	$10,000
Piping	LS	**1**	**10,000**	$10,000
Valves	LS	**1**	**15,000**	$15,000
Fitting	LS	**1**	**15,000**	$15,000
Removals	LS	**1**	**10,000**	$10,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%		**2%**	$92,800
Process-Mechanical Piping % Not Listed Above	%		**15%**	$696,000
Electrical % Not Listed Above	%		**10%**	$464,000
Instrumentation and Control % Not Listed Above	%		**10%**	$464,000
Plumbing % Not Listed Above	%		**1%**	$46,400
HVAC % Not Listed Above	%		**3%**	$139,200

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$4,640,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-1
Provide Enhanced Chemical Addition and Filtration [Cloth-Media Filters]

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	LS	**1**	**1,000**	1,000
Earthwork: Excavation/Backfill	LS	**1,987**	**30**	59,600
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**60,600**
Concrete: Filtration Tank Walls	CY	**30**	**750**	22,500
Concrete: Chemi Mix Tank Walls	unit	**83**	**750**	62,500
Concrete: Base Slab	unit	**800**	**400**	320,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**405,000**
Metals: Grating	SF	**150**	**35**	5,250
Metals: Railing	LF	**50**	**60**	3,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**8,250**
Building: New Chemical P Building	sq ft	**840**	**200**	168,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**168,000**
Demolition: Concrete Demo	LS	**1**	**10,000**	10,000
Demolition: Sawcutting	LS	**1**	**5,000**	5,000
Demolition: Equipment Demo	LS	**1**	**50,000**	50,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**65,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-2
Add Nutrient Recovery Systems [Algae Effluent Polishing and Struvite Recovery]

Cost Opinion Summary

General Description

This alternative reduces phosphorus concentrations through the use phosphorus recovery systems: an algae bioreactor and struvite recovery system. This alternative has potential payback from harvesting used algae and struvite, selling it at market value.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$13,099,246
Contingency	30%	$3,929,774
Estimated Construction Cost Without Markup		$17,029,020
Contractor Overhead & Profit Markup	25%	$4,257,255
Estimated Construction Cost		$21,286,275
Engineering	15%	$3,192,941
Total Initial Cost		**$24,479,216**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$24,479,216**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-2
Add Nutrient Recovery Systems [Algae Effluent Polishing and Struvite Recovery]

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$8,333
Concrete	See Detailed Worksheet	$95,833
Metals	See Detailed Worksheet	$0
Buildings	See Detailed Worksheet	$630,000
Demolition	See Detailed Worksheet	$0

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
CLEARAS ABNR System	LS	**1**	**12,650,000**	$12,650,000
Influent Pump Station	LS	**1**	**250,000**	$250,000
Carbon Dioxide Tanks and Equipment	LS	**1**	**150,000**	$150,000
Chemical Storage Tanks	EA	**2**	**9,600**	$19,200
Struvite Harvesting System	LS	**1**	**995,000**	$995,000
Deduct Engineering (10%) and Contingency (20%) for the Clearas ABNR System	EA	**-1**	**3,795,000**	-$3,795,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**2%**	$261,985
Process-Mechanical Piping % Not Listed Above	%	**5%**	$654,962
Electrical % Not Listed Above	%	**4%**	$523,970
Instrumentation and Control % Not Listed Above	%	**2%**	$261,985
Plumbing % Not Listed Above	%	**1%**	$130,992
HVAC % Not Listed Above	%	**2%**	$261,985

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$13,099,246**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

PFL-2
Add Nutrient Recovery Systems [Algae Effluent Polishing and Struvite Recovery]

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Excavation + Structural Fill	CY	**167**	**50**	8,333
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**8,333**
Concrete: Tanks for Separators	CY	**110**	**750**	82,500
Concrete: Base Slab	CY	**30**	**450**	13,333
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**95,833**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building: Blower/Algae Harvest Building	SF	**2,000**	**175**	350,000
Building: Struvite Building	SF	**1,600**	**175**	280,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**630,000**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIS
Increase Disinfection Capacity

Cost Opinion Summary

General Description

This alternative will add 5 mgd of disinfection capacity, at this time, and hydraulic capacity for 10 mgd.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$868,281
Contingency	30%	$260,484
Estimated Construction Cost Without Markup		$1,128,766
Contractor Overhead & Profit Markup	25%	$282,191
Estimated Construction Cost		$1,410,957
Engineering	15%	$211,644
Total Initial Cost		**$1,622,601**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$1,622,601**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIS
Increase Disinfection Capacity

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$54,000
Concrete	See Detailed Worksheet	$72,000
Metals	See Detailed Worksheet	$49,700
Buildings	See Detailed Worksheet	$0
Demolition	See Detailed Worksheet	$50,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
UV Disinfection Equipment (5 mgd)	LS	**1**	**250,000**	$250,000
Gates	EA	**2**	**10,000**	$20,000
Compressor System	LS	**1**	**15,000**	$15,000
Temporary Pumping for UV Tie-In	LS	**1**	**30,000**	$30,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Lifting Equipment	LS	**1**	**15,000**	$15,000

Discipline %s Do Not Apply to This Alternative			
Civil % Not Listed Above	%	**10%**	$86,828
Process-Mechanical Piping % Not Listed Above	%	**4%**	$34,731
Electrical % Not Listed Above	%	**15%**	$130,242
Instrumentation and Control % Not Listed Above	%	**7%**	$60,780
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$868,281**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIS
Increase Disinfection Capacity

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Excavation	CY	**3,000**	**10**	30,000
Earthwork: Backfill	CY	**3,000**	**8**	24,000
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**54,000**
Concrete: UV Channel and Surrounding Slab	CY	**60**	**400**	24,000
Concrete: UV Channel Walls	CY	**30**	**1,200**	36,000
Concrete: Cut Out Channel Wall	LS	**1**	**12,000**	12,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**72,000**
Metals: Doors	EA	**5**	**7,000**	35,000
Metals: UV Grating	SF	**420**	**35**	14,700
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**49,700**
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**0**
Demolition: Remove Asphalt and Prep Area	SY	**2,500**	**20**	50,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**50,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIG-1
Rehabilitate Mesophilic Digestion Complex

Cost Opinion Summary

General Description

This alternative upgrades the digestion complex, converts the secondary digesters to primary digesters, replaces the secondary digester covers, creates an NFPA 820 compliant biogas handling room, replaces aging building systems, and replaces all biogas equipment and piping.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$5,072,900
Contingency	30%	$1,521,870
Estimated Construction Cost Without Markup		$6,594,770
Contractor Overhead & Profit Markup	25%	$1,648,692
Estimated Construction Cost		$8,243,462
Engineering	15%	$1,236,519
Total Initial Cost		**$9,479,981**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$9,479,981**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIG-1
Rehabilitate Mesophilic Digestion Complex

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$0
Metals	See Detailed Worksheet	$41,000
Buildings	See Detailed Worksheet	$219,000
Demolition	See Detailed Worksheet	$75,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
80-ft Digester Covers	EA	**2**	**633,942**	$1,267,885
Install Digester Cover	EA	**2**	**443,760**	$887,519
HEX	EA	**2**	**100,000**	$200,000
Recirc Pumps	EA	**2**	**20,000**	$40,000
Biogas Boiler and Pumps	EA	**2**	**75,000**	$150,000
NG Boiler and Pumps	EA	**2**	**35,000**	$70,000
Heating Pumps	LS	**1**	**50,000**	$50,000
Glycol System	LS	**1**	**25,000**	$25,000
Biogas Piping and Valves	LS	**1**	**250,000**	$250,000
Biogas Conditioning: Moisture and H2S	LS	**1**	**330,000**	$330,000
Biogas Compressors	EA	**2**	**125,000**	$250,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**1%**	$50,729
Process-Mechanical Piping % Not Listed Above	%	**10%**	$507,290
Electrical % Not Listed Above	%	**4%**	$202,916
Instrumentation and Control % Not Listed Above	%	**6%**	$304,374
Plumbing % Not Listed Above	%	**1%**	$50,729
HVAC % Not Listed Above	%	**2%**	$101,458

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$5,072,900**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

DIG-1
Rehabilitate Mesophilic Digestion Complex

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals: Miscellaneous	LS	**1**	**20,000**	20,000
Metals: Doors	EA	**3**	**7,000**	21,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**41,000**
Building: Coatings	LS	**1**	**130,000**	130,000
Building: Masonry Walls	LS	**1**	**40,000**	40,000
Building: Tuckpointing and Misc Bldg Improve	LS	**1**	**25,000**	25,000
Building: Roof	SF	**2,400**	**10**	24,000
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**219,000**
Demolition:	LS	**1**	**75,000**	75,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**75,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-1
Improve Thickening, Improve Dewatering and Produce Dry Class A Biosolids

Cost Opinion Summary

General Description

This alternatives improves side stream equalization, solids thickening, and solids dewatering. Digested cake solids are dried in a medium-temperature dryer and temporarily stored on site before distributed to agricultural landowners or others.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$12,055,316
Contingency	30%	$3,616,595
Estimated Construction Cost Without Markup		$15,671,911
Contractor Overhead & Profit Markup	25%	$3,917,978
Estimated Construction Cost		$19,589,889
Engineering	15%	$2,938,483
Total Initial Cost		**$22,528,373**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$22,528,373**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-1
Improve Thickening, Improve Dewatering and Produce Dry Class A Biosolids

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$43,750
Metals	See Detailed Worksheet	$0
Buildings	See Detailed Worksheet	$2,883,200
Demolition	See Detailed Worksheet	$100,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
TWAS/PSD Pumps	Ea	**4**	**25,000**	$100,000
Polymer Feed System	Ea	**1**	**150,000**	$150,000
Gravity Belt Thickeners	Ea	**2**	**425,000**	$850,000
Filtrate Pumps	Ea	**2**	**25,000**	$50,000
Side Stream Samplers	Ea	**2**	**10,000**	$20,000
2.0-m Belt Filter Press	Ea	**2**	**485,000**	$970,000
Polymer System	Ea	**1**	**160,000**	$160,000
Filtrate EQ Mixer	Ea	**1**	**18,750**	$18,750
Belt Dryer System	LS	**1**	**3,800,000**	$3,800,000
Includes:				
Dryer				
Wet Cake Bin				
Cake Pumps (2)				
Product Cooler/Return Conveyors				
Burner System				
W3 Booster Pump	Each	**1**	**6,000**	$6,000
Air Compressor/Dryer/Receiver	LS	**1**	**25,000**	$25,000
Shaftless Screw Conveyor (Wet Cake)	LF	**1,600**	**55**	$88,000
Shaftless Screw Conveyor (Dry Product)	LS	**1,300**	**30**	$39,000
Pneumatic Conveyance System	LS	**1**	**220,000**	$220,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**2%**	$241,106
Process-Mechanical Piping % Not Listed Above	%	**7%**	$843,872
Electrical % Not Listed Above	%	**5%**	$602,766
Instrumentation and Control % Not Listed Above	%	**3%**	$361,659
Plumbing % Not Listed Above	%	**1%**	$120,553
HVAC % Not Listed Above	%	**3%**	$361,659

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$12,055,316**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-1
Improve Thickening, Improve Dewatering and Produce Dry Class A Biosolids

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete: Filtrate EQ Tank Base Slab	CY	**25**	**400**	10,000
Concrete: Filtrate EQ Tank Walls	unit	**45**	**750**	33,750
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**43,750**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building: New Solids Building for Thick/Dewater	sq ft	**8,960**	**200**	1,792,000
Building: Dryer Building Adder	sq ft	**5,456**	**200**	1,091,200
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**2,883,200**
Demolition: Removals	LS	**1**	**100,000**	100,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**100,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-2
Improve Thickening, Improve Dewatering, and Expand Class A Wet-Cake Storage

Cost Opinion Summary

General Description

This alternatives improves side stream equalization, solids thickening, and solids dewatering. Digested cake solids are stored as they are now in a 365-d cake storage building. The existing cake storage building is rehabilited. A new cake storage building provides the required supplemental storage. The mesophilic digestion system would be converted to a batch TPAD system to produce a Class A cake.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$10,190,132
Contingency	30%	$3,057,039
Estimated Construction Cost Without Markup		$13,247,171
Contractor Overhead & Profit Markup	25%	$3,311,793
Estimated Construction Cost		$16,558,964
Engineering	15%	$2,483,845
Total Initial Cost		**$19,042,808**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$19,042,808**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-2
Improve Thickening, Improve Dewatering, and Expand Class A Wet-Cake Storage

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$25,000
Concrete	See Detailed Worksheet	$1,068,750
Metals	See Detailed Worksheet	$180,000
Buildings	See Detailed Worksheet	$3,512,000
Demolition	See Detailed Worksheet	$120,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
TWAS/PSD Pumps	Ea	**4**	**25,000**	$100,000
Polymer Feed System	Ea	**1**	**150,000**	$150,000
Gravity Belt Thickeners	Ea	**2**	**425,000**	$850,000
Filtrate Pumps	Ea	**2**	**25,000**	$50,000
Side Stream Samplers	Ea	**2**	**10,000**	$20,000
2.0-m Belt Filter Press	Ea	**2**	**485,000**	$970,000
Polymer System	Ea	**1**	**160,000**	$160,000
Filtrate EQ Mixer	Ea	**1**	**18,750**	$18,750
HEX	EA	**2**	**100,000**	$200,000
Piping and Valving	EA	**3**	**80,000**	$240,000
Thermo Transfer Pumps	EA	**3**	**20,000**	$60,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Floor Removals | Rehab Cake Bldg	LS	**1**	**20,000**	$20,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**4%**	$407,605
Process-Mechanical Piping % Not Listed Above	%	**7%**	$713,309
Electrical % Not Listed Above	%	**6%**	$611,408
Instrumentation and Control % Not Listed Above	%	**3%**	$305,704
Plumbing % Not Listed Above	%	**1%**	$101,901
HVAC % Not Listed Above	%	**3%**	$305,704

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$10,190,132**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-2
Improve Thickening, Improve Dewatering, and Expand Class A Wet-Cake Storage

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Structural Fill | Rehab Cake Bldg	cu yd	**1,000**	**25**	25,000
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**25,000**
Concrete: Foundation | New Cake Bldg	sq ft	**35,000**	**25**	875,000
Concrete: Repair | Rehab Cake Bldg	cu yd	**600**	**250**	150,000
Concrete: Filtrate EQ Tank Base Slab	CY	**25**	**400**	10,000
Concrete: Filtrate EQ Tank Walls	unit	**45**	**750**	33,750
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**1,068,750**
Metals: Coating | Rehab Cake Bldg	sq ft	**30,000**	**6**	180,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**180,000**
Building: New Cake Bldg	sq ft	**35,000**	**40**	1,400,000
Building: New Solids Building for Thick/Dewater	sq ft	**8,960**	**200**	1,792,000
Building: Room for Additional HEX and Pumps	SF	**1,600**	**200**	320,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**3,512,000**
Demolition: Floor Removal | Rehab Cake Bldg	LS	**1**	**20,000**	20,000
Demolition: Removals	LS	**1**	**100,000**	100,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**120,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-3
Improve Thickening, Improve Dewatering, and Expand Class B Wet-Cake Storage

Cost Opinion Summary

General Description

This alternatives improves side stream equalization, solids thickening, and solids dewatering. Digested cake solids are stored as they are now in a 365-d cake storage building. The existing cake storage building is rehabilited. A new cake storage building provides the required supplemental storage.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$9,111,184
Contingency	30%	$2,733,355
Estimated Construction Cost Without Markup		$11,844,539
Contractor Overhead & Profit Markup	25%	$2,961,135
Estimated Construction Cost		$14,805,674
Engineering	15%	$2,220,851
Total Initial Cost		**$17,026,525**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$17,026,525**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-3
Improve Thickening, Improve Dewatering, and Expand Class B Wet-Cake Storage

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$25,000
Concrete	See Detailed Worksheet	$1,068,750
Metals	See Detailed Worksheet	$180,000
Buildings	See Detailed Worksheet	$3,192,000
Demolition	See Detailed Worksheet	$120,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
TWAS/PSD Pumps	Ea	**4**	**25,000**	$100,000
Polymer Feed System	Ea	**1**	**150,000**	$150,000
Gravity Belt Thickeners	Ea	**2**	**425,000**	$850,000
Filtrate Pumps	Ea	**2**	**25,000**	$50,000
Side Stream Samplers	Ea	**2**	**10,000**	$20,000
2.0-m Belt Filter Press	Ea	**2**	**485,000**	$970,000
Polymer System	Ea	**1**	**160,000**	$160,000
Filtrate EQ Mixer	Ea	**1**	**18,750**	$18,750

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Floor Removals | Rehab Cake Bldg	LS	**1**	**20,000**	$20,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**4%**	$364,447
Process-Mechanical Piping % Not Listed Above	%	**7%**	$637,783
Electrical % Not Listed Above	%	**6%**	$546,671
Instrumentation and Control % Not Listed Above	%	**3%**	$273,336
Plumbing % Not Listed Above	%	**1%**	$91,112
HVAC % Not Listed Above	%	**3%**	$273,336

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$9,111,184**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

SOL-3
Improve Thickening, Improve Dewatering, and Expand Class B Wet-Cake Storage

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Structural Fill | Rehab Cake Bldg	cu yd	**1,000**	**25**	25,000
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**25,000**
Concrete: Foundation | New Cake Bldg	sq ft	**35,000**	**25**	875,000
Concrete: Repair | Rehab Cake Bldg	cu yd	**600**	**250**	150,000
Concrete: Filtrate EQ Tank Base Slab	CY	**25**	**400**	10,000
Concrete: Filtrate EQ Tank Walls	unit	**45**	**750**	33,750
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**1,068,750**
Metals: Coating | Rehab Cake Bldg	sq ft	**30,000**	**6**	180,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**180,000**
Building: New Cake Bldg	sq ft	**35,000**	**40**	1,400,000
Building: New Solids Building for Thick/Dewater	sq ft	**8,960**	**200**	1,792,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**3,192,000**
Demolition: Floor Removal | Rehab Cake Bldg	LS	**1**	**20,000**	20,000
Demolition: Removals	LS	**1**	**100,000**	100,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**120,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-1
Improve Non-Electrical Distribution Site Infrastructure

Cost Opinion Summary

General Description

This alternative improves the entrance, security, and parking; pavement and sidewalks; site lighting; stormwater control; and yard process piping.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$1,450,000
Contingency	30%	$435,000
Estimated Construction Cost Without Markup		$1,885,000
Contractor Overhead & Profit Markup	25%	$471,250
Estimated Construction Cost		$2,356,250
Engineering	15%	$353,438
Total Initial Cost		**$2,709,688**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$2,709,688**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-1
Improve Non-Electrical Distribution Site Infrastructure

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$125,000
Concrete	See Detailed Worksheet	$0
Metals	See Detailed Worksheet	$0
Buildings	See Detailed Worksheet	$0
Demolition	See Detailed Worksheet	$150,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Replacement/New Yard Piping	LS	**1**	**750,000**	$750,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Site Lighting	LS	**1**	**75,000**	$75,000
Pavement	LS	**1**	**150,000**	$150,000
Stormwater Structures and Piping	LS	**1**	**50,000**	$50,000
Fencing and Gates	LS	**1**	**100,000**	$100,000
Controls Wiring	LS	**1**	**50,000**	$50,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$1,450,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-1
Improve Non-Electrical Distribution Site Infrastructure

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Grading/Earthwork	LS	**1**	**50,000**	50,000
Earthwork: Visual Screening Allowance	LS	**1**	**50,000**	50,000
Earthwork: Erosion Control	LS	**1**	**25,000**	25,000
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**125,000**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**0**
Demolition: Remove Pavement and Sidewalk	LS	**1**	**100,000**	100,000
Demolition: Remove Building	LS	**1**	**50,000**	50,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**150,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-2
Site-Wide Electrical Improvements

Cost Opinion Summary

General Description

The existing Facility has two electric services. One at the Main Building for the north half of the site and one at the Blower Building for the south half of the site. A diesel standby generator in the Main Building provides standby power to the north half of the site and the Filtration Building on the south half of the site. The blowers in the Blower Building currently are not powered from the standby generator. Both electric services and the standby generator will be removed as part of the plant expansion.

The new Solids Building will become the main electrical distribution point for the entire site and will contain the new incoming electric service and new standby generator. New underground concrete encased conduit duct banks from the Solids Building will back feed power to the existing buildings on site. Backup power from the standby generator will be available to the entire plant and the control system will limit/lock out certain loads during a power outage to reduce the generator size. The blowers in the Blower Building will be connected to the standby generator and the control system will limit the number of blowers that can run during a power outage.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$2,625,000
Contingency	30%	$787,500
Estimated Construction Cost Without Markup		$3,412,500
Contractor Overhead & Profit Markup	25%	$853,125
Estimated Construction Cost		$4,265,625
Engineering	15%	$639,844
Total Initial Cost		**$4,905,469**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$4,905,469**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-2
Site-Wide Electrical Improvements

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$0
Metals	See Detailed Worksheet	$0
Buildings	See Detailed Worksheet	$500,000
Demolition	See Detailed Worksheet	$0

Major Electrical Work	Units	Quantity	Unit Cost ($)	Initial Cost ($)
480V Switchgear	Ea	**1**	**500,000**	$500,000
Standby Generator - 1.5MW + Accessories	Ea	**1**	**400,000**	$400,000
Back Feed Existing Buildings Concrete Duct Banks, Conduit, and Wiring	Ea	**1**	**350,000**	$350,000
Electical Testing and Power System study	Ea	**1**	**100,000**	$100,000
Electric Service - Utility Cost	Ea	**1**	**25,000**	$25,000
Electric Service - Primary Conduits and Secondary Conduit and Wire	Ea	**1**	**600,000**	$600,000
Removals - Existing Services, Existing Electrical Equipment, Existing Generator	Ea	**1**	**100,000**	$100,000
Fire Alarm System	LS	**1**	**50,000**	$50,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$2,625,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-2
Site-Wide Electrical Improvements

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building: Generator/SWGR Building	SF	**2,500**	**200**	500,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**500,000**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-3
Improve Site-Wide Tunnel System

Cost Opinion Summary

General Description

This alternative addresses shortcomings in the site-wide tunnel system including the primary effluent piping, RAS/WAS piping and valving, HVAC systems, lighting systems, plumbing systems, and NFPA 820 issues.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$1,656,725
Contingency	30%	$497,018
Estimated Construction Cost Without Markup		$2,153,743
Contractor Overhead & Profit Markup	25%	$538,436
Estimated Construction Cost		$2,692,178
Engineering	15%	$403,827
Total Initial Cost		**$3,096,005**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$3,096,005**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-3
Improve Site-Wide Tunnel System

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$42,500
Metals	See Detailed Worksheet	$78,000
Buildings	See Detailed Worksheet	$125,000
Demolition	See Detailed Worksheet	$0

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)
WAS Valves and Fittings	LS	**1**	**75,000**	$75,000
6" DI Pipe	LF	**550**	**125**	$68,750
RAS Valves and Fittings	LS	**1**	**150,000**	$150,000
8" DI Pipe	LF	**305**	**145**	$44,225
10" DI Pipe	LF	**25**	**170**	$4,250
12" DI Pipe	LF	**200**	**200**	$40,000
14" DI Pipe	LF	**240**	**350**	$84,000
16" DI Pipe	LF	**560**	**375**	$210,000
Bypass Pumping: Mobilization and Setup	LS	**1**	**75,000**	$75,000
Bypass Pumping: 2 Months	Ea	**2**	**70,000**	$140,000
Bypass Pumping: Labor and Fuel	Ea	**2**	**50,000**	$100,000

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Emergency Lighting	LS	**1**	**20,000**	$20,000
Lighting and Ancillary	LS	**1**	**50,000**	$50,000
Electrical Removals	LS	**1**	**25,000**	$25,000
HVAC	LS	**1**	**175,000**	$175,000
Structural Removals	LS	**1**	**50,000**	$50,000
Piping Removals	LS	**1**	**100,000**	$100,000

Discipline %s Do Not Apply to This Alternative			
Civil % Not Listed Above	%	**0%**	$0
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$1,656,725**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

STE-3
Improve Site-Wide Tunnel System

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete: Repairs	CY	**50**	**750**	37,500
Concrete: Reinforcing Dowels	EA	**100**	**50**	5,000
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**42,500**
Metals: Pipe Coating	SF	**10,000**	**6**	60,000
Metals: Stairs	Treads	**20**	**450**	9,000
Metals:	unit	**20**	**450**	9,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**78,000**
Building: NFPA 820 Structural Modifications	LS	**1**	**125,000**	125,000
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building:	unit			
Building Total				**125,000**
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**0**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-1
Constructive Extensive Main Building Improvements and Supplemental Vehicle Storage Building

Cost Opinion Summary

General Description

This alternative rehabilitates, improves, and repurposes the Main Building. Improvements include laboratory upgrades, office space and administration improvements, male/female restrooms and locker rooms, lighting, HVAC, plumbing, doors, windows, exterior brick/block, coatings, flooring, parts and equipment storage, roof ladders, and other improvements. This alternative does not include any process improvements within this Structure. Those costs are reflected elsewhere. This alternative includes improvements to address NFPA 820 issues. It also includes a supplemental vehicle and equipment storage building.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$3,574,665
Contingency	30%	$1,072,400
Estimated Construction Cost Without Markup		$4,647,065
Contractor Overhead & Profit Markup	25%	$1,161,766
Estimated Construction Cost		$5,808,831
Engineering	15%	$871,325
Total Initial Cost		**$6,680,155**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$6,680,155**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-1
Constructive Extensive Main Building Improvements and Supplemental Vehicle Storage Building

Initial Cost Opinion

Structural		Initial Cost ($)
Earthwork	See Detailed Worksheet	$0
Concrete	See Detailed Worksheet	$185,185
Metals	See Detailed Worksheet	$100,000
Buildings	See Detailed Worksheet	$1,100,000
Demolition	See Detailed Worksheet	$200,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)

Non-Process Equipment	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Plumbing	LS	**1**	**150,000**	$150,000
HVAC	LS	**1**	**550,000**	$550,000
Electrical: Non-Process or Main Distribution	LS	**1**	**175,000**	$175,000
SCADA/Control Room Improvements	LS	**1**	**225,000**	$225,000
Vehicle and Equipment Storage	SF	**4,500**	**150**	$675,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**6%**	$214,480
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$3,574,665**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-1
Constructive Extensive Main Building Improvements and Supplemental Vehicle Storage Building

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	LS	**1**	**185,185**	185,185
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**185,185**
Metals:	LS	**1**	**100,000**	100,000
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**100,000**
Building: Masonry	LS	**1**	**225,000**	225,000
Building: Doors and Frames	LS	**1**	**100,000**	100,000
Building: Finishes	LS	**1**	**225,000**	225,000
Building: Specialties and Furnishings	LS	**1**	**250,000**	250,000
Building: Roofing	SF	**30,000**	**10**	300,000
Building:	unit			
Building:	unit			
Building Total				**1,100,000**
Demolition:	unit	**1**	**200,000**	200,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**200,000**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-2
Build New Administration and Vehicle Storage Buildings, Repurpose Main Building

Cost Opinion Summary

General Description

This alternative constructs a new Administration Building that includes offices (3), a staff "bullpen", SCADA/control room, laboratory, small conference room, break room, male locker room, female locker room, and restrooms. It also constructs a supplemental Vehicle Storage Building. This alternative also includes minimal rehabiltiation (relative to AMS-1) and repurposing of the Main Building to improve maintenance spaces, storage spaces, and aging lighting, HVAC, and plumbing systems.Other Main Building improvements would address doors, windows, exterior brick/block, and coatings. This alternative does not include any process improvements within the Main Building. Those costs are reflected elsewhere. This alternative includes improvements to address NFPA 820 issues in the Main Building.

Summary of Initial Costs

Estimated Construction Cost Without Contingency or Markup		$3,849,202
Contingency	30%	$1,154,761
Estimated Construction Cost Without Markup		$5,003,963
Contractor Overhead & Profit Markup	25%	$1,250,991
Estimated Construction Cost		$6,254,953
Engineering	15%	$938,243
Total Initial Cost		**$7,193,196**

Summary of Annual Costs

Total Annual Cost		$0
Life Cycle Analysis		
Interest Rate Per Year	3.625%	
Number of Years	20	
Present Worth Factor	14.053	
Present Worth of Total Annual Cost		**$0**

Total Present Worth **$7,193,196**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-2
Build New Administration and Vehicle Storage Buildings, Repurpose Main Building

Initial Cost Opinion

Structural				Initial Cost ($)
Earthwork		See Detailed Worksheet		$0
Concrete		See Detailed Worksheet		$0
Metals		See Detailed Worksheet		$0
Buildings		See Detailed Worksheet		$3,213,250
Demolition		See Detailed Worksheet		$100,000

Major Process Equipment and Piping Systems	Units	Quantity	Unit Cost ($)	Initial Cost ($)

Non-Process Equipment | Structure 100	Units	Quantity	Unit Cost ($)	Initial Cost ($)
HVAC	LS	**1**	**225,000**	$225,000
Electrical: Non-Process or Main Distribution	LS	**1**	**80,000**	$80,000

The %s Used Below are Project-Wide %s. Actual %s for this Alternative May Differ.

Civil % Not Listed Above	%	**6%**	$230,952
Process-Mechanical Piping % Not Listed Above	%	**0%**	$0
Electrical % Not Listed Above	%	**0%**	$0
Instrumentation and Control % Not Listed Above	%	**0%**	$0
Plumbing % Not Listed Above	%	**0%**	$0
HVAC % Not Listed Above	%	**0%**	$0

Initial Estimate of Construction Cost Without Contingency or Contractor Markup **$3,849,202**

2040 Wastewater Facilities Plan
COST OPINION SPREADSHEET
Wausau, Wisconsin

AMS-2
Build New Administration and Vehicle Storage Buildings, Repurpose Main Building

Structural Detail

Structural Items	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork:	unit			
Earthwork Total				**0**
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete:	unit			
Concrete Total				**0**
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals:	unit			
Metals Total				**0**
Building: New Admin Building with Furnishings	sq ft	**10,850**	**245**	2,658,250
Building: Roofing | Main Building	SF	**30,000**	**10**	300,000
Building: Masonry | Main Building	LS	**1**	**90,000**	90,000
Building: Doors and Frames | Main Building	LS	**1**	**65,000**	65,000
Building: Finishes | Main Building	LS	**1**	**100,000**	100,000
Building:	unit			
Building:	unit			
Building Total				**3,213,250**
Demolition: Main Building	LS	**1**	**100,000**	100,000
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demolition:	unit			
Demoltion Total				**100,000**

Appendix E

Preliminary Design Basis and Operational Strategies

CIVIL

FACILITY-WIDE

This section summarizes Civil features applicable to the Project.

General

1. Site Location
    a. Address: 435 Adrian Street, Wausau, WI, 54401.
    b. County: Marathon
    c. PLSS: Township 29, Range 07, Section 36

Codes

1. Zoning and Land Use
    a. Zoning - M2 General Industrial:
        i. M2, General Industrial. The M2 general industrial district is designed to accommodate large, relatively self-contained and isolated areas intended to be used for industrial activities whose potential nuisance or hazard generation is moderately high including municipal sewage treatment plants.
        ii. Zoning Requirements:
            1. Front Yard – No front yard requirement
            2. Corner Side Yard – No corner side requirement
            3. Transitional Yards – Follows M1 district zoning requirements: Where a side or rear lot line in an industrial district coincides with a side or rear lot line in an adjacent residence or business district, a yard shall be provided along the side or rear lot line on the industrial lot. The yard shall be not less than thirty feet in depth.
            4. Regulations Along Residence and Business District Boundaries – Follows M1 district zoning requirements: In the M1 district, on properties or portions thereof located directly across a street from a business or residence district, if any point on the exterior surface of any building or structure is at a greater height than thirty-five feet above curb level, the point projected vertically upon the ground shall, in no case, be nearer to the business or residence district boundary line than a horizontal distance equal to one and one-half times the height of the point above curb level. However, stacks, tanks, bulkheads, or ventilating equipment, including towers enclosing same, shall be exempt from the limitation if not exceeding in the aggregate twenty-five feet in lineal dimension parallel to the street for any one hundred feet of street frontage. Parapets not exceeding three feet in height are also exempt from the limitation.
            5. Floor Ratio - In the M2 district the floor area ratio shall not exceed 3.60.
    b. Zoning – River Edge Overlay District
        i. The purpose of the river edge overlay district is to help protect the water quality and scenic resources of the Wisconsin River by reducing soil bank erosion, establishing building setback regulations, and regulating signs near the river's edge. The establishment of this district is intended to help promote the public health, safety and general welfare of the community.

ii. The area encompassed by this zoning district is located from the ordinary high water mark of the Wisconsin River inland a distance of fifty feet on any property so designated on the city of Wausau zoning map by the Wausau common council. The location of the ordinary high water mark shall be determined by the director of inspections and electrical systems in consultation with the Wisconsin Department of Natural Resources.

iii. Zoning Requirements:

1. No building may be constructed nor may an existing building be expanded within the river edge overlay district unless the construction or expansion activity is approved following a public hearing before the city plan commission and in accordance with Chapter 23.72 of the Municipal Code governing conditional uses.

Permits and Reviews

1. Wisconsin Department of Natural Resources Submittal Requirements for Municipal and Industrial Sewerage Systems Submittals for Review:
    a. Transmittal Letter
    b. 1 Form 3400-205
    c. 2 Sets of plans on paper in the half-size format (11” x 17”)
    d. 2 Sets of specifications on paper
    e. 2 copies of design calculations
    f. 1 CD containing PDF files of the PE stamped plans and specifications
2. Wisconsin Department of Natural Resources Construction Site Storm Water Permit Forms
    a. Water Resources Application for Project Permits (WRAPP) permit as well as erosion control plans for storm water must be submitted and reviewed.
3. City of Wausau Determination of Applicability of City of Wausau Storm Water Management Ordinance Form must be submitted to the City.
4. A Federal Aviation Administration Notice Criteria Tool on the FAA Obstruction Evaluation website may be needed due to the height of the new silo and its proximity to the Wausau Downtown Airport.

Environmental

1. Groundwater Recharge System
    a. A groundwater recharge system will likely be needed to prevent the spread of contaminants from the SNE site when dewatering occurs at the wastewater treatment plant site. The ground water recharge system design is based on the 1989 wastewater treatment plant projects.
2. Site Dewatering
    a. Site dewatering will likely be required for construction of several of the deeper structures. A WiDNR permit will be required. The permit will include identifying discharge treatment and best management practices.

Wetlands

1. Wisconsin Department of Natural Resources Surface Water Data Viewer
    a. Per the Wisconsin Department of Natural Resources Surface Water Data Viewer, there are wetland indicator soils and mapped wetlands adjacent to the Wastewater Treatment Facility. It is recommended that a wetland delineation is completed and mapped. No impacts to the mapped wetlands are anticipated.

Floodplain

1. FEMA Flood Insurance Rate Map (FIRM)
    a. The site falls in the FIRM Panel Marathon County 550245 Panel 0384. Per this FIRM Panel, The site does not fall within the "Regulatory Floodway". Approximately 70% of the site falls under the "0.2% Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas less than one square mile. The remaining 30% of the site does not fall in any flood hazard areas.

Stormwater Management

1. The City of Wausau is an MS4 permitted community and coordination with the assistant City Engineer will be required to determine TSS reduction requirements and whether additional treatment of runoff will be needed. It is anticipated this site construction will be considered redevelopment and a maximum of 40% TSS removal will be required.
    a. Given the site constraints, the City may have identified this area as a location where less than 40% TSS removal is needed.
    b. Post-construction peak discharge may need to be reduced to pre-development conditions for the 2-year, 24-hour storm.
    c. It is anticipated the construction will be exempt from infiltration requirements per NR 151.124(3)(b)1, but this will require DNR confirmation.
2. Site grading will likely be in excess of 1 acre and require a WiDNR storm water and erosion control permit.
3. WinSLAMM modelling will be required.

Access Drives and Paving

1. Main Access Route
    a. The main access route around the plant shall be a minimum of 16' wide at its narrowest to accommodate traffic with large turning radii which will allow Tractor-Trailer and fire-protection access to the plant structures. The main access route around the plant will have the following pavement structure:

Base Aggregate 1-1/4" Dense	10"
Lower Layer of Asphalt – 3 MT 58-28 S	2.25"
Upper Layer of Asphalt – 4 MT 58-28 S	1.75"

2. New Administration Building Parking Lot (Building 120)
    a. The parking lot for the new Administration Building will have the following pavement structure:

Base Aggregate 1-1/4" Dense	8"
Lower Layer of Asphalt – 5 LT 58-28 S	1.5"
Upper Layer of Asphalt – 5 LT 58-28 S	1.5"

3. Concrete Pavement Areas
    a. Concrete pavement will be installed around the Biosolids Storage Silo and under building 770 overhang. The concrete pavement in this area will have the following pavement structure:

Base Aggregate 1-1/4" Dense	6"
Concrete Pavement	7"

Grading

1. Site Grading
    a. Site grading will be designed to prevent storm water from pooling on site. The parking lot area for the new Administration Building will be graded to the storm sewer catch basins.
    b. Where feasible, existing drainage patterns will maintained, or improved.

Erosion Control

1. The prime contractor shall be responsible for the installation, maintenance, and removal of the temporary erosion control BMPs measures as identified in the project plans. These erosion control measures will be placed on-site to prevent soil, sediment, and other pollutants from entering the Waters of the State. Erosion control measures may include, but are not limited to silt fence, inlet protection, dust control, stone tracking pads and/or tire washing, seeding, erosion mat, mulching, and temporary ditch checks. Additional or enhanced erosion control measures may be directed by the engineer, owner, or regulatory official before, during, or after construction, as deemed necessary.
    a. Silt Fence:
    Silt fence is a temporary sediment barrier of entrenched permeable geotextile fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1056.
    b. Inlet Protection:
    Inlet protection is a temporary geofabric device that is installed in or around a storm inlet designed to minimize sediment from entering storm drainage systems. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1060.
    c. Dust Control:
    Dust control includes practices used to reduce or prevent the surface and air transport of dust during construction. Dust control measures for construction activities include minimization of soil disturbance, applying mulch and establishing vegetation, water spraying, surface roughening, applying polymers, spray-on tackifiers, chlorides, barriers

and street sweeping/vacuuming. Installation and maintenance and performance of the practices shall be followed in accordance with WDNR Conservation Practice Standard 1068.

d. Stone Tracking Pad and Tire Washing:
A stabilized pad of stone aggregate or tire washing station located at any point where traffic will egress a construction site represents a stone tracking pad or tire washing BMP. The purpose of this standard is to reduce offsite sedimentation by eliminating the tracking of sediment off construction sites by construction equipment. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1057.

e. Seeding for Construction Site Erosion Control:
The purpose of permanent seeding is to permanently stabilize areas of disturbed or exposed soil. The purpose of temporary seeding (one year or less) is to reduce runoff and erosion until permanent vegetation or other erosion control practices can be established. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1059.

f. Mulch:
Mulching is the application of organic material to the soil surface to protect it from raindrop impact and overland flow. Mulch covers the soil, absorbs the erosive impact of rainfall, and reduces the flow velocity of runoff. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1058.

g. Non-channel Erosion Mat:
To protect the soil surface from raindrop impact and sheet erosion during vegetation establishment, erosion mat may be used. The erosion mat can consist of straw, wood, coconut fiber, or plastic fibers corresponding to the required strength and life span necessary for the project. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1052.

h. Temporary Ditch Checks:
Temporary ditch checks consist of straw bales, hay bales, straw logs, or other suitable material entrenched and anchored into the ground. The practice is used to reduce slope length of a disturbed area and intercept and retain transported sediment from the disturbed area. Installation and maintenance shall be followed in accordance with WDNR Conservation Practice Standard 1056.

Buried Plant Piping

1. Buried plant piping is described on sheet C300. Most piping is process related. Gravity piping will be designed in accordance with WI DNR NR110 minimum grades. Pressure piping will designed, where feasible, to drain to discharge point or back to pumps in the case of a flooded discharge.
2. Pipes less than 6 feet deep will be insulated, usually 4 inches of polystyrene foam board insulation.
3. WWTF staff noted concerns about municipal water supply pressure at times. The preliminary site design includes a 6-inch looping watermain that connects the end of Adrian Street to the large watermain on East Chellis Street. Additional hydrants are included in the layout to improve fire protection. This line does not replace the existing watermain, which is currently shown to remain in service.
    a. Backflow prevention is not required if the watermain(s) only serve fire hydrants. If either supply line will be connected to any process line, a backflow preventer will be required. If the proposed looping watermain supplies water to Building 770, it should

have a backflow preventer installed. If this is the case, a backflow preventer should also be installed in Building 610.

Site Security Fencing

1. Security Fencing Around Facility
    a. The existing security fence around the wastewater treatment facility will be removed and replaced with a new 10-foot high chain link fence. The fence would secure the area from the new administration building and follow the existing fence route to the south end of the sludge storage building (Bldg. 760). Fencing near the DPW building would not be addressed.
    b. A new motor operated vehicle gate will be installed between the new administration building and the vehicle storage garage (Bldg. 110). The gate will be operated by card access and/or remote controls. Free exit loop detectors would be installed to allow any vehicle to exit without use of an access card or remote.

Contractor Access and Staging/Storage Area

a. It is anticipated contractor access, staging and storage will be at the end of Adrian Street near the new administration building. Other areas on site can be utilized as needed.

Roadways

1. Adrian Street
    a. Adrian Street from the Administration Building (120) to the Main Access Route around the plant will be replaced with the following pavement structure:

Base Aggregate 1-1/4” Dense	10”
Lower Layer of Asphalt – 3 MT 58-28 S	2.25”
Upper Layer of Asphalt – 4 MT 58-28 S	1.75”

    b. Adrian Street will also have 24-inch curb and gutter installed from the existing curb and gutter on Adrian Street to the beginning of the main access route around the wastewater treatment plant.

STRUCTURE-BY-STRUCTURE

This section summarizes Civil features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. Not applicable.

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. Not applicable.

200 - Grit Building

1. Not applicable.

310 - Primary 1

1. Not applicable.

320 - Primary 2

1. The gravity drain lines will be affected by construction of Tunnel 910. Since the clarifiers are drained infrequently, it is proposed to replace Manhole 56E with a wet well manhole and use portable pumping equipment to drain the clarifiers when needed.

330 - Primary 3

1. Not applicable.

340 - Primary 4

1. The gravity drain lines will be affected by construction of Tunnel 910. Since the clarifiers are drained infrequently, it is proposed to replace Manhole 56E with a wet well manhole and use portable pumping equipment to drain the clarifiers when needed.

350 - PE Channel

1. Not applicable.

400 - Activated Sludge Building

1. Not applicable.

404 - Junction Structure

1. There are two permanent survey monuments located near the junction structure and anoxic tank. These are high level survey monuments and one is a Wisconsin Continuously Operating Reference Station (WISCORS). The monuments cannot be disturbed. Coordination may be required with the operators of this network to ensure heavy equipment operating nearby does not disturb the radio signals.

405 - Anoxic Selector Tank

1. There are two permanent survey monuments located near the junction structure and anoxic tank. These are high level survey monuments and one is a Wisconsin Continuously Operating Reference Station (WISCORS). The monuments cannot be disturbed. Coordination may be required with the operators of this network to ensure heavy equipment operating nearby does not disturb the radio signals.

406 - Mixing Tank

1. Not applicable.

410 - Activated Sludge Basins

1. Not applicable.

420 - ML Channel

1. Not applicable.

500 - Secondary Splitter

1. Not applicable.

510 - Secondary 1

1. Not applicable.

515 - Secondary Scum Manhole 1

1. Not applicable.

520 - Secondary 2

1. A provision has been made in preliminary design budgetary costs for installing a 75’ long retaining wall east of the existing walking path. This provision was included in the event the path and fence must be shifted further east to allow adequate separation between the buried watermain, secondary effluent and mixed liquor pipes.

530 - Secondary 3

1. See “520 – Secondary 2” section.

535 - Secondary Scum Manhole 2

1. Not applicable.

540 - Secondary 4

1. Not applicable.

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. Not applicable.

610 - P-Chem Storage Building

1. Not applicable.

700 - Digestion Building

1. Not applicable.

710 - Digester 1

1. Not applicable.

720 - Digester 2

1. Not applicable.

730 - Digester 3

1. Not applicable.

740 - Digester 4

1. Not applicable.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Not applicable.

760 - Cake Building

1. Not applicable.

770 - Solids Building

The site of these structures will affect many underground pipes.

1. The existing siphon discharge will be relocated west of the facility and discharge into the interceptor sewer west of the solids storage building. This portion of the 30-inch diameter concrete interceptor will be replaced with a larger pipe, likely 36-inch diameter pipe
2. There is a deep storm sewer structure located in this area that dates back to the original 1939 plant. It is anticipated this storm line will be re-routed to pass under Structure 910 and divert around Structure 770. If possible it would pass under the drive-through section of Structure 771. If not feasible, a new outfall may need to be installed.

771 – Silo

1. See “770 – Solids Building” section.

772 - Nitrogen System

1. Not applicable.

775 - PSD Thickener

1. The bypass line passing under 775 will be abandoned.
2. See “770 – Solids Building” section.

900 – Tunnel

1. Not applicable.

910 – Tunnel

1. See “770 – Solids Building” section.

STRUCTURAL-ARCHITECTURAL

FACILITY-WIDE

This section summarizes Structural-Architectural features applicable to the Project.

Codes

1. International Building Code – 2015 Edition
2. American Concrete Institute(ACI) 318: Building Code Requirements for Structural Concrete
3. ACI 350: Code Requirements for Environmental Engineering Concrete Structures
4. ACI 530: Building Code Requirements for Masonry Structures
5. ASCE 7: Minimum Design Loads for Buildings and Other Structures
6. AISC 360: Specification for Structural Steel Buildings

Foundations

1. Information from geotechnical investigations will be used for the design of the new facilities foundations.
2. Surface fill materials will be excavated and replaced with compacted granular fill beneath structures.
3. Ground water elevation for design will be based on project high water levels from the geotechnical investigations, but not less than the 100 year flood elevation. Below grade wall design will assume a worst case scenario of groundwater elevation at grade.
4. New structures will be supported on mat type foundations or conventional spread footing foundations.
5. Bottom of excavations will be covered by mud mat or 12 inches of compacted granular material.
6. Backfill in trenches and excavations below pavements and structures shall be compacted granular material.
7. Exterior foundation insulation shall be provided along new building foundations.
8. 2” polyisocyanurate rigid insulation.

Cast-in-Place Concrete

1. Reinforcement: Deformed bars, ASTM A615, Grade 60.
2. Welded Wire Fabric: ASTM A185.
3. Concrete: 4500 psi, air entrained. Concrete for walls of water containing structures that extend more than a few feet above grade and locations separating a dry space from a water holding tank or channel will include a waterproofing admixture as manufactured by Xypex or equal.
4. Fill Concrete: 3000 psi, fiber reinforced.
5. Waterstop:
    a. 6 inch PVC. Place in construction joints of water containing structures and dry structures below grade.
    b. Gasket type. Locate where new concrete is placed against existing concrete in water containing structures and dry structures below grade.
6. Slab Finish:
    a. Floors: Slope ¼ in/ft to drains, troweled and sealed.
    b. Submerged Slabs: Float
    c. Exterior Slabs: Float and broom finish

7. Wall Finish:
    a. Submerged and Buried: As cast
    b. Interior Exposed: Repair surface and prepare for specified finish.
    c. Exterior Exposed: Repair surface and coat with two coats Finishing Grout
8. Interior Stairs: Concrete with metal nosing

Masonry

1. Block: ASTM C90 standard weight units.
2. Brick: ASTM C216, Grade SW, Type FBX.
3. Face brick size and color to match existing buildings.
4. Mortar: ASTM C270, Type S.
5. Horizontal Joint Reinforcement: Galvanized ladder or truss type at 16 inches on center.
6. 2 inch cavity wall insulation.
7. Vertical cores of masonry reinforced at 4 foot on center minimum.

Metals

1. Structural Steel: ASTM A36 or ASTM A992.
2. Aluminum: Alloy 6061-T6 or 6063-T6.
3. Stainless Steel: AISI Type 316 exterior or submerged, Type 304 interior.
4. Ladders: Aluminum.
5. Exterior Stairs and Elevated Walkways: Galvanized Steel or Aluminum stringers and framing, serrated aluminum bar grating treads and platforms.
6. Grating: Solid aluminum plank grating, serrated aluminum bar grating, or fiberglass grating.
7. Handrail: Aluminum pipe. Fiberglass inside chemical containment areas.
8. Floor access hatches: Aluminum with safety grating.

Doors and Windows

1. Anodized aluminum window frames.
2. Anodized aluminum or galvanized hollow metal insulated doors and frames. Fiberglass doors and frames at chemical rooms.
3. 1 inch thick double pain insulated glass.
4. Insulated steel or aluminum overhead coiling or sectional doors with operators as appropriate.
5. Egress doors shall be equipped with exit devices where required by code.
6. All exterior doors on site shall be replaced. New doors shall be equipped with electronic FOB access.

Roofing

1. Steel joists and framing at Administration Building.
2. Precast prestressed hollow core roof plank or double tee's at other buildings.
3. Fully adhered single ply 60 mil rubber membrane over tapered insulation at other buildings.
4. Prefinished aluminum fascia and copings. Color to match existing buildings.

Coatings

1. Submerged steel and ductile iron: 1 coat polyurethane primer and 2 coats epoxy.
2. Concrete (only where noted): 3 coats epoxy.
3. Interior concrete block and interior precast concrete ceilings: 3 coats epoxy.
4. Interior exposed steel and ductile iron: 1 coat polyurethane primer and 2 coats epoxy.

5. Exterior exposed steel and ductile iron: 1 coat polyurethane primer, 1 coat epoxy, 1 coat polyurethane.
6. Dissimilar metal protection: 1 coat epoxy.
7. Provide chemical resistant coatings for concrete where required.

STRUCTURE-BY-STRUCTURE

This section summarizes Structural-Architectural features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 – Existing Main Building

1. Lower Level of structure 100 to remain open and get walled off where access is no longer needed.
2. Replace existing roof with new fully adhered membrane roof.
3. Screening area:
    a. Remove precast plank slab over screening room and replace with cast-in-place slab and beams.
    b. Remove existing cmu walls around conveyor room and replace with cmu cavity wall and face brick to match existing building.
    c. Precast plank roof.
    d. 3 ton explosion proof bridge crane in conveyor room.
    e. Removable aluminum grating over opening in conveyor room floor.
    f. Repair concrete in screening channel as required. Coat walls and slab.
    g. Remove existing metal joists and provide new precast plank roof over motor room. Provide aluminum roof hatches in plank above openings in motor room floor for pump removal.
4. Administration Area:
    a. Interior Walls:
        i. At wall infills: match existing construction (CMU, metal studs, wood studs)
        ii. At new walls: metal studs with gypsum board finish.
        iii. At certain existing walls: new metal stud furring with gyp board.
    b. New West Entry Vestibule:
        i. Anodized aluminum storefront walls and doors.
        ii. Standing seam metal roof over wood deck over steel joists.
5. Sludge Thickening area:
    a. Remove elevated sludge thickening area and provide new concrete slab at same elevation as surrounding floor. Provide concrete slab over open areas of floor. Area below sludge thickening floor to be abandoned.
    b. CMU walls separating new Generator, Electrical, and Gas Handling Rooms.
    c. Provide ceiling over Gas Handling Room to enclose space.
6. Coatings and Finishes at Admin Area
    a. Flooring:
        i. Sealed concrete at utilitarian areas and toilet rooms.
        ii. Commercial carpet (Kinetix) at new occupied rooms.
        iii. Quarry tile flooring and base at main passages.
        iv. Walk-off carpet at new West Entry Vestibule

b. Walls:
    i. Paint, unless otherwise noted.
    ii. Ceramic tile and base at wet walls.
c. Ceilings:
    i. Standard 2’ x 2’ ACT at new occupied rooms, unless noted otherwise.
    ii. 2’ x 2’ Vinyl-Faced ACT at toilet rooms.

110 - Vehicle Storage Building

1. Not applicable.

120 – New Administration Building

1. Building details:
    a. Masonry: same as facility-wide, except:
        i. At exterior masonry & metal stud cavity walls: 3” spray foam insulation (in lieu of rigid).
        ii. Precast concrete window sills, headers and decorative features.
        iii. Modular brick.
    b. Doors and Windows: same as facility-wide, except:
        i. Interior man doors: solid core wood doors with hollow metal frames.
        ii. Exterior man doors: insulated hollow metal doors and frames.
        iii. Lab office door/wall: anodized aluminum storefront system
        iv. Vehicle doors: insulated steel sectional overhead.
        v. Entry/Vestibule doors: anodized aluminum storefront system.
        vi. Vehicle Storage Area skylights: Thermally broken, aluminum framed, acrylic glazed.
    c. Roofing:
        i. At Vehicle Storage area:
            1. Prestressed, precast, hollow-core concrete plank bearing on CMU walls, tapered rigid insulation, fully adhered single ply 60 mil rubber membrane.
        ii. At Offices area:
            1. Steel joists bearing on steel beam and column system, metal decking, deck cover board, tapered rigid insulation, insulation cover board, fully adhered single ply 60 mil rubber membrane.
        iii. At Entry Vestibule:
            1. Steel joists/trusses bearing on steel structure, wood decking, standing seam metal roofing.
        iv. Prefinished aluminum fascia and copings. Color as appropriate.
    d. Coatings: same as facility-wide. Also:
        i. Flooring:
            1. Commercial carpet (Kinetix) at occupied rooms, unless noted otherwise.
            2. Sealed concrete at Entry Vestibule, Lab, Passages, Locker Rooms, Mechanical Room, Break Room and Vehicle Storage.
            3. Ceramic tile at Showers.
        ii. Walls:
            1. Paint, unless otherwise noted.
            2. Ceramic tile at shower areas and at wet walls.

iii. Ceilings:
    1. Standard 2’ x 2’ ACT at new occupied rooms, unless noted otherwise.
    2. 2’ x 2’ Vinyl-Faced ACT at toilet rooms.
    3. Painted Gypsum Board ceilings at Locker Rooms, Shower Rooms and Locker Toilet Rooms.

200 - Grit Building

1. CMU walls installed on existing concrete foundation. New concrete foundations provided at building extensions on west side and northeast corner.
2. Precast plank roof with tapered insulation and fully adhered membrane.
3. Provide eye hooks over grit washer and spout for removal.
4. New aluminum grating over grit basin and channels.
5. Provide plastic laminated board insulation over perimeter of building.
6. Remove existing concrete stairs to dumpster at west end of building and replace with aluminum stairs.

310 - Primary 1

1. Repair deteriorated concrete and replace existing painted handrail with aluminum handrail.

320 - Primary 2

1. Repair deteriorated concrete and replace existing painted handrail with aluminum handrail.

330 - Primary 3

1. See facility wide description.

340 - Primary 4

1. See facility wide description.

350 - PE Channel

1. See facility wide description.

400 - Activated Sludge Building

1. Provide hole in floor and/or convert west stair into opening for access to lower level.
2. Provide new overhead door at south wall for equipment removal.
3. Patch doorway in wall between Gas Treatment and Blower Rooms to separate spaces.
4. Provide new door in south wall of Gas Treatment Room and SE corner of Blower Room.
5. Replace existing roof with new fully adhered membrane roof.

404 - Junction Structure

1. Aluminum grating and handrail.

405 - Anoxic Selector Tank

1. Galvanized steel walkways with aluminum grating and handrail.

406 - Mixing Tank

1. Aluminum grating and handrail.

410 - Activated Sludge Basins

1. Replace painted steel handrail with aluminum handrail.
2. Replace existing grating with new aluminum grating.
3. Fill existing channels below walkways with structural fill and place concrete slab over top.

420 - ML Channel

1. See facility wide description.

500 - Secondary Splitter

1. Aluminum grating and handrail.
2. Stainless steel or fiberglass baffle.

510 - Secondary 1

1. Repair deteriorated concrete and replace existing painted handrail with aluminum handrail.

515 - Secondary Scum Manhole 1

1. Precast concrete.
2. Aluminum access hatch.

520 - Secondary 2

1. Repair deteriorated concrete and replace existing painted handrail with aluminum handrail.

530 - Secondary 3

1. See facility wide description.

535 - Secondary Scum Manhole 2

1. Precast concrete.
2. Aluminum access hatch.

540 - Secondary 4

1. Pressure relief valves in floor and walls.
2. Aluminum railing and grating.

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. Aluminum access hatches, grating, and handrail.
2. Provide steel platform around disc filters for access to top of equipment.
3. Replace existing roof with new fully adhered membrane roof.

610 - P-Chem Storage Building

1. Masonry cavity walls with precast concrete roof.
2. Fully adhered membrane roof.
3. Skylights in roof for chemical storage tank access.

4. Aluminum grating.

695 - Outfall Structure

1. Not applicable.

700 - Digestion Building

1. Masonry divider wall around gas handling space at lower level for separation of space.
2. Masonry cavity wall with plank roof at stairwell to gas handling space.
3. Monorail in stairwell for equipment removal.
4. Replace existing roof with new fully adhered membrane roof.

720 - Digester 2

1. Not applicable.

730 - Digester 3

1. Not applicable.

740 - Digester 4

1. Not applicable.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Not applicable.

756 – Digester Gas Manhole 1

1. Precast construction.
2. Sump at bottom of manhole.

757 – Digester Gas Manhole 2

1. Precast construction.
2. Sump at bottom of manhole.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. Precast sandwich panel walls.
2. Precast double tee and plank roof.
3. Stair with doghouse for roof access.
4. Fully adhered membrane roof.
5. Masonry interior divider walls.
6. Aluminum hatches, grating, and railing.
7. Steel or aluminum access platforms.

8. 1 ton monorail over the dryer.
9. 2 ton monorail in Sludge Handling Room for access to lower level.
10. Overhead doors for equipment removal.

771 – Silo

1. Cast in place concrete foundation.

772 - Nitrogen System

1. Cast in place concrete foundation.

775 - PSD Thickener

1. Aluminum railing and grating.

900 – Tunnel

1. Pressure inject leaking cracks with foam.
2. New concrete channel and slab above tunnel with 2” rigid insulation between for separation.

910 – Tunnel

1. Floor slope of ½” per foot from Digestion Building down to Solids Building.
2. Formed concrete gutter at edge of tunnel for drainage.

PROCESS-MECHANICAL

FACILITY-WIDE

This section summarizes Process-Mechanical features applicable to the Project.

Applicable Codes

1. Ten States Standards for Wastewater Facilities.
2. NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
3. NR110: Wisconsin Wastewater Treatment Facility Design Code

Piping

1. Piping:
    a. Non-buried liquid service, 4-inch and larger:
        i) AWWA C151, glass-lined ductile iron, Class 53, minimum, AWWA C110 ductile iron fittings, flanged or grooved-end joints for RAS, WAS, thickened sludge, digested sludge, and scum lines.
        ii) AWWA C151, cement-lined ductile iron, Class 53, minimum, AWWA C110 ductile iron fittings, flanged or grooved-end joints for all other liquid services.
    b. Non-buried liquid service, less than 4-inch:
        i) Schedule 80 PVC.
        ii) ASTM A312, grade TP 316L Schedule 40 Type 316 stainless steel.
        iii) Schedule 40 Type 304 stainless steel.
    c. Non-buried Ferric Chloride (FeCl) service: Schedule 80 PVC, double contained piping system in areas where piping is routed overhead.
    d. Non-buried air low pressure (ALP) and cake sludge (CS) service:
        i) ASTM A312 or A778, Grade T304L stainless steel, welded joints, unpainted.
            - Schedule 10S: 3-inch and greater
    e. Non-buried digester gas (DG) service:
        i) ASTM A312, Grade TP316L stainless steel, welded joints, unpainted.
            - Schedule 40S: 0.5 to 2-inch
            - Schedule 10S: Larger than 2-inch
        ii) ASTM A778, Grade TP316L stainless steel, welded joints, unpainted.
            - Schedule 40S: 0.5 to 1-inch
            - Schedule 10S: 3 to 12-inch
    f. Non-buried heat transfer fluid (HTF):
        i) Carbon steel, black, seamless, ASTM A106, Grade B. Schedule 40. All welded joints with the exception of limited instrumentation taps.
    g. Non-buried high pressure air (AHP) service:
        i) Aluminum, Alloy 5042, seamless extruded pipe to ASTM B241.
    h. Buried pipe: Refer to Civil

2. Pipe Supports:
    a. Hangers, rods, clamps, protective shields, metal framing, support components, and hanger accessories in dry or dusty locations shall be hot dipped galvanized or of stainless steel construction.
    b. Hangers, rods, clamps, protective shields, metal framing, support components, and hanger accessories in submerged or wet locations shall be Type 316 stainless steel.

c. Hangers, rods, clamps, protective shields, metal framing, support components, and hanger accessories in corrosive areas shall be non-ferrous materials.

3. Piping and Equipment Identification:
   a. Piping labels shall use the following coloring scheme:
      i) Black on yellow background for flammable fluids.
      ii) Black on yellow background for potable, cooling, boiler feed, and other waters.
      iii) Black on yellow background for compressed air.
      iv) White on red background for fire quenching fluids.
      v) Black on yellow background for toxic and corrosive fluids, including biogas.
      vi) Black on yellow background for combustible fluids.
      vii) Black on yellow background for wastewater.
      viii) Black on yellow background for sludge service.
      ix) Black on white background for other.

   b. Pipes shall be color coded using the following general scheme:
      i) Sewage – Dark Gray
      ii) Wastewater Effluents – Light Gray
      iii) Sludge – Dark or Light Brown
      iv) Natural Gas – Red
      v) Digester Gas – Orange with Yellow Band
      vi) Potable Water, W1 – Dark Blue
      vii) Non-Potable Water, W2 – Dark Blue with Red Band
      viii) Plant Effluent, W3 – Dark Blue with Green Band
      ix) Low Pressure Air – Dark Green
      x) High Pressure Air – Dark Green with Red Band
      xi) Sodium Hypochlorite Solution – Yellow
      xii) Polymer – Orange with Green Band
      xiii) Ferric Chloride – Orange with Red Band
      xiv) Sodium Aluminate – Yellow with Green Band
      xv) Heating Water – Light Blue with Red Band

   c. Plastic equipment markers with black letters on a white background shall be provided for all new equipment.

4. Piping Insulation:
   a. All interior water piping will be insulated with 1-inch thickness of fiberglass insulation with color coded PVC jacketing.
   b. All exterior Biogas piping will be insulated with 2-inch thickness of polyisocyanurate insulation with aluminum jacketing.
   c. All exterior water and drain piping will be heat traced and insulated with 2-inch thickness of polyisocyanurate insulation with aluminum jacketing.
   d. All interior heating water piping will be insulated with 2-inch thickness of fiberglass insulation with color coded PVC jacketing.
   e. All buried heating water piping will be a factory preinsulated steel piping system with foam insulation and PVC pipe as jacket.
   f. Interior blower discharge piping will be insulated with 2-inch thick fiberglass with aluminum jacketing.

g. Thermal fluid piping will be insulated with 4-inch thick foam glass with aluminum jacketing.

5. Valves
   a. Liquid service (excluding secondary effluent service, scum-related service, chemical related service, thickened sludge, and biosolids):

      i) Plug Valves – Eccentric Plug, Dezurik, Pratt, or Val-Matic. Valves 6-in and larger shall be equipped with gear actuators.
      ii) Check Valves – Swing Check, GA Industries, APCO, or Henry Pratt.
      iii) Flex Swing Check Valves – Val Matic or Henry Pratt.
   b. Secondary effluent liquid service:
      i) Butterfly Valves – Cast iron body and disc, 304 SST shaft and 316 SST disc edge, Buna-N seat and packing, Dezurik or Henry Pratt.
   c. Scum, thickened sludge, and biosolids-related liquid service:
      i) Plug Valves – Eccentric Full-Port Plug, Dezurik or Val-Matic. Valves 6-in and larger shall be equipped with gear actuators.
      ii) Check Valves – Ball Check, HDL, GA Industries, or Water Technology Resources.
      iii) Flex Swing Check Valves – Val Matic or Henry Pratt.
   d. Chemical-related liquid service:
      i) PVC or CPVC valves: Dry-stem Butterfly Valves, Diaphragm Valves, Ball Valves, and/or Check Valves. Spears Manufacturing Company, Asahi/America, or Hayward.
   e. ALP and DG Service:
      i) Isolation Valves – Butterfly with lugs (not wafer-style), 250 deg F, Dezurik or Henry Pratt.
      ii) Throttling Air Control Valves – Diaphragm Control Valve, 284 deg F, Egger/Iris equipped with electric actuators.
   f. Actuators:
      i) Electric Actuators – Total enclosed and sealed to be provided by valve manufacturer, Auma or Rotork.
      ii) Pneumatic Actuators – rotary actuators by Kinetrol.

6. Expansion Joints
   a. For Wastewater and Sludge Service: EPDM single filled arch with stainless steel control rods. Proco Products, Inc or General Rubber Corp.
   b. For ALP Service: EPDM single filled arch with stainless steel control rods suitable for high temperatures. Proco Products, Inc or General Rubber Corp.

7. Flanged Coupling Adapters (stud anchors not acceptable)
   a. For Ductile Iron Pipe sizes 3 inch through 12 inch: Ductile Iron construction with Type 316 stainless steel bolts; Smith-Blair Style 912-9.
   b. For Steel Pipe sizes 3 inch through 24 inch: Steel construction with Type 316 stainless steel bolts; Smith-Blair Style 913.

8. Pipe Sleeves and Seals
   a. Link seals shall be used to fill annular space between pipe and opening, EPDM with 316 stainless steel bolts and nuts. Thunderline LINK-SEAL.
   b. Sleeves shall be used in conjunction with link seals, HDPE. Thunderline LINK-SEAL.

STRUCTURE-BY-STRUCTURE

This section summarizes Process-Mechanical features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Influent Screen No. 1, 2 Gate
    b. RWW Pump No. 1, 2, 3, 4
    c. Screen Bypass Gate (new actuator on existing gate)
    d. Screen Conveyor No. 2, 3
    e. Digester Gas Compressor No. 1, 2
    f. Digester gas handling equipment

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. Not applicable.

200 - Grit Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. RWW Sampler
    b. Grit Basin Propeller
    c. Grit Pump
    d. Grit Washer
    e. Primary Clarifier No. 1, 2, 3, 4 Influent Gate

310 - Primary 1

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Primary Clarifier No. 1
    b. Scum Mixer No. 1

320 - Primary 2

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Primary Clarifier No. 2
    b. Scum Mixer No. 2

330 - Primary 3

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Primary Clarifier No. 3
    b. Scum Mixer No. 3

340 - Primary 4

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Primary Clarifier No. 4
    b. Scum Mixer No. 4

350 - PE Channel

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Diffused air channel mixing

400 - Activated Sludge Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. WAS Pump No. 1, 2
    b. Aeration Blower No. 1, 2, 3

404 - Junction Structure

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Primary Effluent Sampler
    b. Anoxic Selector Tank Influent Gate
    c. Primary Effluent Step Feed Gate
    d. Secondary Bypass Effluent Gate

405 - Anoxic Selector Tank

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Selector Mixer No. 1, 2, 3, 4
    b. Anoxic Selector Tank Influent Gate

406 - Mixing Tank

1. Not applicable.

410 - Activated Sludge Basins

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Diffused air channel mixing
    b. Fine bubble diffusers
    c. Aeration Tank No. 1, 2, 3, 4, 5, 6 Influent Gate
    d. Aeration Tank No. 1, 2, 3, 4, 5, 6 Effluent Gate
    e. Primary Effluent Step Feed Gate
    f. Alternate Aeration Tank Influent Gate

420 - ML Channel

1. Not applicable.

500 - Secondary Splitter

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Secondary Clarifier No. 1, 2, 3, 4 Influent Gate

510 - Secondary 1

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Flocculating inlet
    b. Effluent launder cover

515 - Secondary Scum Manhole 1

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. SSM Pump No. 1

520 - Secondary 2

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Flocculating inlet
    b. Effluent launder cover

530 - Secondary 3

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Flocculating inlet
    b. Effluent launder cover

535 - Secondary Scum Manhole 2

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. SSM Pump No. 2

540 - Secondary 4

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Secondary Clarifier No. 4
    b. Effluent launder cover

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. SE Filter Pump No. 1, 2, 3, 4

b. Rapid Mix Tank Mixer
c. Coagulation Tank Mixer
d. Flocculation Tank Mixer
e. Disc Filter No. 1, 2, 3, 4
f. Filter Polymer Mixing System No. 1, 2
g. Filter Polymer Aging Tank
h. Filter Polymer Feed System No. 1, 2
i. UV Bank No. 1, 2, 3, 4 and Power Distribution Center No. 1, 2, 3, 4
j. Plant Water Pump No. 1, 2, 3, 4
k. Plant Water Strainer

610 - P-Chem Storage Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Chemical Feed System No. 1, 2
    b. Chemical Storage Tank No. 1, 2
    c. SHC Feed System

695 - Outfall Structure

1. Not applicable.

700 - Digestion Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Digester gas handling equipment
    b. Digester Mixing Pump No. 4
    c. Dewatering Feed Pump Nos. 1-3
    d. Digester No. 3 and 4 Recirculation Pumps
    e. Sludge Transfer Pump No. 1
    f. Digester Gas Boiler No. 1 and 2
    g. Natural Gas Boiler
    h. Digester No. 3 and 4 Heat Exchanger

710 - Digester 1

1. Not applicable.

720 - Digester 2

1. Not applicable.

730 - Digester 3

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Digester No. 3 Cover

740 - Digester 4

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Digester No. 4 Cover

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Waste Gas Burner

756 – Digester Gas Manhole 1

1. Contains two automatic drip traps to remove condensate from the digester gas piping from the Digestion Building to the Waste Gas Burner and Digester Gas Manhole 2.

757 – Digester Gas Manhole 2

1. Contains one automatic drip trap to remove condensate from the digester gas piping from Digester Gas Manhole 1 to the Activated Sludge Building.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Sludge Screen No. 1 and 2
    b. TPSD Pump No. and 2
    c. Gravity Belt Thickener No. 1 and 2
    d. Belt Filter Press No. 1 and 2
    e. Polymer Mixing System Nos. 1-4
    f. Polymer Feed System Nos. 1-4
    g. GBT Polymer Aging Tank
    h. BFP Polymer Aging Tank
    i. BFP Polymer Storage Tank
    j. Ferric Storage Tank
    k. Ferric Feed System
    l. Sludge Drying System
        i. Cake Sludge Hopper
        ii. Screw Feeders
        iii. Wet Cake Pumps
        iv. Wet Cake Dosing Pumps
        v. Rotating Depositor
        vi. Belt No. 1 and 2
        vii. Warm Zone Fan No. 1 and 2

viii. End Zone Fan No. 1 and 2
ix. Warm Zone HEX
x. End Zone HEX
xi. Extraction Screw
xii. Rotary Valve
xiii. Thermal Fluid Heating System
xiv. Condenser
xv. Drying Air Treatment Fan
xvi. Vacuum Fan
xvii. Drag Conveyor No. 1 and 2

m. Recycle Sampler
n. Recycle Pump No. 1 and 2
o. Compressed Air System No. 1 and 2
p. Compressed Air Receiver
q. RAS Pump Nos. 1-3
r. WAS Pump Nos. 1-3

771 – Silo

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Biosolids Storage Silo

772 - Nitrogen System

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. Nitrogen System

775 - PSD Thickener

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. PSD Thickener

900 - Tunnel

1. The following process-mechanical equipment will be provided. See Unit Process Equipment Design Summary and Operational Strategies for additional information.
    a. PSD Pump Nos. 1-4
    b. PSM Pump No. 1 and 2

910 - Tunnel

1. Not applicable.

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

Facility: Wausau Wastewater Treatment Facility

Project: Wastewater Treatment Facility Improvements Project
Wausau, WI

Process Engineer: Bergstrom, Larson, Matthias, Raisbeck, Ransberger, Stephens, Vevang

Project No.: 13229

Date: November 2018

100 - Main Building

RWW Pumps	Name		Raw Wastewater Pumps
RWW Pumps	Type		Dry pit submersible
RWW Pumps	Manufacturers		
RWW Pumps	A.		Fairbanks
RWW Pumps	B.		Flygt
RWW Pumps	Model		
RWW Pumps	A.		5731
RWW Pumps	B.		N3531
RWW Pumps	Total Number of Units		4
RWW Pumps	Firm Number of Units		3
RWW Pumps	Capacity per Unit	mgd	12
RWW Pumps	Total Capacity	mgd	48
RWW Pumps	Firm Capacity	mgd	36
RWW Pumps	Motor		
RWW Pumps	Explosion Proof		No
RWW Pumps	HP		130
RWW Pumps	Voltage		460V / 3 phase
RWW Pumps	RPM		770
RWW Pumps	Drive/Starter		VFD
RWW Pumps	Control		PLC
RWW Pumps	Standby Power		Yes
Influent Gates	Name		Influent Screen No. 1 and No. 2 Influent Gate
Influent Gates	Type		Channel Mounted, Self-Contained
Influent Gates	Manufacturers		
Influent Gates	A.		Whipps, Inc
Influent Gates	B.		RW Gate Company
Influent Gates	C.		Hydro Gate
Influent Gates	Actuator		Electic
Influent Gates	Quantity		2
Influent Gates	Materials		304 SST
Bypass Gate	Name		Screen Bypass Gate
Bypass Gate	Type		Channel Mounted, Self-Contained (Existing Gate)
Bypass Gate	Actuator		New Electric Actuator on Existing Gate
SCN Conveyor	Name		Screenings Conveyors
SCN Conveyor	Quantity		1 existing, 2 new
SCN Conveyor	Type		Screw
SCN Conveyor	Manufacturers		
SCN Conveyor	A.		CleanTek
SCN Conveyor	Motor		
SCN Conveyor	Explosion Proof		Ues
SCN Conveyor	HP		4
SCN Conveyor	Voltage		460V / 60 hz / 3 phase
SCN Conveyor	RPM		1750
SCN Conveyor	Drive/Starter		Starter in LCP
SCN Conveyor	Control		LCP
SCN Conveyor	Standby Power		Yes
SCN Conveyor	Length (ft)		as shown on Drawings
SCN Conveyor	Incline (degrees)		45
SCN Conveyor	Capacity (cf/hr)		35
SCN Conveyor	Material		304 SST
Gas Compressor	Name		Digester Gas Compressor No. 1 and No. 2
Gas Compressor	Purpose		Compress digester gas from anaerobic digestion
Gas Compressor	Type		Reciprocating, Single Stage

Gas Compressor	Manufacturers		
Gas Compressor	A.		Dresser Rand
Gas Compressor	B.		Norwalk
Gas Compressor	Model		
Gas Compressor	A.		ESH-1
Gas Compressor	B.		TR-S
Gas Compressor	Total Number of Units		2
Gas Compressor	Inlet capacity	cfm	65
Gas Compressor	Dishcharge pressure	psi	46
Gas Compressor	Motor		
Gas Compressor	Explosion Proof		Yes
Gas Compressor	HP		20
Gas Compressor	Voltage		480
Gas Compressor	RPM		617
Gas Compressor	Drive/Starter		
Gas Compressor	Control		
Gas Compressor	Standby Power		No

200 - Grit Structure

Grit Basin	Name		Grit Basin Propeller
Grit Basin	Purpose		Remove grit from screened wastewater.
Grit Basin	Manufacturers		
Grit Basin	A.		Smith and Loveless
Grit Basin	B.		Enviro-Care
Grit Basin	Model		
Grit Basin	A.		30.0B PISTA
Grit Basin	B.		DSP18
Grit Basin	Total Number of Units		1.00
Grit Basin	Removal		95%, 105 micron
Grit Basin	Motor		
Grit Basin	Explosion Proof		Yes
Grit Basin	HP		2
Grit Basin	Voltage		460V / 60 hz / 3 phase
Grit Basin	RPM		21
Grit Basin	Drive/Starter		Starter in LCP
Grit Basin	Control		LCP
Grit Basin	Standby Power		Yes
Grit Pump	Name		Grit Pump
Grit Pump	Purpose		Pump grit from grit chamber to grit washer.
Grit Pump	Type		Centrifugal
Grit Pump	Manufacturers		
Grit Pump	A.		Gorman Rupp
Grit Pump	B.		TBD
Grit Pump	Model		
Grit Pump	A.		T4A75S-B
Grit Pump	B.		TBD
Grit Pump	Total Number of Units		1
Grit Pump	Capacity	gpm	450
Grit Pump	Material		Hard Iron
Grit Pump	Motor		
Grit Pump	Explosion Proof		Yes
Grit Pump	HP		10
Grit Pump	Voltage		460V / 3 phase
Grit Pump	RPM		1,130
Grit Pump	Drive/Starter		VFD
Grit Pump	Control		PLC
Grit Pump	Standby Power		Yes
Grit Washer	Name		Grit Washer
Grit Washer	Purpose		Separate, wash, and dewater grit from grit chamber.
Grit Washer	Manufacturers		
Grit Washer	A.		Huber Technologies
Grit Washer	B.		Lakeside Equipment Corporation
Grit Washer	Model		
Grit Washer	A.		RoSF4.3
Grit Washer	B.		Raptor
Grit Washer	Total Number of Units		1

Grit Washer	Capacity per Unit	gpm	500
Grit Washer	Total Capacity	gpm	500
Grit Washer	Removal Efficiency at Design Flow		95% at 200 micron
Grit Washer	Angle of Auger		45
Grit Washer	Material		304L stainless steel
Grit Washer			
Grit Washer	Grit Mixer Motor		
Grit Washer	Explosion Proof		Yes
Grit Washer	HP		0.75
Grit Washer	Voltage		480 / 3 phase
Grit Washer	Drive/Starter		Constant speed, non-rotating
Grit Washer	Control		LCP
Grit Washer	Standby Power		Yes
Grit Washer			
Grit Washer	Grit Screw Motor		
Grit Washer	Explosion Proof		
Grit Washer	HP		1.5
Grit Washer	Voltage		480 / 3 phase
Grit Washer	Drive/Starter		Constant speed, rotating
Grit Washer	Control		LCP
Grit Washer	Standby Power		Yes
PC Influent Gates	Name		Primary Clarifier No. 1, 2, 3, 4 Influent Gate
PC Influent Gates	Type		Downward Opening, Self-Contained
PC Influent Gates	Manufacturers		
PC Influent Gates	A.		Whipps, Inc
PC Influent Gates	B.		RW Gate Company
PC Influent Gates	C.		Hydro Gate
PC Influent Gates	Actuator		Electric
PC Influent Gates	Quantity		4
PC Influent Gates	Materials		304 SST

310, 320, 330, 340 - Primary 1, Primary 2, Primary 3, Primary 4

Primary Mechanism	Name		Primary Clarifier No. 1, 2, 3, 4
Primary Mechanism	Purpose		To remove solids and scum
Primary Mechanism	Type		Scraper
Primary Mechanism	Diameter		80'
Primary Mechanism	Manufacturers		
Primary Mechanism	A.		Evoqua
Primary Mechanism	Materials of Construction		
Primary Mechanism	Submerged		A36 Carbon Steel
Primary Mechanism	Non-submerged		A36 Carbon Steel
Primary Mechanism	Handrail		Aluminum
Primary Mechanism	Walkway and platform flooring		Aluminum
Primary Mechanism	Total Number of Units		4
Primary Mechanism	Primary Influent Max Flow (each)	mgd	9
Primary Mechanism	Motor		
Primary Mechanism	Explosion Proof		Yes
Primary Mechanism	HP		0.5
Primary Mechanism	RPM		1800
Primary Mechanism	Voltage		260/460V / 60 Hz / 3 phase
Primary Mechanism	Drive/Starter		Starter
Primary Mechanism	Control		Manual
Primary Mechanism	Standby Power		Yes
Scum Mixer	Name		Scum Mixer
Scum Mixer	Purpose		To mix scum prior to pumping.
Scum Mixer	Type		
Scum Mixer	Manufacturers		
Scum Mixer	A.		Flygt
Scum Mixer	Model		
Scum Mixer	A.		4620
Scum Mixer	Total Number of Units		4
Scum Mixer	Motor		
Scum Mixer	Explosion Proof		Yes
Scum Mixer	HP		2.28
Scum Mixer	Voltage		240V / 3 phase
Scum Mixer	Drive/Starter		Starter
Scum Mixer	Control		PLC

Scum Mixer	Standby Power		Yes

400 - Activated Sludge Building

Aeration Blowers	Name		Aeration Blowers 1-3
Aeration Blowers	Purpose		Aeration of activated sludge basins and channels
Aeration Blowers	Type		Turbo Blowers
Aeration Blowers	Manufacturers		
Aeration Blowers	A.		Aerzen
Aeration Blowers	B.		APG Neuros
Aeration Blowers	C.		Howden
Aeration Blowers	D.		Sulzer
Aeration Blowers	Model		
Aeration Blowers	A.		AT 400-0.8T G5
Aeration Blowers	B.		NX350-C070
Aeration Blowers	C.		10SV-GK200
Aeration Blowers	D.		HST 9500
Aeration Blowers	Total Number of Units		3
Aeration Blowers	Capacity per Unit	scfm	6,300
Aeration Blowers	Total Capacity	scfm	12,600
Aeration Blowers	Material		
Aeration Blowers	Motor		
Aeration Blowers	Explosion Proof		No
Aeration Blowers	HP		400
Aeration Blowers	Voltage		460 / 3 phase
Aeration Blowers	RPM		12,000
Aeration Blowers	Drive/Starter		VFD
Aeration Blowers	Control		PLC
Aeration Blowers	Standby Power		Yes
WAS Pumps	Name		WAS Pumps 1-2
WAS Pumps	Purpose		Convey WAS from Secondary Clarifier Nos. 1 and 2 to gravity belt thickener
WAS Pumps	Type		Screw Centrifugal Pumps
WAS Pumps	Manufacturers		
WAS Pumps	A.		Hayward Gordon
WAS Pumps	B.		Fairbanks Morse
WAS Pumps	C.		Wemco
WAS Pumps	Model		
WAS Pumps	A.		TBD
WAS Pumps	B.		TBD
WAS Pumps	C.		TBD
WAS Pumps	Total Number of Units		2
WAS Pumps	Capacity per Unit	gpm	600
WAS Pumps	Material		
WAS Pumps	Casing		Cast Iron, ASTM A48 CL30
WAS Pumps	Impeller and Suction Liner		High Chrome Iron, ASTM A532
WAS Pumps	Motor		
WAS Pumps	Explosion Proof		No
WAS Pumps	HP		5 HP
WAS Pumps	Voltage		460V / 3 phase
WAS Pumps	RPM		1800
WAS Pumps	Drive/Starter		VFD
WAS Pumps	Standby Power		No

404 - Junction Structure

AS Influent Gate	Name		Anoxic Selector Tank Influent Gate
AS Influent Gate	Type		Wall-Mounted, Not Self-Contained
AS Influent Gate	Manufacturers		
AS Influent Gate	A.		Whipps, Inc
AS Influent Gate	B.		RW Gate Company
AS Influent Gate	C.		Hydro Gate
AS Influent Gate	Actuator		Manual
AS Influent Gate	Quantity		1
AS Influent Gate	Materials		304 SST

PESF Gate	Name		Primary Effluent Step Feed Gate
PESF Gate	Type		Downward Opening, Self-Contained
PESF Gate	Manufacturers		
PESF Gate	A.		Whipps, Inc
PESF Gate	B.		RW Gate Company
PESF Gate	C.		Hydro Gate
PESF Gate	Actuator		Electric
PESF Gate	Quantity		1
PESF Gate	Materials		304 SST
Sec Byp Gate	Name		Secondary Bypass Effluent Gate
Sec Byp Gate	Type		Downward Opening, Self-Contained
Sec Byp Gate	Manufacturers		
Sec Byp Gate	A.		Whipps, Inc
Sec Byp Gate	B.		RW Gate Company
Sec Byp Gate	C.		Hydro Gate
Sec Byp Gate	Actuator		Manual
Sec Byp Gate	Quantity		1
Sec Byp Gate	Materials		304 SST

405 - Anoxic Selector Tank

Anoxic Mixers	Name		Selector Mixer 1, 2, 3, 4
Anoxic Mixers	Purpose		Completely mix ML in selector zones.
Anoxic Mixers	Type		Mixer
Anoxic Mixers	Manufacturers		
Anoxic Mixers	A.		INVENT
Anoxic Mixers	Model		
Anoxic Mixers	A.		HCM/2000-24-1.5hp
Anoxic Mixers	Total Number of Units		4
Anoxic Mixers	Capacity per Unit	cft/min	6,523
Anoxic Mixers	Material		
Anoxic Mixers	Motor		
Anoxic Mixers	Explosion Proof		No
Anoxic Mixers	HP		1.5
Anoxic Mixers	Voltage		460 / 3 phase
Anoxic Mixers	RPM		24.3
Anoxic Mixers	Drive/Starter		Starter
Anoxic Mixers	Control		ON/OFF
Anoxic Mixers	Standby Power		Yes
AS Tank In Gate	Name		Anoxic Selector Tank Influent Gate
AS Tank In Gate	Type		Channel-Mounted, Self-Contained
AS Tank In Gate	Manufacturers		
AS Tank In Gate	A.		Whipps, Inc
AS Tank In Gate	B.		RW Gate Company
AS Tank In Gate	C.		Hydro Gate
AS Tank In Gate	Actuator		Manual
AS Tank In Gate	Quantity		1
AS Tank In Gate	Materials		304 SST

410 - Activated Sludge Basins

AT Infl Gate	Name		Aeration Tank No. 1, 2, 3, 4, 5, 6 Influent Gate
AT Infl Gate	Type		Downward Opening, Self-Contained
AT Infl Gate	Manufacturers		
AT Infl Gate	A.		Whipps, Inc
AT Infl Gate	B.		RW Gate Company
AT Infl Gate	C.		Hydro Gate
AT Infl Gate	Actuator		Manual
AT Infl Gate	Quantity		6
AT Infl Gate	Materials		304 SST
AT Eflu Gate	Name		Aeration Tank No. 1, 2, 3, 4, 5, 6 Effluent Gate
AT Eflu Gate	Type		Channel-Mounted, Self-Contained
AT Eflu Gate	Manufacturers		
AT Eflu Gate	A.		Whipps, Inc
AT Eflu Gate	B.		RW Gate Company

AT Eflu Gate	C.		Hydro Gate
AT Eflu Gate	Actuator		Manual
AT Eflu Gate	Quantity		6
AT Eflu Gate	Materials		304 SST
PESF Gate	Name		Primary Effluent Step Feed Tate
PESF Gate	Type		Channel-Mounted, Self-Contained
PESF Gate	Manufacturers		
PESF Gate	A.		Whipps, Inc
PESF Gate	B.		RW Gate Company
PESF Gate	C.		Hydro Gate
PESF Gate	Actuator		Manual
PESF Gate	Quantity		1
PESF Gate	Materials		304 SST
Alt AT Infl Gate	Name		Alternate Aeration Tank Influent Gate
Alt AT Infl Gate	Type		Channel-Mounted, Self-Contained
Alt AT Infl Gate	Manufacturers		
Alt AT Infl Gate	A.		Whipps, Inc
Alt AT Infl Gate	B.		RW Gate Company
Alt AT Infl Gate	C.		Hydro Gate
Alt AT Infl Gate	Actuator		Manual
Alt AT Infl Gate	Quantity		1
Alt AT Infl Gate	Materials		304 SST

500 - Secondary Splitter

SC Infl Gate	Name		Secondary Clarifier No. 1, 2, 3, 4 Influent Gate
SC Infl Gate	Type		Channel-Mounted, Self-Contained
SC Infl Gate	Manufacturers		
SC Infl Gate	A.		Whipps, Inc
SC Infl Gate	B.		RW Gate Company
SC Infl Gate	C.		Hydro Gate
SC Infl Gate	Actuator		Manual
SC Infl Gate	Quantity		4
SC Infl Gate	Materials		304 SST

510 - Secondary 1

Clarifier Improvements	Name		FEDWA Baffles
Clarifier Improvements	Name		Launder Covers
Clarifier Improvements	Diameter		90'

515 - Secondary Scum Manhole 1

SSM Pump	Name		SSM Pump No. 1
SSM Pump	Purpose		Pump Secondary Scum to Str 200.
SSM Pump	Type		Prerotation, screw-centrifugal
SSM Pump	Manufacturers		
SSM Pump	A.		Wemco
SSM Pump	Model		
SSM Pump	A.		3x11 CLESR
SSM Pump	Total Number of Units		1
SSM Pump	Capacity per Unit	gpm	70
SSM Pump	Motor		
SSM Pump	Explosion Proof		Yes
SSM Pump	HP		3
SSM Pump	Voltage		480V / 3 phase
SSM Pump	RPM		860
SSM Pump	Drive/Starter		Starter
SSM Pump	Control		PLC
SSM Pump	Standby Power		No

520 - Secondary 2

Clarifier Improvements	Name		FEDWA Baffles
Clarifier Improvements	Name		Launder Covers
Clarifier Improvements	Diameter		90'

530 - Secondary 3

Clarifier Improvements	Name		FEDWA Baffles
Clarifier Improvements	Name		Launder Covers
Clarifier Improvements	Diameter		110'

535 - Secondary Scum Manhole 2

SSM Pump	Name		SSM Pump No. 2
SSM Pump	Purpose		Pump Secondary Scum to Str 200.
SSM Pump	Type		Prerotation, screw-centrifugal
SSM Pump	Manufacturers		
SSM Pump	A.		Wemco
SSM Pump	Model		
SSM Pump	A.		3x11 CLESR
SSM Pump	Total Number of Units		1
SSM Pump	Capacity per Unit	gpm	70
SSM Pump	Motor		
SSM Pump	Explosion Proof		Yes
SSM Pump	HP		3
SSM Pump	Voltage		480V / 3 phase
SSM Pump	RPM		860
SSM Pump	Drive/Starter		Starter
SSM Pump	Control		PLC
SSM Pump	Standby Power		No

540 - Secondary 4

Secondary Clarifier	Name		Secondary Clarifier No. 4
Secondary Clarifier	Purpose		Solids separation
Secondary Clarifier	Type		Suction Header, FEDWA Baffles
Secondary Clarifier	Diameter		110'
Secondary Clarifier	Manufacturers		
Secondary Clarifier	A.		Evoqua
Secondary Clarifier	Materials of Construction		
Secondary Clarifier	Submerged		A36 carbon steel
Secondary Clarifier	Non-submerged		A36 carbon steel
Secondary Clarifier	Handrail		Aluminum
Secondary Clarifier	Walkway and platform flooring		Aluminum
Secondary Clarifier	Total Number of Units		1
Secondary Clarifier	Forward Flow (Max)	mgd	7.8
Secondary Clarifier	RAS (Max)	mgd	3
Secondary Clarifier	Mixed Liquor (Max)	mgd	10.8
Secondary Clarifier	Motor		
Secondary Clarifier	Explosion Proof		No
Secondary Clarifier	HP		0.5
Secondary Clarifier	RPM		1800
Secondary Clarifier	Voltage		460V / 60 Hz / 3 phase
Secondary Clarifier	Drive/Starter		Starter
Secondary Clarifier	Control		MCC
Secondary Clarifier	Standby Power		Yes

600 - Effluent Building

SE Pump	Name		SE Filter Pump No. 1, 2, 3, 4
SE Pump	Purpose		Pump SE to Filter Inlet Channel
SE Pump	Type		Submersible
SE Pump	Manufacturers		
SE Pump	A.		Flygt
SE Pump	Model		
SE Pump	A.		NP-3202.185
SE Pump	Total Number of Units		4
SE Pump	Firm Number of Units		3
SE Pump	Capacity per Unit	mgd	9
SE Pump	Total Capacity	mgd	36
SE Pump	Firm Capacity	mgd	27
SE Pump	Motor		
SE Pump	Explosion Proof		no
SE Pump	HP		60
SE Pump	Voltage		480
SE Pump	RPM		1150

SE Pump	Drive/Starter		VFD
SE Pump	Control		PLC
SE Pump	Standby Power		Yes
Filtration	Name		Tertiary Filters
Filtration	Purpose		Low-level P removal, BOD removal
Filtration	Type		Cloth Media Filter
Filtration	Manufacturers		
Filtration	A.		Kruger
Filtration	B.		Aqua-Aerobic
Filtration	Model		
Filtration	A.		Hydrotech Discfilter
Filtration	B.		Aqua MegaDisk
Filtration	Total Number of Units		4
Filtration	Firm Number of Units		3
Filtration	Capacity per Unit	mgd	6.33
Filtration	Total Capacity	mgd	25.3
Filtration	Firm Capacity	mgd	19
Filtration	Number of Discs Per Unit		21
Filtration	Disc Diameter		2.6 m
Filtration	Drive Motor		
Filtration	Explosion Proof		No
Filtration	HP		1.5
Filtration	Voltage		480
Filtration	RPM		1800
Filtration	Drive/Starter		Starter
Filtration	Control		Inlet water level
Filtration	Standby Power		Yes
Filtration	Backwash Pump Flow		201 gpm
Filtration	Backwash Water Pump Motor		
Filtration	Explosion Proof		No
Filtration	HP		25
Filtration	Voltage		480
Filtration	RPM		1800
Filtration	Drive/Starter		NR
Filtration	Control		Inlet water level
Filtration	Standby Power		Yes
Filtration	Rapid Mixing Tank Mixer Motor		
Filtration	Explosion Proof		No
Filtration	HP		20
Filtration	Voltage		480
Filtration	RPM		1800
Filtration	Drive/Starter		NR
Filtration	Control		On/Off
Filtration	Standby Power		Yes
Filtration	Coagulation Mixign Tank Mixer		
Filtration	Explosion Proof		No
Filtration	HP		7.5
Filtration	Voltage		480
Filtration	RPM		1800
Filtration	Drive/Starter		NR
Filtration	Control		On/Off
Filtration	Standby Power		Yes
Filtration	Flocculation Mixing Tank Mixer		
Filtration	Explosion Proof		No
Filtration	HP		5
Filtration	Voltage		480
Filtration	RPM		1800
Filtration	Drive/Starter		NR
Filtration	Control		On/Off
Filtration	Standby Power		Yes
Polymer Mixing	Name		Filter Polymer Mixing System No. 1, 2
Polymer Mixing	Purpose		Dilution polymer solution to 0.1%
Polymer Mixing	Type		Polymer dilution system
Polymer Mixing	Manufacturers		
Polymer Mixing	A.		Acrison, Inc. (Supplied by Kruger)
Polymer Mixing	Total Number of Units		1
Polymer Mixing	Capacity per Unit	ppd active polymer	40

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

Polymer Mixing	Total Pump Capacity		gph	10
Polymer Mixing	Motor			
Polymer Mixing		Explosion Proof		No
Polymer Mixing		HP		1
Polymer Mixing		Voltage		480V / 3 phase
Polymer Mixing		RPM		1800
Polymer Mixing		Drive/Starter		VFD
Polymer Mixing		Standby Power		No
Polymer Aging	Name			Filter Polymer Aging Tank with Mixer No. 1, 2
Polymer Aging	Purpose			Aging 0.5% polymer solution
Polymer Aging	Type			304 SST Tank
Polymer Aging	Manufacturers			
Polymer Aging		A.		Acrison, Inc. (provided by Kruger)
Polymer Aging	Total Number of Systems			1
Polymer Aging	Capacity per Mix Tank		gallons	200
Polymer Aging	Number of Mix Tanks			1
Polymer Aging	Capacity per Age Tank			400
Polymer Aging	Number of Age Tanks			1
Polymer Feed	Name			Filter Polymer Feed System No. 1, 2
Polymer Feed	Purpose			Aged Polymer Solution
Polymer Feed	Type			Progressive Cavity
Polymer Feed	Manufa	A.		Daparak (Supplied by Kruger)
Polymer Feed		B.		
Polymer Feed				
Polymer Feed	Total Number of Pumps			2
Polymer Feed	Firm Number of Pumps			1
Polymer Feed	Total Pump Capacity		gph	<300
Polymer Feed				
Polymer Feed	Motor	Explosion Proof		No
Polymer Feed		HP		
Polymer Feed		Voltage		480V / 3 phase
Polymer Feed		RPM		
Polymer Feed		Drive/Starter		VFD
Polymer Feed		Standby Power		No
Plant Water Pump	Name			Plant Water Pump No . 1, 2, 3, 4
Plant Water Pump	Purpose			Pump W3 throughout plant
Plant Water Pump	Type			Dry-Pit, Centrifugal - End Suction
Plant Water Pump	Manufacturers			
Plant Water Pump		A.		Fairbanks Morse
Plant Water Pump		B.		Goulds
Plant Water Pump	Model			
Plant Water Pump		A.		TBD
Plant Water Pump		B.		TBD
Plant Water Pump	Total Number of Units			4
Plant Water Pump	Firm Number of Units			3
Plant Water Pump	Capacity per Unit		gpm	433
Plant Water Pump	Total Capacity		gpm	1720
Plant Water Pump	Firm Capacity		gpm	1300
Plant Water Pump	Motor			
Plant Water Pump		Explosion Proof		No
Plant Water Pump		HP		50
Plant Water Pump		Voltage		480
Plant Water Pump		RPM		3600
Plant Water Pump		Drive/Starter		Adjustable Frequency Drive
Plant Water Pump		Control		Pressure
Plant Water Pump		Standby Power		none
UV Disinfection	Name			UV Disinfection
UV Disinfection	Purpose			Effluent disinfection
UV Disinfection	Type			UV
UV Disinfection	Manufacturers			
UV Disinfection		A.		Trojan UV
UV Disinfection	Model			
UV Disinfection		A.		Trojan UV Signa
UV Disinfection	Total Number of Banks			3
UV Disinfection	Total Number of Banks			3

UV Disinfection	Number of Lamps Per Bank		24
UV Disinfection	UV Transmittance (Min)		52%
UV Disinfection	Capacity per Unit		
UV Disinfection	Total Capacity	mgd	26
UV Disinfection	Firm Capacity	mgd	26
UV Disinfection	Motor		
UV Disinfection	Explosion Proof		No
UV Disinfection	kW		75.8
UV Disinfection	Voltage		480
UV Disinfection	Drive/Starter		MCC
UV Disinfection	Control		Forward flow / UVT
UV Disinfection	Standby Power		Yes
UV Disinfection	Level Control		Fixed Weir

610 - P-Chem Storage Building

Chemical Tank	Name		Chemical Storage Tank
Chemical Tank	Purpose		Storing Sodium Aluminate
Chemical Tank	Type		Polyethylene tank
Chemical Tank	Manufacturers		
Chemical Tank	A.		Poly Processing
Chemical Tank	B.		Snyder
Chemical Tank	C.		Assman
Chemical Tank	Total Number of Units		2
Chemical Tank	Capacity per Unit	gallons	6,100
Chemical Feed	Name		Chemical Feed System No. 1
Chemical Feed	Purpose		Feed sodium aluminate for P-removal
Chemical Feed	Type		Chemical feed system
Chemical Feed	Manufacturers		
Chemical Feed	A.		UGSI
Chemical Feed	B.		Prominent
Chemical Feed	Total Number of Feed Pumps		3
Chemical Feed	Capacity per Unit	gph	1.0-8.5, 3.0-19.5
Chemical Feed	Motor		
Chemical Feed	Explosion Proof		No
Chemical Feed	Voltage		120V / 1 phase
Chemical Feed	Drive/Starter		VFD
Chemical Feed	Standby Power		No
Chemical Feed	Name		Chemical Feed System No. 2
Chemical Feed	Purpose		Feed sodium aluminate for tertiary filtration
Chemical Feed	Type		Chemical feed system
Chemical Feed	Manufacturers		
Chemical Feed	A.		UGSI
Chemical Feed	B.		Daparak, Inc
Chemical Feed	Total Number of Feed Pumps		2
Chemical Feed	Capacity per Unit	gph	8 to 53
Chemical Feed	Motor		
Chemical Feed	Explosion Proof		No
Chemical Feed	Amps		20
Chemical Feed	Voltage		120V / 1 phase
Chemical Feed	Drive/Starter		VFD
Chemical Feed	Standby Power		No
SHC Pump	Name		Sodium Hypochlorite Feed System
SHC Pump	Purpose		Feed sodium hypochlorite to Plant Water Sytem
SHC Pump	Type		Chemical feed system
SHC Pump	Manufacturers		
SHC Pump	A.		UGSI
SHC Pump	B.		Prominent
SHC Pump	Total Number of Units		1
SHC Pump	Capacity per Unit	gph	up to 1 gph
SHC Pump	Motor		
SHC Pump	Explosion Proof		No
SHC Pump	Voltage		120V / 1 phase
SHC Pump	Drive/Starter		VFD
SHC Pump	Standby Power		No

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

700 - Digester Building

Digester Mixing	Name		Digester Mixing Pump No. 4
Digester Mixing	Purpose		Duplicate digester mixing pump for nozzle based mixing system
Digester Mixing	Type		Chopper Pump
Digester Mixing	Manufacturers		
Digester Mixing	A.		Hayward Gordon Ltd.
Digester Mixing	Model		
Digester Mixing	A.		CHOPX8RB
Digester Mixing	Total Number of Units		1
Digester Mixing	Capacity per Unit	gpm	3500
Digester Mixing	Motor		
Digester Mixing	Explosion Proof		No
Digester Mixing	HP		60
Digester Mixing	Voltage		460
Digester Mixing	RPM		1200
Digester Mixing	Drive/Starter		VFD
Digester Mixing	Control		
Digester Mixing	Standby Power		No
Dewatering Feed Pump	Name		Dewatering Feed Pump No. 1, No. 2, and No. 3
Dewatering Feed Pump	Purpose		Pump sludge from on digester to another and to dewatering
Dewatering Feed Pump	Type		Progressive cavity
Dewatering Feed Pump	Manufacturers		
Dewatering Feed Pump	A.		Seepex
Dewatering Feed Pump	B.		Netzsch
Dewatering Feed Pump	C.		Moyno
Dewatering Feed Pump	D.		Roper
Dewatering Feed Pump	Model		
Dewatering Feed Pump	A.		BN-52
Dewatering Feed Pump	B.		
Dewatering Feed Pump	C.		
Dewatering Feed Pump	D.		
Dewatering Feed Pump	Total Number of Units		3
Dewatering Feed Pump	Capacity per Unit	gpm	125
Dewatering Feed Pump	Head	psi	50
Dewatering Feed Pump	Speed	rpm	362
Dewatering Feed Pump	Motor		
Dewatering Feed Pump	Explosion Proof		No
Dewatering Feed Pump	HP		10
Dewatering Feed Pump	Voltage		460
Dewatering Feed Pump	RPM		240
Dewatering Feed Pump	Drive/Starter		VFD
Dewatering Feed Pump	Control		
Dewatering Feed Pump	Standby Power		No
Dewatering Feed Pump	Miscellaneous		Horizontal suction
DS Recirculation Pump	Name		Digester 3 and Digester 4 Recirc Pump
DS Recirculation Pump	Purpose		Heat sludge in Digester 3 and Digester 4
DS Recirculation Pump	Type		Rotary Lobe
DS Recirculation Pump	Manufacturers		
DS Recirculation Pump	A.		Borger
DS Recirculation Pump	B.		Vogelsang
DS Recirculation Pump	Model		
DS Recirculation Pump	A.		PL300
DS Recirculation Pump	B.		VX136Q
DS Recirculation Pump	Total Number of Units		2
DS Recirculation Pump	Capacity per Unit	gpm	150
DS Recirculation Pump	Head	psi	35
DS Recirculation Pump	Motor		
DS Recirculation Pump	Explosion Proof		No
DS Recirculation Pump	HP		10
DS Recirculation Pump	Voltage		460
DS Recirculation Pump	RPM		1800
DS Recirculation Pump	Drive/Starter		VFD
DS Recirculation Pump	Standby Power		No
DS Recirculation Pump	Miscellaneous		Motor stacked above pump
DS Transfer Pump	Name		Sludge Transfer Pump No. 1

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

DS Transfer Pump	Purpose		Pump sludge from on digester to another
DS Transfer Pump	Type		Progressive cavity
DS Transfer Pump	Manufacturers		
DS Transfer Pump	A.		Seepex
DS Transfer Pump	B.		Netzsch
DS Transfer Pump	C.		Moyno
DS Transfer Pump	D.		Roper
DS Transfer Pump	Model		
DS Transfer Pump	A.		
DS Transfer Pump	B.		
DS Transfer Pump	C.		
DS Transfer Pump	D.		
DS Transfer Pump	Total Number of Units		1
DS Transfer Pump	Capacity per Unit	gpm	150
DS Transfer Pump	Motor		
DS Transfer Pump	Explosion Proof		No
DS Transfer Pump	HP		10
DS Transfer Pump	Voltage		460
DS Transfer Pump	RPM		
DS Transfer Pump	Drive/Starter		
DS Transfer Pump	Standby Power		No
DS Transfer Pump	Miscellaneous		Horizontal suction
Digester Gas Boiler	Name		Digester Gas Boiler No. 1 and No. 2
Digester Gas Boiler	Purpose		Utilize digester gas to create hot water for heating
Digester Gas Boiler	Type		Low pressure firebox
Digester Gas Boiler	Manufacturers		
Digester Gas Boiler	A.		Hurst
Digester Gas Boiler	Model		
Digester Gas Boiler	A.		S1-81
Digester Gas Boiler	Total Number of Units		2
Digester Gas Boiler	Output	MBH	2000
Digester Gas Boiler	Motor		
Digester Gas Boiler	Explosion Proof		No
Digester Gas Boiler	HP		5
Digester Gas Boiler	Voltage		460
Digester Gas Boiler	Drive/Starter		
Digester Gas Boiler	Standby Power		Yes
Natural Gas Boiler	Name		Natural Gas Boiler No. 1
Natural Gas Boiler	Purpose		Utilize natural gas to create hot water for heating
Natural Gas Boiler	Type		Condensing Boiler
Natural Gas Boiler	Manufacturers		
Natural Gas Boiler	A.		Aerco
Natural Gas Boiler	Model		
Natural Gas Boiler	A.		BMK-2500
Natural Gas Boiler	Total Number of Units		1
Natural Gas Boiler	Output	MBH	2175
Natural Gas Boiler	Motor		
Natural Gas Boiler	Explosion Proof		No
Natural Gas Boiler	HP		3.2
Natural Gas Boiler	Voltage		460
Natural Gas Boiler	Drive/Starter		
Natural Gas Boiler	Standby Power		Yes
DG Boiler Pump	Name		Digester Gas Boiler Pump No. 1 and No. 2
DG Boiler Pump	Purpose		Circulate hot water
DG Boiler Pump	Type		Inline Centrifugal
DG Boiler Pump	Manufacturers		
DG Boiler Pump	A.		Bell and Gossett
DG Boiler Pump	Model		
DG Boiler Pump	A.		
DG Boiler Pump	Total Number of Units		2
DG Boiler Pump	Capacity per Unit	gpm	TBD
DG Boiler Pump	Motor		
DG Boiler Pump	Explosion Proof		No
DG Boiler Pump	HP		2
DG Boiler Pump	Voltage		460
DG Boiler Pump	RPM		

DG Boiler Pump		Drive/Starter		
DG Boiler Pump		Control		
DG Boiler Pump		Standby Power		Yes
DG Boiler Pump	Miscellaneous			
NG Boiler Pump	Name			Natural Gas Boiler Pump No. 1
NG Boiler Pump	Purpose			Circulate hot water
NG Boiler Pump	Type			Inline Centrifugal
NG Boiler Pump	Manufacturers			
NG Boiler Pump		A.		Bell and Gossett
NG Boiler Pump	Model			
NG Boiler Pump		A.		
NG Boiler Pump	Total Number of Units			1
NG Boiler Pump	Capacity per Unit		gpm	TBD
NG Boiler Pump	Motor			
NG Boiler Pump		Explosion Proof		No
NG Boiler Pump		HP		2
NG Boiler Pump		Voltage		460
NG Boiler Pump		RPM		
NG Boiler Pump		Drive/Starter		
NG Boiler Pump		Control		
NG Boiler Pump		Standby Power		Yes
DS Heat Exchanger	Name			Digester 3 and Digester 4 Heat Exchanger
DS Heat Exchanger	Purpose			Heat sludge in Digester 3 and Digester 4
DS Heat Exchanger	Type			Tube-in-tube
DS Heat Exchanger	Manufacturers			
DS Heat Exchanger		A.		Evoqua
DS Heat Exchanger		B.		Walker Process
DS Heat Exchanger	Model			
DS Heat Exchanger		A.		4228
DS Heat Exchanger		B.		
DS Heat Exchanger	Total Number of Units			2
DS Heat Exchanger	Capacity per Unit		MBH	250
DS Heat Exchanger	Water			
DS Heat Exchanger		Flow Rate	gpm	100
DS Heat Exchanger		Inlet Temperature	deg F	155
DS Heat Exchanger		Outlet Temperature	deg F	135
DS Heat Exchanger	Sludge			
DS Heat Exchanger		Flow Rate	gpm	150
DS Heat Exchanger		Bulk Temperature	deg F	95
Primary HW Pumps	Name			Primary Hot Water Pump No. 1 and 2
Primary HW Pumps	Purpose			Circulate hot water
Primary HW Pumps	Type			Centrifugal
Primary HW Pumps	Manufacturers			
Primary HW Pumps		A.		Bell and Gossett
Primary HW Pumps	Model			
Primary HW Pumps		A.		
Primary HW Pumps	Total Number of Units			2
Primary HW Pumps	Capacity per Unit		gpm	300-400
Primary HW Pumps	Motor			
Primary HW Pumps		Explosion Proof		No
Primary HW Pumps		HP		5
Primary HW Pumps		Voltage		460
Primary HW Pumps		RPM		
Primary HW Pumps		Drive/Starter		
Primary HW Pumps		Control		
Primary HW Pumps		Standby Power		

710 - Digester 1

None

720 - Digester 2

None

730 - Digester 3

Floating Digester Cover	Name			Digester Cover
Floating Digester Cover	Purpose			Cover anaerobic digester
Floating Digester Cover	Type			Arched Rib/Duo Deck

Floating Digester Cover	Manufacturers		
Floating Digester Cover	A.		Evoqua
Floating Digester Cover	B.		Walker Process
Floating Digester Cover	C.		OTI
Floating Digester Cover	Total Number of Units		2
Floating Digester Cover	Diameter	ft	80

740 - Digester 4

Floating Digester Cover	Name		Digester Cover
Floating Digester Cover	Purpose		Cover anaerobic digester
Floating Digester Cover	Type		Arched Rib/Duo Deck
Floating Digester Cover	Manufacturers		
Floating Digester Cover	A.		Evoqua
Floating Digester Cover	B.		Walker Process
Floating Digester Cover	C.		OTI
Floating Digester Cover	Total Number of Units		2
Floating Digester Cover	Diameter	ft	80

750 - Gas Sphere

None

755 - Waste Gas Burner

Waste Gas Burner	Name		Waste Gas Burner
Waste Gas Burner	Purpose		Burn digester gas
Waste Gas Burner	Type		Candle Stick
Waste Gas Burner	Manufacturers		
Waste Gas Burner	A.		Shand and Jurs
Waste Gas Burner	B.		Varec
Waste Gas Burner	Model		
Waste Gas Burner	A.		?
Waste Gas Burner	B.		244W
Waste Gas Burner	Total Number of Units		1
Waste Gas Burner	Burning Capacity	CFD	242,450
Waste Gas Burner	Size	in.	6
Waste Gas Burner	Power	Volts	115
Waste Gas Burner	Activation pressure	in. wg.	10

756- Digester Gas Manhole 1

Sump Pump	Name		Sump Pump
Sump Pump	Purpose		Pump water out of manhole
Sump Pump	Manufacturer		Neptune Pump
Sump Pump	Model		LD
Sump Pump	Motor		
Sump Pump	Explosion Proof		Yes
Sump Pump	HP		1/3
Sump Pump	Voltage		115

757- Digester Gas Manhole 2

Sump Pump	Name		Sump Pump
Sump Pump	Purpose		Pump water out of manhole
Sump Pump	Manufacturer		Neptune Pump
Sump Pump	Model		LD
Sump Pump	Motor		
Sump Pump	Explosion Proof		Yes
Sump Pump	HP		1/3
Sump Pump	Voltage		115

760 - Cake Storage

None

770 - Solids Building

Sludge Screens	Name		Sludge Screen No. 1 and 2
Sludge Screens	Purpose		Remove debris from primary sludge
Sludge Screens	Type		Internal screw with perforated screen basket
Sludge Screens	Manufacturers		
Sludge Screens	A.		Huber Technology, Inc.
Sludge Screens	B.		Hydro International

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

Sludge Screens	Model		
Sludge Screens	A.		Strain Press -290
Sludge Screens	B.		Hydro-Sludge
Sludge Screens	Total Number of Units		2
Sludge Screens	Capacity per Unit	gpm	175-440 depenfing on solids concentration
Sludge Screens	Total Capacity	gpm	175-440, firm
Sludge Screens	Material		304 SST mostly
Sludge Screens	Motor		
Sludge Screens	Explosion Proof		No
Sludge Screens	HP		5
Sludge Screens	Voltage		480V / 3 phase
Sludge Screens	RPM		
Sludge Screens	Drive/Starter		Reversing
Sludge Screens	Standby Power		No
TPSD Pumps	Name		TPSD Pump No. 1 and 2
TPSD Pumps	Purpose		Pump TPSD from thickener to digesters
TPSD Pumps	Type		Air operated diaphragm
TPSD Pumps	Manufacturers		
TPSD Pumps	A.		Dorr Oliver
TPSD Pumps	B.		Ramparts
TPSD Pumps	Model		
TPSD Pumps	A.		
TPSD Pumps	B.		
TPSD Pumps	Total Number of Units		2
TPSD Pumps	Capacity per Unit	gpm	40
TPSD Pumps	Total Capacity	gpm	40, firm
TPSD Pumps	Material		Cast iron w/ EPDM diaphragm
WAS GBTs	Name		WAS Gravity Belt Thickener No. 1 and 2
WAS GBTs	Purpose		Thicken WAS activated sludge prior to digestion
WAS GBTs	Type		2-m gravity belt thickeners
WAS GBTs	Manufacturers		
WAS GBTs	A.		Komline-Sanderson
WAS GBTs	B.		Alfa-Laval/Ashbrook
WAS GBTs	Total Number of Units		2
WAS GBTs	Capacity per Unit	gpm	400
WAS GBTs	Total Capacity	gpm	800
WAS GBTs	Motor		
WAS GBTs	Explosion Proof		No
WAS GBTs	HP		3
WAS GBTs	Voltage		480/3
WAS GBTs	RPM		
WAS GBTs	Drive/Starter		VFD
WAS GBTs	Standby Power		No
GBT Polymer Mixing	Name		Polymer Mixing System No. 1 and 2
GBT Polymer Mixing	Purpose		Dilution neat polymer to 0.5%
GBT Polymer Mixing	Type		Emulsion polymer dilution system
GBT Polymer Mixing	Manufacturers		
GBT Polymer Mixing	A.		UGSI
GBT Polymer Mixing	B.		Prominent
GBT Polymer Mixing	C.		Fluid Dynamics
GBT Polymer Mixing	D.		Velodyne
GBT Polymer Mixing	Total Number of Units		2
GBT Polymer Mixing	Capacity per Unit	gph	13
GBT Polymer Mixing	Total Capacity	gph	13, firm
GBT Polymer Mixing	Motor		
GBT Polymer Mixing	Explosion Proof		No
GBT Polymer Mixing	HP		
GBT Polymer Mixing	Voltage		480V / 3 phase
GBT Polymer Mixing	RPM		
GBT Polymer Mixing	Drive/Starter		VFD
GBT Polymer Mixing	Standby Power		No
BFP Polymer Mixing	Name		Polymer Mixing System No. 3 and 4
BFP Polymer Mixing	Purpose		Dilution neat polymer to 0.5%
BFP Polymer Mixing	Type		Emulsion polymer dilution system
BFP Polymer Mixing	Manufacturers		

BFP Polymer Mixing	A.		UGSI
BFP Polymer Mixing	B.		Prominent
BFP Polymer Mixing	C.		Fluid Dynamics
BFP Polymer Mixing	D.		Velodyne
BFP Polymer Mixing	Total Number of Units		2
BFP Polymer Mixing	Capacity per Unit	gph	15
BFP Polymer Mixing	Total Capacity	gph	15, firm
BFP Polymer Mixing	Motor		
BFP Polymer Mixing	Explosion Proof		No
BFP Polymer Mixing	HP		
BFP Polymer Mixing	Voltage		480V / 3 phase
BFP Polymer Mixing	RPM		
BFP Polymer Mixing	Drive/Starter		VFD
BFP Polymer Mixing	Standby Power		No
GBT Polymer Feed	Name		Polymer Feed System No. 1 and 2
GBT Polymer Feed	Purpose		Dilution polymer solution to 0.1%
GBT Polymer Feed	Type		Polymer dilution system
GBT Polymer Feed	Manufacturers		
GBT Polymer Feed	A.		UGSI
GBT Polymer Feed	B.		Prominent
GBT Polymer Feed	C.		Fluid Dynamics
GBT Polymer Feed	D.		Velodyne
GBT Polymer Feed	Total Number of Units		2
GBT Polymer Feed	Capacity per Unit	gph	26
GBT Polymer Feed	Total Capacity	gph	52
GBT Polymer Feed	Motor		
GBT Polymer Feed	Explosion Proof		No
GBT Polymer Feed	HP		
GBT Polymer Feed	Voltage		480V / 3 phase
GBT Polymer Feed	RPM		
GBT Polymer Feed	Drive/Starter		VFD
GBT Polymer Feed	Standby Power		No
BFP Polymer Feed	Name		Polymer Feed System No. 3 and 4
BFP Polymer Feed	Purpose		Dilution polymer solution to 0.1%
BFP Polymer Feed	Type		Polymer dilution system
BFP Polymer Feed	Manufacturers		
BFP Polymer Feed	A.		UGSI
BFP Polymer Feed	B.		Prominent
BFP Polymer Feed	C.		Fluid Dynamics
BFP Polymer Feed	D.		Velodyne
BFP Polymer Feed	Total Number of Units		2
BFP Polymer Feed	Capacity per Unit	gph	33
BFP Polymer Feed	Total Capacity	gph	66
BFP Polymer Feed	Motor		
BFP Polymer Feed	Explosion Proof		No
BFP Polymer Feed	HP		
BFP Polymer Feed	Voltage		480V / 3 phase
BFP Polymer Feed	RPM		
BFP Polymer Feed	Drive/Starter		VFD
BFP Polymer Feed	Standby Power		No
GBT Polymer Aging Tank	Name		GBT Polymer Aging Tank
GBT Polymer Aging Tank	Purpose		Aging 0.5% polymer solution
GBT Polymer Aging Tank	Type		Polyethylene tank
GBT Polymer Aging Tank	Manufacturers		
GBT Polymer Aging Tank	A.		Poly Processing
GBT Polymer Aging Tank	B.		Snyder
GBT Polymer Aging Tank	C.		Assman
GBT Polymer Aging Tank	Total Number of Units		1
GBT Polymer Aging Tank	Capacity per Unit	gallons	1,250
BFP Polymer Aging Tank	Name		BFP Polymer Aging Tank
BFP Polymer Aging Tank	Purpose		Aging 0.5% polymer solution
BFP Polymer Aging Tank	Type		Polyethylene tank
BFP Polymer Aging Tank	Manufacturers		
BFP Polymer Aging Tank	A.		Poly Processing
BFP Polymer Aging Tank	B.		Snyder

BFP Polymer Aging Tank	C.		Assman
BFP Polymer Aging Tank	Total Number of Units		1
BFP Polymer Aging Tank	Capacity per Unit	gallons	1,250
BFP Polymer Storage Tank	Name		BFP Polymer Storage Tank
BFP Polymer Storage Tank	Purpose		Storing neat emulsion polymer
BFP Polymer Storage Tank	Type		Polyethylene tank
BFP Polymer Storage Tank	Manufacturers		
BFP Polymer Storage Tank	A.		Poly Processing
BFP Polymer Storage Tank	B.		Snyder
BFP Polymer Storage Tank	C.		Assman
BFP Polymer Storage Tank	Total Number of Units		1
BFP Polymer Storage Tank	Capacity per Unit	gallons	6,100
Ferric Storage Tank	Name		Ferric Storage Tank
Ferric Storage Tank	Purpose		Storing ferric chloride
Ferric Storage Tank	Type		Polyethylene tank
Ferric Storage Tank	Manufacturers		
Ferric Storage Tank	A.		Poly Processing
Ferric Storage Tank	B.		Snyder
Ferric Storage Tank	C.		Assman
Ferric Storage Tank	Total Number of Units		1
Ferric Storage Tank	Capacity per Unit	gallons	2,000
Ferric Feed System	Name		Ferric Feed System
Ferric Feed System	Purpose		Feed ferric chloride to BFP filtrate
Ferric Feed System	Type		Chemical feed system
Ferric Feed System	Manufacturers		
Ferric Feed System	A.		UGSI
Ferric Feed System	B.		Prominent
Ferric Feed System	Total Number of Units		1
Ferric Feed System	Capacity per Unit	gph	10
Ferric Feed System	Motor		
Ferric Feed System	Explosion Proof		No
Ferric Feed System	HP		
Ferric Feed System	Voltage		120V / 1 phase
Ferric Feed System	RPM		
Ferric Feed System	Drive/Starter		VFD
Ferric Feed System	Standby Power		No
Belt Filter Presses	Name		Belt Filter Press No. 1 and 2
Belt Filter Presses	Purpose		Dewater digested sludge
Belt Filter Presses	Type		1.5-m belt filter presses
Belt Filter Presses	Manufacturers		
Belt Filter Presses	A.		Komline-Sanderson
Belt Filter Presses	B.		Alfa-Laval/Ashbrook
Belt Filter Presses	C.		BDP
Belt Filter Presses	Total Number of Units		2
Belt Filter Presses	Capacity per Unit	lbs/h	1,350
Belt Filter Presses	Total Capacity	lbs/h	2,700
Belt Filter Presses	Motor		
Belt Filter Presses	Explosion Proof		No
Belt Filter Presses	HP		3
Belt Filter Presses	Voltage		480/3
Belt Filter Presses	RPM		
Belt Filter Presses	Drive/Starter		VFD
Belt Filter Presses	Standby Power		No
Sludge Drying System	4,500 lbs/h evaporative capacity		
Cake Sludge Hopper	Name		Cake Sludge Hopper
Cake Sludge Hopper	Purpose		Store dewatered cake
Cake Sludge Hopper	Type		Steel hopper with live bottom
Cake Sludge Hopper	Manufacturers		
Cake Sludge Hopper	A.		JMS
Cake Sludge Hopper	Total Number of Units		1
Cake Sludge Hopper	Capacity per Unit	cy	
Cake Sludge Hopper	Total Capacity		
Screw Feeders	Name		Screw Feeder No. 1 and 2

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

Screw Feeders	Purpose		Feed dewatered sludge to wet cake pumps
Screw Feeders	Type		Twin auger screws
Screw Feeders	Manufacturers		
Screw Feeders	A.		JMS
Screw Feeders	Total Number of Units		2
Screw Feeders	Capacity per Unit	lbs/h	
Screw Feeders	Total Capacity	lbs/h	
Screw Feeders	Motor		
Screw Feeders	Explosion Proof		No
Screw Feeders	HP		5
Screw Feeders	Voltage		480/3
Screw Feeders	RPM		
Screw Feeders	Drive/Starter		VFD
Screw Feeders	Standby Power		No
Wet Cake Pumps	Name		Wet Cake Pump Nos. 1-4
Wet Cake Pumps	Purpose		Feed dewatered cake to dryer dosing pumps
Wet Cake Pumps	Type		Progressive cavity
Wet Cake Pumps	Manufacturers		
Wet Cake Pumps	A.		Seepex
Wet Cake Pumps	Total Number of Units		4
Wet Cake Pumps	Capacity per Unit	gpm	
Wet Cake Pumps	Total Capacity	gpm	
Wet Cake Pumps	Motor		
Wet Cake Pumps	Explosion Proof		No
Wet Cake Pumps	HP		15
Wet Cake Pumps	Voltage		480/3
Wet Cake Pumps	RPM		
Wet Cake Pumps	Drive/Starter		VFD
Wet Cake Pumps	Standby Power		No
Wet Cake Dosing Pumps	Name		Wet Cake Dosing Pump Nos. 1-8
Wet Cake Dosing Pumps	Purpose		Pump wet cake through dryer nozzles
Wet Cake Dosing Pumps	Type		Progressive cavity
Wet Cake Dosing Pumps	Manufacturers		
Wet Cake Dosing Pumps	A.		Seepex
Wet Cake Dosing Pumps	Total Number of Units		8
Wet Cake Dosing Pumps	Capacity per Unit	gpm	
Wet Cake Dosing Pumps	Total Capacity	gpm	
Wet Cake Dosing Pumps	Motor		
Wet Cake Dosing Pumps	Explosion Proof		Yes
Wet Cake Dosing Pumps	HP		5
Wet Cake Dosing Pumps	Voltage		480/3
Wet Cake Dosing Pumps	RPM		
Wet Cake Dosing Pumps	Drive/Starter		VFD
Wet Cake Dosing Pumps	Standby Power		No
Rotating Depositor	Name		Rotating Depositer
Rotating Depositor	Purpose		Distribute cake sludge on dryer belt
Rotating Depositor	Total Number of Units		1
Rotating Depositor	Motor		
Rotating Depositor	Explosion Proof		Yes
Rotating Depositor	HP		2
Rotating Depositor	Voltage		480/3
Rotating Depositor	RPM		
Rotating Depositor	Drive/Starter		VFD
Rotating Depositor	Standby Power		No
Belt No. 1	Name		Belt No. 1
Belt No. 1	Purpose		Covey sludge through dryer
Belt No. 1	Total Number of Units		1
Belt No. 1	Motor		
Belt No. 1	Explosion Proof		Yes
Belt No. 1	HP		2
Belt No. 1	Voltage		480/3
Belt No. 1	RPM		
Belt No. 1	Drive/Starter		VFD
Belt No. 1	Standby Power		No

UNIT PROCESS EQUIPMENT DESIGN SUMMARY

Preliminary Layouts

Belt No. 2	Name		Belt No. 1
Belt No. 2	Purpose		Covey sludge through dryer
Belt No. 2	Total Number of Units		1
Belt No. 2	Motor		
Belt No. 2	Explosion Proof		Yes
Belt No. 2	HP		2
Belt No. 2	Voltage		480/3
Belt No. 2	RPM		
Belt No. 2	Drive/Starter		VFD
Belt No. 2	Standby Power		No
Warm Zone Fans	Name		Warm Zone Fan No. 1 and 2
Warm Zone Fans	Purpose		Circulate air through the dryer
Warm Zone Fans	Type		Centrifugal
Warm Zone Fans	Manufacturers		
Warm Zone Fans	A.		
Warm Zone Fans	Total Number of Units		2
Warm Zone Fans	Capacity per Unit	scfm	
Warm Zone Fans	Total Capacity	scfm	
Warm Zone Fans	Motor		
Warm Zone Fans	Explosion Proof		Yes
Warm Zone Fans	HP		30
Warm Zone Fans	Voltage		480/3
Warm Zone Fans	RPM		
Warm Zone Fans	Drive/Starter		VFD
Warm Zone Fans	Standby Power		No
End Zone Fans	Name		End Zone Fan No. 1 and 2
End Zone Fans	Purpose		Circulate air through the dryer
End Zone Fans	Type		Centrifugal
End Zone Fans	Manufacturers		
End Zone Fans	A.		
End Zone Fans	Total Number of Units		2
End Zone Fans	Capacity per Unit	scfm	
End Zone Fans	Total Capacity	scfm	
End Zone Fans	Motor		
End Zone Fans	Explosion Proof		Yes
End Zone Fans	HP		25
End Zone Fans	Voltage		480/3
End Zone Fans	RPM		
End Zone Fans	Drive/Starter		VFD
End Zone Fans	Standby Power		No
Warm Zone Heat Exchanger	Name		Warm Zone HEX
Warm Zone Heat Exchanger	Purpose		Transfer heat from thermal fluid to dryer air
Warm Zone Heat Exchanger	Type		
Warm Zone Heat Exchanger	Manufacturers		
Warm Zone Heat Exchanger	A.		
Warm Zone Heat Exchanger	Total Number of Units		1
Warm Zone Heat Exchanger	Capacity per Unit	btu/h	
Warm Zone Heat Exchanger	Total Capacity	btu/h	
End Zone Heat Exchanger	Name		End Zone HEX
End Zone Heat Exchanger	Purpose		Transfer heat from thermal fluid to dryer air
End Zone Heat Exchanger	Type		
End Zone Heat Exchanger	Manufacturers		
End Zone Heat Exchanger	A.		
End Zone Heat Exchanger	Total Number of Units		1
End Zone Heat Exchanger	Capacity per Unit	btu/h	
End Zone Heat Exchanger	Total Capacity	btu/h	
Extraction Screw	Name		Extraction Screw
Extraction Screw	Purpose		Remove dried sludge from dryer
Extraction Screw	Type		Screw Conveyor
Extraction Screw	Manufacturers		
Extraction Screw	A.		
Extraction Screw	Total Number of Units		1
Extraction Screw	Capacity per Unit	cfm	
Extraction Screw	Total Capacity	cfm	

Extraction Screw	Motor		
Extraction Screw	Explosion Proof		Yes
Extraction Screw	HP		3
Extraction Screw	Voltage		480/3
Extraction Screw	RPM		
Extraction Screw	Drive/Starter		VFD
Extraction Screw	Standby Power		No
Rotary Valve	Name		Rotary Valve
Rotary Valve	Purpose		Control inlet to the extraction screw
Rotary Valve	Type		Rotary airlock valve
Rotary Valve	Manufacturers		
Rotary Valve	A.		
Rotary Valve	Total Number of Units		1
Rotary Valve	Capacity per Unit	cfm	
Rotary Valve	Total Capacity	cfm	
Rotary Valve	Motor		
Rotary Valve	Explosion Proof		Yes
Rotary Valve	HP		1
Rotary Valve	Voltage		480/3
Rotary Valve	RPM		
Rotary Valve	Drive/Starter		CS
Rotary Valve	Standby Power		No
Thermal Fluid Heating System	Name		Thermal Fluid Heating System
Thermal Fluid Heating System	Purpose		Provide heat to the drying system
Thermal Fluid Heating System	Type		NG burning thermal oil system
Thermal Fluid Heating System	Manufacturers		
Thermal Fluid Heating System	A.		
Thermal Fluid Heating System	Total Number of Units		1
Thermal Fluid Heating System	Capacity per Unit	btu/h	
Thermal Fluid Heating System	Total Capacity	btu/h	
Condenser	Name		Condenser
Condenser	Purpose		Remove evaporated water from air
Condenser	Type		Spray condenser
Condenser	Manufacturers		
Condenser	A.		
Condenser	Total Number of Units		1
Condenser	Capacity per Unit	btu/h	
Condenser	Total Capacity	btu/h	
Drying Air Treatment Fan	Name		Drying Air Treatment Fan
Drying Air Treatment Fan	Purpose		Circulate air between the condenser and dryer
Drying Air Treatment Fan	Type		Centrifugal
Drying Air Treatment Fan	Manufacturers		
Drying Air Treatment Fan	A.		
Drying Air Treatment Fan	Total Number of Units		1
Drying Air Treatment Fan	Capacity per Unit	scfm	
Drying Air Treatment Fan	Total Capacity	scfm	
Drying Air Treatment Fan	Motor		
Drying Air Treatment Fan	Explosion Proof		Yes
Drying Air Treatment Fan	HP		15
Drying Air Treatment Fan	Voltage		480/3
Drying Air Treatment Fan	RPM		
Drying Air Treatment Fan	Drive/Starter		VFD
Drying Air Treatment Fan	Standby Power		No
Vacuum Fan	Name		Vacuum Fan
Vacuum Fan	Purpose		Waste air from the condenser to atmosphere
Vacuum Fan	Type		Centrifugal
Vacuum Fan	Manufacturers		
Vacuum Fan	A.		
Vacuum Fan	Total Number of Units		1
Vacuum Fan	Capacity per Unit	scfm	
Vacuum Fan	Total Capacity	scfm	
Vacuum Fan	Motor		
Vacuum Fan	Explosion Proof		Yes
Vacuum Fan	HP		3

Vacuum Fan	Voltage		480/3
Vacuum Fan	RPM		
Vacuum Fan	Drive/Starter		VFD
Vacuum Fan	Standby Power		No
Drag Conveyors	Name		Drag Conveyor No. 1 and 2
Drag Conveyors	Purpose		Transport dried biosolids to the silo
Drag Conveyors	Type		Tubular drag conveyor
Drag Conveyors	Manufacturers		
Drag Conveyors	A.		Hapman
Drag Conveyors	Total Number of Units		1
Drag Conveyors	Capacity per Unit	cfm	
Drag Conveyors	Total Capacity	cfm	
Drag Conveyors	Motor		
Drag Conveyors	Explosion Proof		No
Drag Conveyors	HP		
Drag Conveyors	Voltage		480/3
Drag Conveyors	RPM		
Drag Conveyors	Drive/Starter		VFD
Drag Conveyors	Standby Power		No
Recycle Sampler	Name		Recycle Sampler
Recycle Sampler	Purpose		Sample Recycle Wet Well
Recycle Sampler	Type		Stationary, Refridgerates
Recycle Sampler	Manufacturers		
Recycle Sampler	A.		Teledyne-Isco
Recycle Sampler	Total Number of Units		1
Recycle Pumps	Name		Recycle Pump No. 1 and 2
Recycle Pumps	Purpose		Pump recycle flow to the front of the plant
Recycle Pumps	Type		Centrifugal
Recycle Pumps	Manufacturers		
Recycle Pumps	A.		Fairbanks Morse
Recycle Pumps	B.		Hayward Gordon
Recycle Pumps	Total Number of Units		2
Recycle Pumps	Capacity per Unit	gpm	2,809
Recycle Pumps	Total Capacity	gpm	2,809 firm
Recycle Pumps	Motor		
Recycle Pumps	Explosion Proof		No
Recycle Pumps	HP		40
Recycle Pumps	Voltage		480/3
Recycle Pumps	RPM		
Recycle Pumps	Drive/Starter		VFD
Recycle Pumps	Standby Power		No
Compressed Air System	Name		Compressed Air System No. 1 and 2
Compressed Air System	Purpose		Provided compressed air to the plant
Compressed Air System	Type		Screw compressor with dessicant dryers
Compressed Air System	Manufacturers		
Compressed Air System	A.		Ingersoll-Rand
Compressed Air System	B.		Kaeser
Compressed Air System	C.		Aerzen
Compressed Air System	Total Number of Units		2
Compressed Air System	Capacity per Unit	scfm	110
Compressed Air System	Total Capacity	scfm	110
Compressed Air System	Motor		
Compressed Air System	Explosion Proof		No
Compressed Air System	HP		
Compressed Air System	Voltage		480/3
Compressed Air System	RPM		
Compressed Air System	Drive/Starter		VFD
Compressed Air System	Standby Power		No
Compressed Air Receiver	Name		Compressed Air Receiver
Compressed Air System	Purpose		Provided compressed air to the plant
Compressed Air System	Type		Vertical, steel air receiver
Compressed Air System	Manufacturers		
Compressed Air System	A.		Ingersoll-Rand
Compressed Air System	B.		Kaeser

Compressed Air System	C.		Aerzen
Compressed Air System	Total Number of Units		1
Compressed Air System	Capacity per Unit	gal	240
RAS Pumps	Name		RAS Pumps 1-3
RAS Pumps	Purpose		Convey RAS from Secondary Clarifer Nos. 3 and 4 to anoxic selector tank
RAS Pumps	Type		Screw Centrifugal Pumps
RAS Pumps	Manufacturers		
RAS Pumps	A.		Hayward Gordon
RAS Pumps	B.		Fairbanks Morse
RAS Pumps	C.		Wemco
RAS Pumps	Model		
RAS Pumps	A.		XCS8D, XCS8C
RAS Pumps	B.		TBD
RAS Pumps	C.		TBD
RAS Pumps	Total Number of Units		3
RAS Pumps	Capacity per Unit	gpm	2,400
RAS Pumps	Firm Capacity	gpm	4,800
RAS Pumps	Material		
RAS Pumps	Casing		Cast Iron, ASTM A48 CL30
RAS Pumps	Impeller and Suction Liner		High Chrome Iron, ASTM A532
RAS Pumps	Motor		
RAS Pumps	Explosion Proof		No
RAS Pumps	HP		20
RAS Pumps	Voltage		460V / 3 phase
RAS Pumps	RPM		1800
RAS Pumps	Drive/Starter		VFD
RAS Pumps	Standby Power		Yes
WAS Pumps	Name		WAS Pumps 1-3
WAS Pumps	Purpose		Convey WAS from Secondary Clarifier Nos. 3 and 4 to gravity belt thickener
WAS Pumps	Type		Screw Centrifugal Pumps
WAS Pumps	Manufacturers		
WAS Pumps	A.		Hayward Gordon
WAS Pumps	B.		Fairbanks Morse
WAS Pumps	C.		Wemco
WAS Pumps	Model		
WAS Pumps	A.		XCS5C
WAS Pumps	B.		TBD
WAS Pumps	C.		TBD
WAS Pumps	Total Number of Units		3
WAS Pumps	Capacity per Unit	gpm	600
WAS Pumps	Firm Capacity	gpm	1200
WAS Pumps	Material		
WAS Pumps	Casing		Cast Iron, ASTM A48 CL30
WAS Pumps	Impeller and Suction Liner		High Chrome Iron, ASTM A532
WAS Pumps	Motor		
WAS Pumps	Explosion Proof		
WAS Pumps	HP		5
WAS Pumps	Voltage		460V / 3 phase
WAS Pumps	RPM		1800
WAS Pumps	Drive/Starter		VFD
WAS Pumps	Standby Power		Yes

771 - Silo

Biosolids Storage Silo	Name		Biosolids Storage Silo
Biosolids Storage Silo	Purpose		Store dried biosolids
Biosolids Storage Silo	Type		Vertical, steel, drive under silo
Biosolids Storage Silo	Manufacturers		
Biosolids Storage Silo	A.		CST
Biosolids Storage Silo	Total Number of Units		1
Biosolids Storage Silo	Capacity per Unit	cf	7,500

772 - Nitrogen System

Nitrogen System	Name		Nitrogen System
Nitrogen System	Purpose		Purge the silo if a fire is detected
Nitrogen System	Type		Liquid nitrogen storage and evaporation

Nitrogen System	Manufacturers			
Nitrogen System	A.			Praxair
Nitrogen System	B.			AirGas
Nitrogen System	Total Number of Units			1
Nitrogen System	Capacity per Unit		gal	3,000

775 - PSD Thickener

PSD Thickener	Name			PSD Thickener
PSD Thickener	Purpose			Thicken thin primary sludge prior to digestion
PSD Thickener	Type			Gravity thickener
PSD Thickener	Manufacturers			
PSD Thickener	A.			Ovivo
PSD Thickener	B.			WesTech
PSD Thickener	C.			Walker Process
PSD Thickener	Total Number of Units			1
PSD Thickener	Capacity per Unit		ppd	12,450
PSD Thickener	Motor			
PSD Thickener		Explosion Proof		No
PSD Thickener		HP		1
PSD Thickener		Voltage		480/3
PSD Thickener		RPM		
PSD Thickener		Drive/Starter		VFD
PSD Thickener		Standby Power		No

900 - Tunnel

Primary Sludge Pumps	Name			PSD Pump Nos. 1-4
Primary Sludge Pumps	Purpose			Pump primary sludge to screens or digesters
Primary Sludge Pumps	Type			Centrifugal, grit handling
Primary Sludge Pumps	Manufacturers			
Primary Sludge Pumps	A.			Wemco
Primary Sludge Pumps	B.			Fairbanks Morse
Primary Sludge Pumps	Total Number of Units			1
Primary Sludge Pumps	Capacity per Unit		gpm	500
Primary Sludge Pumps	Motor			
Primary Sludge Pumps		Explosion Proof		No
Primary Sludge Pumps		HP		30
Primary Sludge Pumps		Voltage		480/3
Primary Sludge Pumps		RPM		
Primary Sludge Pumps		Drive/Starter		VFD
Primary Sludge Pumps		Standby Power		No

Primary Scum Pumps	Name			PSM Pump No. 1 and 2
Primary Scum Pumps	Purpose			Pump primary scum to the digesters
Primary Scum Pumps	Type			Centrifugal
Primary Scum Pumps	Manufacturers			
Primary Scum Pumps	A.			Wemco
Primary Scum Pumps	B.			Fairbanks Morse
Primary Scum Pumps	Total Number of Units			2
Primary Scum Pumps	Capacity per Unit		gpm	100
Primary Scum Pumps	Motor			
Primary Scum Pumps		Explosion Proof		No
Primary Scum Pumps		HP		
Primary Scum Pumps		Voltage		480/3
Primary Scum Pumps		RPM		
Primary Scum Pumps		Drive/Starter		FVNR
Primary Scum Pumps		Standby Power		No

PLUMBING

FACILITY-WIDE

This section summarizes Plumbing features applicable to the Project.

Codes

1. SPS 382: Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing
2. SPS 363: Energy Conservation. International Energy Conservation Code with Wisconsin Amendments
3. Ten States Standards for Wastewater Facilities
4. NR110: Wisconsin Wastewater Treatment Facility Design Code

Water Service / Site

1. Donohue identified the following as standard:
    a. W1 is potable water
    b. W2 is non-potable water from the city supply
    c. W3 is pumped plant effluent (non-potable)

2. Existing water service will be modified to installed site backflow preventer at grade level within the Building 100 Motor Room.
    a. Potable (W1) and Non-potable (2) backflow preventers will be included.
    b. W1 and W2 piping will be extended to other structures through the tunnel system to the greatest extent possible.
    c. W3 piping will be looped around the site to serve all structures for washdown and process needs.
    d. W2 will be piped to serve as a back-up water supply for critical W3 loads such as seal water connections.

3. Dedicated fire protection water services will be extended to Building 610 and Building 770 for fire suppression system supply. Each service will be protected by a backflow preventer.

Piping and Valves

1. All sanitary piping to be of PVC construction with the exception of hub drains. Hub drains will be of cast iron construction and transition to PVC below slab.
2. All sanitary vent piping to be of PVC construction.
3. All storm piping to be of PVC DWV construction.
4. All W1, W2, and W3 piping 4” and larger to be of cement lined ductile iron construction.
5. All W1 piping smaller than 4”, with the exception of the Administration Building, will be CPVC construction. All W1 piping in the Administration Building will be copper.
6. All W2 and W3 piping smaller than 4” will be of PVC construction except as follows:

    a. Drops to hose reels, hose connection, and equipment connection will be stainless steel from service connection to a location a minimum of two pipe supports from connection.

7. Unless indicated otherwise, all washwater connections will be ¾” hose thread connections.

8. All water lines will be insulated with 1” fiberglass insulation with PVC jacketing.
9. All exterior water lines requiring heat tracing and insulation will be insulated with 2” of polyisocyanurate insulation and aluminum jacketing.
10. Water supply to each structure will be supplied with a gate valve for isolation. All other plumbing valve will be ball valves of materials matching piping system in which they are installed.

Fixtures and Equipment

1. Water closets (WC) will be wall outlet, flush valve type with automatic flush.
2. Urinals will be wall mounted type with automatic flush valve operation.
3. Toilet Room lavatories will be wall hung type.
4. Locker Room lavatories will be drop-in type installed on a countertop.
5. Counter top sinks in the Break Rooms will be of stainless steel construction.
6. Showers will be ADA accessible.
7. Mop sinks will be terrazzo finished, floor mounted sink with stainless steel rim guard.
8. Sample (SS-1) and service sinks (SS-2) will be of heavy-duty, cast iron design with enamel finish and stainless steel rim guard.
9. Interior emergency wash stations located within chemical rooms will be of PVC construction with face wash assembly.
10. Interior emergency wash stations located within Laboratories will be of stainless steel construction with face wash assembly.
11. Freeze resistant emergency wash station will be plumed with stainless steel piping.
12. All emergency wash stations will be supplied a tepid (>70°F) water supply.
13. Domestic water heaters will be high efficiency, natural gas fired, sealed combustion type.
14. Sump pumps will be submersible style. Simplex installations will contain integral float controls. Duplex installations will include a control panel and float controls. Pump removal rails will be provided for any sump deeper than 3-feet.
15. Floor drains in process spaces will have coated iron grate.
16. Floor drains in finished spaces will have polished nickel grate.

STRUCTURE-BY-STRUCTURE

This section summarizes Plumbing features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. Building will remain entrance location of main water service. W1 and W2 backflow preventers will be installed at grade level within the Motor Room.
2. Existing sump pumps within the Pump Room and the Lower Level will be replaced.
3. A duplex, explosion proof sump pump system will be installed in the Gas Handling Equipment Space.
4. Washwater connections will be provided in each process space and strategically elsewhere as needed.
5. The Screen Room will be provide a 1-1/2” washwater connection for flushing the Wet Well.
6. Plumbing fixtures within existing Locker Room will remain unchanged.
7. Two level, ADA accessible water cooler will be provide at building entrance.
8. New Men’s and Women’s Toilet rooms will include 2/3 waterclosets respectively with the Men’s room including a urinal. These spaces will also include two countertop sinks in each.

9. A dual basin countertop sink will be included in the Training Room

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. Fixtures will be provided as shown on Plan. All Lab Sinks will be provided as part of lab furniture.
2. Roof drains will be collected with interior roof drain piping and extended to building exterior, discharging to grade.
3. A gas fired water heater will be installed in the Mechanical Room. Unit will be installed to hot water recirculation to minimize wait time for hot water at remote locations.
4. Emergency wash station will be installed in Laboratory. Unit will be supplied tepid water from mixing valve installed in Mechanical Room.
5. All floor drainage collected in the Vehicle Storage area will be routed through a catch basin.

200 - Grit Building

1. Service sink with a point of use water heater will be installed in Sampler Room.
2. New floor drain will be added to dumpster area.
3. Washdown hose connections will be provided

310 - Primary 1

1. Not applicable.

320 - Primary 2

1. Not applicable.

330 - Primary 3

1. Not applicable.

340 - Primary 4

1. Not applicable.

350 – PE Channel

1. Not applicable.

400 - Activated Sludge Building

1. No work anticipated other than miscellaneous piping modifications/relocation for new equipment and building clean-up.

404 - Junction Structure

1. Not applicable.

405 – Anoxic Selector Tank

1. Not applicable.

406 - Mixing Tank

1. Not applicable.

410 - Activated Sludge Basins

1. Not applicable.

420 - ML Channel

1. Not applicable.

500 - Secondary Splitter

1. Not applicable.

510 - Secondary 1

1. Not applicable.

515 - Secondary Scum Manhole 1

1. Not applicable.

520 - Secondary 2

1. Not applicable.

530 - Secondary 3

1. Not applicable.

535 - Secondary Scum Manhole 2

1. Not applicable.

540 - Secondary 4

1. Not applicable.

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. A new potable water supply will be extended into structure.
2. A service sink with point of use electric water heater will be provided in the UV Room.
3. W3 piping will be routed around structure for washdown connections.
4. Provide a new sump and duplex sump pump system for Pump Room Lower Level

610 - P-Chem Storage Building

1. Provide fire suppression system for Chemical Room and SHC Room.
2. Provide a service sink in the Chemical Room and the SHC Room.
3. Provide an emergency wash station in the Chemical Room and the SHC Room.
4. Provide a water closet and wall hung lavatory in the Lavatory.

5. Provide water heater in Mechanical Room to serve emergency wash stations, lavatory, and service sinks.
6. W3 piping will be routed around structure for washdown connections.

700 - Digestion Building

1. Plumb seal water to all pumps.
2. Provide sanitary collection for all digester gas drains.
3. W3 piping will be routed around structure for washdown connections.
4. A roof mounted freeze-proof hose connection will be provided.

710 - Digester 1

1. Not applicable.

720 - Digester 2

1. Not applicable.

730 - Digester 3

1. Not applicable.

740 - Digester 4

1. Not applicable.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Not applicable.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. Provide fire suppression system for Chemical Room, Dryer Room, and Thermal Fluid Room.
2. Plumb seal water to all sludge pumps with local hub drain to collect seal discharge.
3. Floor drains and lower level hub drains routed to duplex sump pump system.
4. Service sink in lower level.
5. W3 piping will be routed around structure for washdown connections within all process spaces.
6. Provide an emergency wash station in the Chemical Room and external to Chemical Room at fill station.
7. Provide emergency eye wash for Solids Lab.
8. Provide a Rest Room with shower, urinal, water closet, and countertop sink.

771 – Silo

1. Not applicable.

772 - Nitrogen System

1. Not applicable.

775 - PSD Thickener

1. Not applicable.

900 – Tunnel

1. All existing water piping will be removed within the tunnel. New W1 and W2 piping will be routed to all structures via the tunnel system.
2. Replace both submersible sump pumps.

910 – Tunnel

1. The tunnel will be used to route W1 and W2 between the Digestion Building and the Solids Building.
2. A trench will be formed in the side of the tunnel to collect any water dripping within the space. This trench will be sloped towards the Solids Building with the waste lifted by the Solids Building sump pump system.

HVAC

FACILITY-WIDE

This section summarizes HVAC features applicable to the Project.

Codes

1. Ten States Standards for Wastewater Facilities.
2. NR110: Wisconsin Wastewater Treatment Facility Design Code
3. SPS 363: Energy Conservation. International Energy Conservation Code with Wisconsin amendments
4. SPS 364: Heating, Ventilating and Air Conditioning. International Mechanical Code with Wisconsin amendments.
5. SPS 365: Fuel Gas Appliances. International Fuel Gas Code and National Fuel Gas Code (NFPA 54) with Wisconsin amendments.
6. SPS 341: Boilers and Pressure Vessels.
7. NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

Design

1. Heating equipment will be sized to maintain 72°F in the Electrical Rooms and administrative spaces. All other spaces will be designed for 60°F.
2. Cooling equipment will be sized to maintain 80°F in Electrical Rooms and 70°F in administrative spaces. Process spaces will be ventilated to maintain a maximum temperature of 104°F.
3. Design outside air temperature will be -20°F for heating calculation and 87°F dry bulb / 75°F wet bulb for cooling calculations.
4. All HVAC controls will be digital type with remote access.
5. All systems providing ventilation to reduce hazardous classifications with be monitored for presence of required airflow. A loss of airflow for any of these systems will be locally alarms with lights at each entrance door to the spaces served and remotely alarms via SCADA.

Ductwork

1. All ductwork will be of aluminum construction except where noted to be of stainless steel construction in the structure specific text.
2. The only ductwork to be insulated will be the supply and return ductwork serving administrative spaces and outside air intake from building penetration to equipment connection.
3. Ductwork will be routed in such a way as to provide a sweeping of fresh supply air across potential operator positions and exhausted at points of moisture and odor collection while providing access to the air grilles.

Piping

1. All above ground hot water piping will be constructed of schedule 40 black steel pipe with threaded connection for smaller than 2-1/2” and welded for 2-1/2” and larger.
2. All above grade hot water piping will be insulated with a minimum 2 inch thickness of fiberglass insulation with color coded PVC jacketing.
3. All below grade hot water piping will be factory fabricated, pre-insulated piping system with welded schedule 40 black steel carrier pipe, foam insulation and schedule 40 PVC external jacketing pipe.

4. All above grade natural gas piping upstream of Utility pressure reducing valve will be welded black steel.
5. All above grade natural gas piping downstream of Utility pressure reducing valve will be threaded black steel for smaller than 2-1/2" and welded black steel for 2-1/2" and larger.
6. All below grade natural gas piping will be MDPE gas piping.

Equipment

1. All air handling units and make-up air units will be of double wall construction provided with two-part epoxy coating systems inside and out to resist corrosion caused by the wastewater treatment atmosphere. Unit located outdoors will receive a polyurethane top coat for protection against UV degradation.
2. All natural gas fired make-up air units and gas fired unit heaters will be provided with stainless steel heat exchangers or burners.
3. All air handling units with heating and/or coiling coils and air cooled condensers will have Heresite or E-Coat coating on the coils.
4. All fans will be of aluminum construction. Fans serving spaces with exposed wastewater, exposed sludge or chemical storage will be provided with a protective coating or be on non-metallic construction

Gas Service

1. A new natural gas service will be provided to the Main Building. The Utility will provide a gas meter and a supply pressure of 5-psig. From this point, a 5-psig site distribution system will be installed to supply all buildings on the site that require gas. A pressure reducing valve will be provided at each building to reduce pressure from 5-psig to 0.5-psig as required for the equipment served.

STRUCTURE-BY-STRUCTURE

This section summarizes HVAC features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. The Conveyor Room and Screening Room will be continuously ventilated with a rooftop mounted, natural gas fired make-up air unit, capable of providing a ventilation rate of 12 AC/Hr. Occupancy and gas detection controls will be utilized to allow operation at 6 AC/Hr when not occupied and no hazards present. Exhaust will be via roof mounted exhaust fans. This space will be maintained at a slight negative pressure. All ductwork serving this space will be of stainless steel construction.
2. The Motor Room and Pump Room will be continuously ventilated with a rooftop mounted, natural gas fired make-up air unit, capable of providing a ventilation rate of 6 AC/Hr. Occupancy and gas detection controls will be utilized to allow operation at 2 AC/Hr when not occupied and no hazards present. Exhaust will be via roof mounted exhaust fans.
3. The Old Electrical Room will be heated and cooled with a hot water heat, refrigerant cooled, air handling unit installed in the old Dewatering Room. Unit will be furnished with activated carbon filtration and configured for a small amount of outside air to ensure a positive pressure in the Old Electrical Room, relative to the rest of the structure and outdoors.
4. The Large Training Room and associated administrative spaces will be heated and cooled with a hot water heat, refrigerant cooled, air handling unit installed in the Storage room. Roof

mounted exhaust fans will be used to ventilate the locker and toilet room spaces. Zone temperature control will be accomplished with hot water heated variable air volume (VAV) boxes and radiant heaters.

5. The maintenance and storage spaces throughout the structure will be heated with hot water unit heaters and roof mounted exhaust fans.
6. The Main Electrical Room will be heated with hot water unit heaters and cooled with duct free, split system air conditioning unit. The space will be maintained under a slight positive pressure with a pressurization unit with activated carbon filtration.
7. The Generator Room will be heated with hot water unit heaters and cooled with roof mounted exhaust fans. Large intake and exhaust louvers will be installed for generator radiator cooling. The discharge ductwork of each generator will include a recirculation damper to direct a thermostatically controlled portion of the radiator discharge air back to the space to prevent over cooling.
8. The Gas Compression Room will be continuously ventilated with a natural gas fired make-up air unit, capable of providing a ventilation rate of 12 AC/Hr installed within the Storage room. Occupancy and gas detection controls will be utilized to allow operation at 6 AC/Hr when not occupied and no hazards present. Exhaust will be via roof mounted exhaust fans. Additional exhaust will be provided as required to ensure proper cooling ventilation is available. This space will be maintained at a slight negative pressure.

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. The main administrative spaces will be heated and cooled with a rooftop, natural gas heat, refrigerant cooled air handling unit. All supply and return ductwork serving these spaces will be of galvanized steel construction.
2. Zone temperature control for the individual spaces will be accomplished with variable air volume (VAV) boxes, with one serving each space. The boxes will consist of a modulating damper, regulating airflow to the space and a hot water heating coil.
3. All locker and toilet spaces will be ventilated with roof mounted exhaust fans.
4. The lab will be heated and cooled with a dedicated rooftop, natural gas heat, refrigerant cooled air handling unit. All ductwork from lab hoods will be of stainless steel construction.
5. Lab hoods will be exhaust by roof mounted exhaust fans, either coated or of non-metallic construction for corrosion resistance.
6. The AV / Server Room will be cooled with a duct free, split system air conditioning unit.
7. Two boilers (75% redundancy) will be installed to provide heating water to the VAV system. Each boiler will be served by a dedicated boiler pump.
8. Two heating water pumps (one redundant) will circulate heating water to heating equipment.
9. The Vehicle Storage space will be heated with gas fired, infrared tube heaters. Ceiling fans will be installed to minimize temperature stratification.
10. The Vehicle Storage space will be ventilated at a rate of 0.5 cfm/sq ft with a roof mounted, natural gas fired make-up air unit and exhausted by rooftop mounted exhaust fans. Controls will include timers and gas detection (CO and NOx) to minimize runtime of ventilation system.

200 - Grit Building

1. The Grit Handling Room will be continuously ventilated with a rooftop mounted, natural gas fired make-up air unit, capable of providing a ventilation rate of 12 AC/Hr. Occupancy and gas detection controls will be utilized to allow operation at 6 AC/Hr when not occupied and no hazards present. Exhaust will be via wall mounted exhaust fans. This space will be maintained at a slight negative pressure. All ductwork serving this space will be of stainless steel construction.
2. Sampler/Electrical Room will be cooled with a duct free split system air conditioning unit. Space will be heated with an electric unit heater.

310 - Primary 1

1. Not applicable.

320 - Primary 2

1. Not applicable.

330 - Primary 3

1. Not applicable.

340 - Primary 4

1. Not applicable.

350 – PE Channel

1. Not applicable.

400 - Activated Sludge Building

1. The lower level of the Blower Building will be continuously ventilated at a rate of 6 AC/Hr with a hot water heated make-up air unit. This same unit will be the source of fresh air for the west half of the tunnel system and the lower level of the Digester Complex. This unit will be installed in the Lower Level of the building. This unit will be ducted to blend a percentage of upper level room air with the outside air to recover heat radiated from the Blowers and to temper the air for freeze protection.
2. The upper level of the Blower Building will be continuously ventilated at a rate of 6 AC/Hr with a rooftop mounted natural gas fired make-up air unit. Occupancy and gas detection controls will allow operation at 2 AC/Hr outside air when the space is not occupied and not hazard detected.
3. Additional cooling ventilation will be provided for the upper level to reject heat generated by the blowers. This will be accomplished with wall mounted intake air louvers and wall mounted exhaust fans.
4. Additional cooling ventilation will be provided for the Gas Handling Room to maintain a space temperature no greater than 10°F above ambient.

404 - Junction Structure

1. Not applicable.

405 – Anoxic Selector Tank

1. Not applicable.

406 - Mixing Tank

1. Not applicable.

410 - Activated Sludge Basins

1. Not applicable.

420 - ML Channel

1. Not applicable.

500 - Secondary Splitter

1. Not applicable.

510 - Secondary 1

1. Not applicable.

515 - Secondary Scum Manhole 1

1. Not applicable.

520 - Secondary 2

1. Not applicable.

530 - Secondary 3

1. Not applicable.

535 - Secondary Scum Manhole 2

1. Not applicable.

540 - Secondary 4

1. Not applicable.

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. The UV Room will be heated with natural gas fired unit heaters. Ventilation will be provided for dehumidification with a continuously running supply fan drawing a variable volume of outside in response to space temperature and humidity. All air supplied to the space will be relieved through a gravity roof hood.
2. The Filtration Tank Room will be heated with natural gas fired unit heaters. Ventilation will be provided for dehumidification with a continuously running supply fan drawing a variable volume of outside in response to space temperature and humidity. All air supplied to the space will be relieved through a gravity roof hood.
3. The Pump Room will be heated with natural gas fired unit heaters. Thermostatically controlled ventilation will be provided for space cooling.

610 - P-Chem Storage Building

1. The Chemical Room and SHC Room will be heated and continuously ventilated at a rate of 1 cfm/ft2 with a rooftop mounted, natural gas fired make-up air unit. Exhaust air will be removed by a wall mounted exhaust fan, one serving each room. All supply ductwork in these spaces will be of stainless steel construction. All exhaust ductwork in these space will be non-metallic. Exhaust fans serving these space will be of fiberglass construction.
2. The Mechanical Room will be heated with an electric unit heater and thermostatically ventilated with a roof mounted exhaust fan.
3. The Electrical Room will be heated and cooled with wall mounted air conditioning units with electric heat.
4. The Lavatory will be heated with a wall mounted electric heater and ventilated with a roof mounted exhaust fan with operation interlocked with the lights in the space.

695 - Outfall Structure

1. Not applicable.

700 - Digestion Building

1. The Boiler Room and Pump Room will be continuously ventilated at a rate of 6 AC/Hr. The supply air for these space will come from the Building 600 lower level air handling unit and the Building 770 lower level air handling unit with the air being transferred through the interconnecting tunnel system. Exhaust air will be directed through a heat recovery coil with the recovered heat used to temper the entering air supply to the Gas Handling Room. Supplemental heat will be provided with hot water unit heaters.
2. The Boiler Room will be furnished with louvers and motor operated combustion air dampers, interlocked to open whenever either digester gas boiler is called to fire.
3. The Gas Handling Room will be continuously ventilated at a rate of 12 AC/Hr. Supply air will come from a roof mounted supply fan, discharging through a heat recovery coil and into the space. Exhaust will be from a roof mounted exhaust fan.
4. The Electrical Room will be continuously ventilated at 6 AC/Hr with an energy recovery ventilator. Space cooling will be accomplished with a duct free split system air conditioning unit and space heating with a hot water unit heater.

710 - Digester 1

1. Not applicable.

720 - Digester 2

1. Not applicable.

730 - Digester 3

1. Not applicable.

740 - Digester 4

1. Not applicable.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Not applicable.

756 – Digester Gas Manhole 1

1. Not applicable.

757 – Digester Gas Manhole 2

1. Not applicable.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. All air handling and make-up air units will be installed indoors, in the upper level Mechanical Room. Units will be ducted to draw outside air from the north side of the building through intake air louvers, sized to allow removal of each air handling unit through their respective louver.
2. The Sludge Screening Room will be continuously ventilated at a rate of 6 AC/Hr with a natural gas fired make-up air unit. Exhaust will be predominantly be drawn for the area of the screenings containers for odor containment and will be discharged to the outdoors through a roof mounted exhaust fan. All ductwork within this space will be of stainless steel construction.
3. The Thermal Fluid Room will be heated with a hot water unit heater. Thermostatically controlled cooling ventilation will be provided via indoor inline supply fan and discharged through a roof mounted gravity hood.
4. The Thermal Fluid Room will be furnished with combustion air intake louvers and dampers interlocked with thermal fluid heater to open whenever unit is called to fire.
5. The Sludge Handling Room will be continuously ventilated at a rate of 6 AC/Hr with a natural gas fired make-up air unit. Supply air will be provided along the perimeter of the space and over the access platforms. Exhaust will be localized at the thickeners and presses to contain odors. Consideration will be given to strip curtain enclosures during final design for additional odor containment. Exhaust will be directed through a coated inline type fan, discharging through a wall louver. All ductwork within this space will be of stainless steel construction.
6. The Chemical Room will be continuously ventilated at a rate of 1 cfm/sq ft with a natural gas fired make-up air unit. Supplemental heat will be provided with stainless steel hot water unit heaters. Exhaust will be directed through a fiberglass inline type fan, discharging through a wall louver. All supply air will be distributed through a non-metallic perforated fabric duct (Ductsox or equal) and all exhaust ductwork will be of non-metallic construction.
7. The Dryer Room will be continuously ventilated with an inline supply fan with mixing box to allow variable amounted of outside air. Amount of airflow provided will be thermostatically controlled for cooling. Air will be relieved by roof mounted gravity relief hood. Additional summer time cooling ventilation will be provide by roof mounted exhaust fans drawing air from wall louvers. Space heat will be provided by hot water unit heaters.
8. The Electrical Room will be cooled with split system air conditioning units. Heat will be provided by hot water unit heaters.
9. The Pump Room will be continuously ventilated at a rate of 6 AC/Hr with a natural gas fired make-up air unit. Exhaust will be transferred to Digester Building through the tunnel system and exhausted from the Digester Building.

10. The Control Room and Solids Lab will be heated and cooled with a hot water heat, refrigerant cooled air handling unit with the associated air conditioning unit located on the roof. Zone temperature control will be provided by variable air volume boxes with hot water reheat.
11. The Rest Room will be generally heated and cooled via transfer air from the Solids Lab and Control Room. Supplemental heat will be provide with hot water radiant heaters. Exhaust will be via roof mounted exhaust fan, interlocked with the room lights.
12. The Mechanical Room will be thermostatically cooled with an intake air louver and an inline exhaust fan discharging through a louver. Heat will be via hot water unit heaters with supplemental heat provide by heat recovery of the air compressor system.

771 – Silo

1. Not applicable.

772 - Nitrogen System

1. Not applicable.

775 - PSD Thickener

1. Not applicable.

900 – Tunnel

1. The Tunnels will be used to route heating water piping and natural gas piping between buildings.
2. The Tunnels will be ventilated with air supply equipment located in the Activated Sludge Building with the Tunnels serving as a ventilation conduit to be exhausted from within the Digestion Building.

910 – Tunnel

1. The Tunnels will be used to route heating water piping and natural gas piping between buildings.
2. The Tunnels will be ventilated with air supply equipment located in the Solids Building with the Tunnels serving as a ventilation conduit to be exhausted from within the Digestion Building.

ELECTRICAL

FACILITY-WIDE

This section summarizes Electrical features applicable to the Project.

Applicable Codes

1. National Electrical Code (NEC)
2. Wisconsin Electrical Code
3. NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
4. Ten States Standards for Wastewater Facilities

Existing Electrical Distribution System

The existing Wastewater Treatment Facility has two electric services. One at the Main Building (powers Main Building, Digester Building, and Vehicle Storage) and one at the Blower Building (powers Blower Building and UV/Filter Building). A parallel feeder from the Main Building to the Blower Building and an automatic transfer switch at the Blower Building allows the diesel standby generator at the Main Building to provide backup power to the UV/Filter Building.

The existing Wastewater Treatment Facility has a 675kW diesel standby generator located in the existing Main Building. Backup power is provided to the entire facility except for the aeration blowers.

New Electrical Distribution System

The electrical improvements will remove the existing two electric services and provide one new electric service at the existing Main Building. This new electric service will power the entire facility with the new electrical room in the existing Main Building serving as the main distribution point for the entire facility. Existing Blower Building, Existing Main Building equipment, and new Administration Building will be powered from the new Main Building Electrical Room. Modifications will be made to the existing electrical distribution equipment at the Main Building and Blower Building to remove existing electric services. Existing buildings powered from the Main Building and Blower Building will continue to be powered from those buildings. Two new standby generators in the new generator room in the existing Main Building will provide backup power to the facility. See New Standby Generation paragraph below.

The new main electrical distribution equipment in the new electrical room in the existing Main Building will be configured as a redundant feeder and redundant circuit breaker distribution system (redundant feeder). A redundant feeder system can have a building feeder or building main circuit breaker fail and the system can be switched to isolate the failure and maintain power to the building and entire system. Redundant feeder systems can also isolate portions of the electrical distribution system for testing and maintenance without shutting down the Plant. For a redundant feeder system the existing main electrical distribution equipment at the Main Building, MCC-2 in the Main Building, and Blower Building will be revised and expanded to include an additional main breaker, two tie circuit breakers, and a redundant incoming power feeder. The electrical distribution equipment will be a main-tie-tie-main configuration where the two tie breakers will allow complete electrical isolation of each half of the electrical equipment for testing and maintenance.

New Standby Generation

The electrical improvements will include two new larger 750kW diesel standby generators located inside the new generator room in the existing Main Building. Physically the generators will be connected to the entire electrical distribution system and during a power outage the Plant control system will lock out certain loads to prevent them for operating while the generators are powering the facility. Standby power will be supplied to the entire facility but only one aeration blower will be allowed to run. Any one of the three aeration blowers can run, but only one. The generators are sized based on the Plant operating at full capacity. When operating on standby power one generator will automatically turn off if not needed and then automatically turn back on if needed. During a power outage when the Plant is experiencing low flows, the staff could manually turn on a second aeration blower after verifying both generators are running and the generator load is low enough to allow the generators to run an additional aeration blower. Extreme care must be taken when manually turning on loads during a power outage to prevent overloading the generator. Otherwise the generator will trip offline and the generator and Plant would need to be restarted.

Electrical Distribution Equipment

1. Switchgear
    a. Draw-out circuit breaker construction.
    b. Redundant incoming main circuit breakers and main-tie-tie-main distribution construction for redundancy.
    c. Interlocked PLC controlled circuit breakers will be used for connecting the standby generator to the switchgear.
    d. New switchgear shall have power monitors.
2. Motor Control Centers
    a. New Motor Control Centers will be Main-Tie-Tie-Main configuration.
    b. New Motor Control Centers shall have power monitors.
    c. Motor starters with motor circuit protectors in the motor control centers.
    d. Circuit breaker feeders in the motor control center.
    e. Minimum starter size: NEMA 1.
3. Variable Frequency Drives (VFD's)
    a. Pulse width modulated (PWM) variable frequency drives.
    b. The VFD's will be 6-pulse PWM drives with separate harmonic mitigation on drives 30 horsepower and larger.
4. Motor Shaft Grounding Ring
    a. Motors driven by VFDs shall have motor shaft grounding ring factory installed.
    b. Grounding ring shall be bolt-on design.
5. Power Panelboards – 480/277V
    a. The 480/277V lighting panelboards will power the 480V loads and any 277V loads in the buildings.
    b. 42-circuit panelboards.
6. Lighting Panelboards – 120/208V
    a. The 120/208V lighting panelboards will power the lighting and 120V loads in the buildings.
    b. 42-circuit panelboards.

Conduit and Conductors

1. Conduit
    a. Exterior Conduit:

i) Underground – Concrete encased with reinforcing and Schedule 40 PVC conduit. Underground bends, elbows, and stub-ups will be PVC coated galvanized rigid steel conduit.
ii) In Slabs – Schedule 40 PVC conduit. Transition to PVC coated rigid steel conduit 5'-0" before exiting slab and for conduit stub-ups and conduit elbows.
iii) Exposed - PVC coated galvanized rigid steel conduit.

b. Interior Conduit:
i) Exposed Dry Locations – Galvanized rigid steel conduit to match existing or aluminum conduit in new buildings.
ii) Exposed Corrosive and Wet Locations – PVC coated galvanized rigid steel conduit.
iii) Concealed Dry Locations – Intermediate metal conduit.
iv) Flexible Conduit – Liquidtight flexible metal conduit.

c. Hazardous Locations:
i) Exposed Dry Locations – Galvanized rigid steel conduit to match existing or aluminum conduit in new buildings.
ii) Exposed Corrosive and Wet Locations – PVC coated galvanized rigid steel conduit.
iii) Flexible Conduit – Stainless steel braided flexible metal conduit.

d. Minimum Size: ¾ inch
e. Threaded, no set screw or indentor type fittings.

2. Conductors (600V and less)
a. Branch Circuits – Single conductor THHN/THWN copper conductors.
b. Feeders and Conduit Duct Banks – Single conductor XHHW-2 copper conductors.
c. Minimum size #12 AWG.

Lighting

1. Light emitting diode (LED) lighting.
a. New buildings and areas in existing buildings with new work.
b. Pole mounted site lighting.

STRUCTURE-BY-STRUCTURE

This section summarizes Electrical features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. A new Generator Room will be created in the southeast corner of the building for the two new standby generators.
a. 750kW each with a small diesel day tank.
b. An exterior diesel fuel tank will supply both generators. Enough fuel for 24 hour continuous operation.
2. A new Main Electrical Room will be created in the southeast corner of the building next to the new generator room. Room will house the main electrical service entrance switchgear and the site distribution electrical switchgear. This will be the main electrical distribution point for the entire site.
a. Main Electrical Switchgear – Main service breaker and two feeder breakers. PLC auto throw-over controlling the main breaker, two feeder breakers, and the two generator breakers in the site distribution electrical switchgear. Send start and stop signals to the standby generators.

   b. Site Distribution Electrical Switchgear – Main-Tie-Tie-Main breakers, two generator breakers, and feeder breakers. Main distribution point feeding power to the entire site.
3. Construct a new electrical room around existing MCC-4 and MCC-DEQ along the south wall of the large thickener room.
4. Motor Room – Remove existing motor control center MCC-2 and variable frequency drives.
5. Old Electrical Room – Remove existing generator and fuel tank. Install new motor control center (replaces MCC-2) and new variable frequency drives for RWW pumps.
   a. Motor control center – Main-tie-tie-main configuration
   b. Variable frequency drives – With solid state reduce voltage starter bypass and across the line bypass.
   c. Harmonic filters on the RWW pump variable frequency drives.
6. New LED lighting is spaces where work is being done.

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. Mechanical/Electrical Room
   a. Two 480V power panels – Power 480V equipment in building.
   b. Lighting transformer and two 120/108V lighting panels – Power 120V loads in administration portion of building.
2. AV/Server Room
   a. Uninterruptable power supply (UPS) – For lab lighting panel. Provides conditioned power and battery backup power to lab. Will provide battery backup power to lab until standby generator is providing generator backup power. This will result in no power outages in lab.
3. Lab
   a. 120/208V lighting panel – dedicated to lab power and lighting.
4. Vehicle Storage
   a. Lighting transformer and 120/108V lighting panel – Dedicated to vehicle storage loads.
5. LED lighting
   a. 2x4 lay-in ceiling mounted fixtures in finished spaces.
   b. 1x4 fixtures in unfinished spaces
   c. Low bay fixtures in vehicle storage.
   d. Exterior building mounted at doors.

200 - Grit Building

1. Electrical Room will contain the motor control center, lighting transformer and lighting panel.
   a. Motor control center – Main-tie-tie-main configuration. Starters and breakers to power building loads.
   b. Lighting panel – Power 120V loads.
2. LED lighting
   a. 1x4 fixtures in electrical room
   b. Explosion proof CID1 fixtures in process area.
   c. Exterior building mounted at doors.

310 - Primary 1

1. Conduit and wiring to power new mechanism and instrumentation.

320 - Primary 2

1. Conduit and wiring to power new mechanism and instrumentation.

330 - Primary 3

1. Conduit and wiring to power new mechanism and instrumentation

340 - Primary 4

1. Conduit and wiring to power new mechanism and instrumentation.

350 - PE Channel

1. Conduit and wiring to power new instrumentation.

400 - Activated Sludge Building

1. Blower Room
    a. New main-tie-tie-main switchboard – Provides power to 480V blowers, turbines, and existing motor control centers in building. Existing switchboard DGIP becomes one of the distribution sections on the lineup.
    b. Add sections and starters to existing motor control centers for new 480V loads.
    c. Existing electric service switchboard and automatic transfer switch will be removed.
2. LED Lighting
    a. The newer Blower Room LED lighting will remain.
    b. New LED lighting in lower level.

404 - Junction Structure

1. Conduit and wiring to power new instrumentation.

405 - Anoxic Selector Tank

1. Conduit and wiring to power new mixers and new instrumentation.

406 - Mixing Tank

1. Conduit and wiring to power new mixers and new instrumentation.

410 - Activated Sludge Basins

1. Conduit and wiring to power new valves and new instrumentation.

420 - ML Channel

1. Conduit and wiring to power new instrumentation.

500 - Secondary Splitter

1. Conduit and wiring to power new instrumentation.

510 - Secondary 1

1. Conduit and wiring to power new instrumentation.

515 - Secondary Scum Manhole 1

1. Conduit and wiring to power new instrumentation.

520 - Secondary 2

1. Conduit and wiring to power new instrumentation.

530 - Secondary 3

1. Conduit and wiring to power new instrumentation.

535 - Secondary Scum Manhole 2

1. Conduit and wiring to power new instrumentation.

540 - Secondary 4

1. Conduit and wiring to power new mechanism and instrumentation.

550 - SE Channel

1. Conduit and wiring to power new instrumentation.

600 - Effluent Building

1. Existing motor control center and electrical equipment in the UV room will be removed. Equipment in the Effluent Building will be powered from the new electrical room in Building 610.
2. LED Lighting
    a. New LED lighting in building.
    b. New LED exterior building mounted lights at doors.

610 - P-Chem Storage Building

1. Electrical Room will contain the motor control center, variable frequency drives, lighting transformer, and lighting panel.
    a. Motor control center – Main-tie-tie-main configuration. Starters and breakers to power building 610 loads and Building 600 loads.
    b. Variable frequency drives – For Building 610 and 600 loads. Will include a harmonic filter for motors 30HP and larger.
    c. Lighting panel – Power 120V loads.
2. LED lighting
    a. 1x4 fixtures in electrical room and some process areas.
    b. Low bay fixtures for some process areas.
    c. LED exterior building mounted lights at doors.

695 - Outfall Structure

1. Not applicable.

700 - Digestion Building

1. New electrical room at grade level will house 480V power panels, variable frequency drives, lighting transformer, and lighting panels.
    a. Power panels – Power 480V loads in Building 700.
    b. Variable frequency drives – For Building 700 loads. Will include a harmonic filter for motors 30HP and larger.
    c. Lighting panel – Power 120V loads.
2. LED lighting
    a. 1x4 fixtures in electrical room.
    b. Low bay fixtures in process areas and lower level.
    c. LED explosion proof fixtures in new Gas Handling CID1 room.
    d. LED exterior building mounted lights at doors.

710 - Digester 1

1. Conduit and wiring to power new instrumentation.

720 - Digester 2

1. Conduit and wiring to power new instrumentation.

730 - Digester 3

1. Conduit and wiring to power new instrumentation.

740 - Digester 4

1. Conduit and wiring to power new instrumentation.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Not applicable.

756 – Digester Gas Manhole 1

1. Conduit and wiring to power new equipment and instrumentation.

757 – Digester Gas Manhole 2

1. Conduit and wiring to power new equipment and instrumentation.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. Electrical Room will contain the motor control center, variable frequency drives, lighting transformer, and lighting panel.
    a. Motor control center – Main-tie-tie-main configuration. Starters and breakers to power Building 770 loads, Structure 771 loads, Structure 772 loads, and Structure 775 loads.

   b. Variable frequency drives – For Building 770 loads. Will include a harmonic filter for motors 30HP and larger.
   c. Lighting panels – Power Building 770 loads, Structure 771 loads, Structure 772 loads, and Structure 775 120V loads.
2. LED lighting
   a. 1x4 fixtures in electrical room and some process areas.
   b. Low bay fixtures in some process areas.
   c. LED exterior building mounted lights at doors.

771 – Silo

1. Conduit and wiring to power new equipment and instrumentation.

772 - Nitrogen System

1. Conduit and wiring to power new equipment and instrumentation.

775 - PSD Thickener

1. Conduit and wiring to power new equipment and instrumentation.

900 – Tunnel

1. Conduit and wiring will be routed in tunnel from electrical distribution equipment in Building 100 to Building 200 and Building 400 in the north south direction of the tunnel.
2. Conduit and wiring will be routed in tunnel from electrical distribution equipment in Building 100 to Building 700 and Building 770 in the east west direction of the tunnel.
3. The existing tunnel lighting will be replaced with LED lighting. Existing conduit and wiring will be reused.

910 – Tunnel

1. Conduit and wiring will be routed in tunnel from electrical distribution equipment in Building 100 to Building 770.
2. The new tunnel lighting will be LED lighting.

Site

1. Underground concrete encased conduit duct banks.
   a. Building 100 to electric utility transformer.
   b. Utility transformer to road for electric utility wiring.
   c. Building 100 to Building 120.
   d. Building 400 to Building 610.
   e. Building 610 to Building 600.
2. LED site lighting across the site.

INSTRUMENTATION AND CONTROL

FACILITY-WIDE

This section summarizes Instrumentation and Control features applicable to the Project.

Codes And Standards

1. ISA: International Society of Automation
2. NEC: National Electric Code
3. NEMA: National Electrical Manufacturers Association
4. NFPA: National Fire Protection Agency
5. UL: Underwriters Laboratory

Existing Conditions

1. Programmable Logic Controllers (PLC's)
    a. Process control of the facilities is performed by Rockwell Automation SLC® series of controllers. Rockwell Automation has classified the SLC® control system platform in their Lifecycle Status Key as *Active Mature,* which is defined as "Fully supported, but a newer product exists. Gain value by migrating". The next Lifecycle Status Key stage for the SLC® series platform is *End of Life*, whereby a discontinued date is announced by the company.

2. Process Control Network (PCN)
    a. The PCN allows the PLC processors to exchange information amongst themselves, and deliver and receive information to the Human Machine Interface (HMI).
    b. The PCN used at the WWTF utilizes the Ethernet/IP protocol. Copper cabling is used for inter-building links less than 300 feet, while 6-strand multimode fiber optic cabling is used for links between buildings.
    c. The PCN includes radio communications with external lift stations. The radio is a GE MDS SD4 and is located in the Control Room within the Main Building.

3. Human Machine Interface (HMI)
    a. HMI functions for the Process Control System (PCS) are based on the Intellisys software platform.
    b. The system is a stand-alone application. The primary server is located in the Control Room within the Main Building.
    c. The system includes ReportView reporting software.
    d. Alarming after hours is transmitted by telephone line via Verbatim dialer and is located in the Control Room within the Main Building.

Network Design

1. Ethernet is the de-facto standard used for communications between servers, computers, PLC's, and a multitude of other devices used for process control. A new Gigabit speed network backbone is envisioned using a redundant loop topology to serve the networking needs of the facility into the foreseeable future. Any network additions included in the proposed process improvements

will continue to use the Ethernet protocol as established at the facility.

2. The fiber will be upgraded to 12-strand multimode installed in a redundant loop configuration.
3. Network switches will be upgraded to allow Gigabit redundant loop configuration and installation form factor will be standard 19" rack mount. Consideration will be given to include redundant power supplies for all network switches.

Programmable Logic Controller Considerations

1. The existing SLC platform will eventually be classified as *End of Life* status by Rockwell Automation. Escalating pricing for SLC based hardware is an ever-increasing incentive to migrate to the much more capable ControLogix platform.
2. ControLogix systems offer the advantages of greatly improved processor speeds and capabilities. Memory available for programming and data storage will be increased by several orders of magnitude. Improved programming software supports function block, statement list, and other programming options in addition to the ladder logic based programming used for the SLC processors.
3. Compatibility with the Owner's selection of FactoryTalk SCADA software make the ControLogix PLC platform a strategic advantage for plant programming moving forward.
4. Wherever possible, I/O points for critical process equipment will be distributed across the available I/O modules in such a manner that failure of a single I/O point or I/O module will not disturb the overall process.
5. For major equipment, typical interconnection diagrams will be developed as part of the final design for motor starters and valve/gate actuators. The Contractor will be responsible for generating, marking up, and turning over to the plant detailed interconnecting wiring diagrams and loop diagrams for all devices connected to the PCS.
6. All analog PLC I/O will be 4-20mA. All discrete PLC I/O will be 120 Vac. Monitoring of non-critical I/O on variable frequency drives (VFDs) and other "intelligent" motor control and power monitoring equipment will be via Ethernet/IP and will be included in the final design network diagram. Control of VFD's and critical I/O will be hardwired (as stated above).
7. The PLC programming specifications will take advantage of available status, diagnostic, and health information so that problems such as weak or failed UPS battery, I/O point and card faults, communication failures, redundancy status, and so forth can be indicated on the distributed PanelViews, and at the SCADA HMI.

SCADA System Considerations

1. The current SCADA system hardware and software is outdated, is failing with increasing frequency and is need of a complete replacement. The Owner has expressed the desire to use Allen Bradley FactoryTalk SE for software and we agree with this path forward for plant SCADA software.
2. A historian (data repository) will be included for the collection, storage and dissemination of plant I/O data.
3. Server redundancy will be a consideration during detailed design.
4. Process Buildings will include new PanelView SCADA nodes that are capable of viewing and controlling all processes in the Building and in the Plant. The PanelViews will operate independently of the SCADA hardware/software described above.

5. A new software configurable alarming solution will be provided and located on one of the servers. WIN-911 (or similar) solution will alarm using text, talk, and/or email as determined by the Owner during detailed design.
6. The existing verbatim alarming will be used as a secondary (last resort) means of alarming.
7. External access to the Plant SCADA system will be via Firewall allowing secure connection to monitor and control Plant operations.
8. Smart phone apps that access Plant SCADA will be discussed with the Owner during detailed design.

Plant Security and Communication Considerations

1. Telephone systems throughout the Plant will be discussed with City IT staff for possible upgrading or hardware replacement.
2. The Plant has a separate security system that has served them well and includes door switches and motion sensors in strategic locations throughout the facility. Detailed design will determine whether this system should be kept and expanded or simply included in the new SCADA system.
3. The Plant has an Access Control and billing system used to identify haulers. Replacement of the Access Control System will be determined during detailed design and would be compatible with other country-wide security access systems that the City has discussed in previous meetings.
4. Additional security measures such as closed circuit television (CCTV) at the hauler gate access, and other locations – such as along the rear fencing will be identified and included to provide process related monitoring and general site security.
5. Uninterruptable power supply (UPS) equipment will be provided for the new PLC and SCADA HMI equipment, Access Control equipment, and for the PCN and BIN hub equipment. Detailed design will determine power supply capacities and locations.

Miscellaneous Requirements

1. Field Instrumentation
    a. Process Liquid Analysis – New instrumentation will be designed around Xylem-YSI to stay consistent with newer Ortho-Phosphate hardware and embedded networking capabilities.
    b. Process Gas Analysis – New instrumentation will be designed around MSA with consideration given to other manufacturers for competitive pricing.
    c. Process Liquid Flow – New instrumentation will be designed around ABB with consideration given to other manufacturers for competitive pricing.
    d. Process Gas Flow – New instrumentation will be designed around Kurz, FCI, and Sierra with consideration given to other manufacturers for competitive pricing.
    e. Ultrasonic Level – New instrumentation will be designed around Siemens with consideration given to other manufacturers for competitive pricing.
    f. Radar Level – New instrumentation will be designed around Vega with consideration given to other manufacturers for competitive pricing.
    g. Hydrostatic Level – New instrumentation will be designed around Siemens with consideration given to other manufacturers for competitive pricing.
    h. Pressure Transmitters – New instrumentation will be designed around Rosemount with consideration given to other manufacturers for competitive pricing.

2. System Integration
    a. System Integration, including Application Engineering Services will be competitively bid with a select number of well qualified firms being considered who are qualified to perform the scope of this design.

STRUCTURE-BY-STRUCTURE

This section summarizes Instrumentation and Control features that are unique to a particular structure or structures and not clearly delineated in the preceding Facility-Wide section.

100 - Main Building

1. A New Main Building PLC will be located on grade level within the building and will include existing radio equipment, and local PanelView.
2. A new network switch and fiber patch panel will be located in a 19” rack located on grade level within the building.

110 - Vehicle Storage Building

1. Not applicable.

120 - Administration Building

1. A New Administration Building PLC will be located on grade level within the building connected to the Plant PCS.
2. A new network switch and fiber patch panel will be located in a 19” rack located on grade level within the building.
3. SCADA server hardware and software will be located in new Control Room.
4. Field instrumentation as required to support new equipment.
5. WiFi access throughout facility will be considered during detailed design.
6. VOIP phone system throughout facility will be considered during detailed design.
7. A/V equipment as required for Training Room.
8. YSI sensor node located in Laboratory Room for on-line calibration of Aeration Basin sensors.
9. Secure access to facility as determined during detailed design.

200 - Grit Building

1. Field instrumentation as required to support new equipment.
2. Determination will need to be made whether to hardwire new equipment controls from Main Building PLC or provide a Remote Input/Output panel (RIO) in the Electrical Room for network connection.

310 - Primary 1

1. Field instrumentation as required to support new equipment.

320 - Primary 2

1. Field instrumentation as required to support new equipment.

330 - Primary 3

1. Field instrumentation as required to support new equipment.

340 - Primary 4

1. Field instrumentation as required to support new equipment.

350 - PE Channel

1. Not applicable.

400 - Activated Sludge Building

1. A New Activated Sludge Building PLC and local PanelView will be located on grade level within the building connected to the Plant PCS.
2. A new network switch and fiber patch panel will be located in a 19” rack located on grade level within the building.
3. Field instrumentation as required to support new equipment.
4. VOIP phone system within facility will be considered during detailed design.
5. Secure access to facility as determined during detailed design.

404 - Junction Structure

1. Field instrumentation as required to support new equipment.

405 - Anoxic Selector Tank

1. Field instrumentation as required to support new equipment.
2. ORP digital network sensors by YSI and shall include air purge cleaning.

406 - Mixing Tank

1. Not applicable.

410 - Activated Sludge Basins

1. Field instrumentation as required to support new equipment.
2. DO digital network sensors by YSI and shall include air purge cleaning.

420 - ML Channel

1. Field instrumentation as required to support new equipment.

500 - Secondary Splitter

1. Not applicable.

510 - Secondary 1

1. Field instrumentation as required to support new equipment.

520 - Secondary 2

1. Field instrumentation as required to support new equipment.

530 - Secondary 3

1. Field instrumentation as required to support new equipment.

540 - Secondary 4

1. Field instrumentation as required to support new equipment.

515 - Secondary Scum Manhole 1

1. Field instrumentation as required to support new equipment.

535 - Secondary Scum Manhole 2

1. Field instrumentation as required to support new equipment.

550 - SE Channel

1. Not applicable.

600 - Effluent Building

1. Determination will need to be made whether to hardwire new equipment controls to P-Chem Storage Building PLC or provide a Remote Input/Output panel (RIO) in the UV Room for network connection.
2. A New effluent Building local PanelView will be located on grade level within the building connected to the Plant PCS.
3. Field instrumentation as required to support new equipment.
4. VOIP phone system within facility will be considered during detailed design.
5. Secure access to facility as determined during detailed design.

610 - P-Chem Storage Building

1. A New P-Chem Storage Building PLC and local PanelView will be located on grade level within the building connected to the Plant PCS.
2. A new network switch and fiber patch panel will be located in a 19” rack located on grade level within the building.
3. Field instrumentation as required to support new equipment.
4. VOIP phone system within facility will be considered during detailed design.
5. Secure access to facility as determined during detailed design.

695 - Outfall Structure

1. Not applicable.

700 - Digestion Building

1. Determination will need to be made whether to hardwire new equipment controls to Main Building PLC or provide a Remote Input/Output panel (RIO) in a new Electrical Room for network connection.
2. A New Digestion Building local PanelView will be located on grade level within new Electrical Room connected to the Plant PCS.
3. Field instrumentation as required to support new equipment.
4. VOIP phone system within facility will be considered during detailed design.
5. Secure access to facility as determined during detailed design.

710 - Digester 1

1. Field instrumentation as required to support new equipment.

720 - Digester 2

1. Field instrumentation as required to support new equipment.

730 - Digester 3

1. Field instrumentation as required to support new equipment.

740 - Digester 4

1. Field instrumentation as required to support new equipment.

750 - Gas Sphere

1. Not applicable.

755 - Waste Gas Burner

1. Field instrumentation as required to support new equipment.

756 – Digester Gas Manhole 1

1. Field instrumentation as required to support new equipment.

757 – Digester Gas Manhole 2

1. Field instrumentation as required to support new equipment.

760 - Cake Building

1. Not applicable.

770 - Solids Building

1. A New Solids Building PLC and local PanelView will be located on grade level within the building connected to the Plant PCS.
2. A new network switch and fiber patch panel will be located in a 19” rack located within the building.
3. A new Control Room upstairs will include two new Operator Desktop Workstations with access to Plant SCADA.
4. Field instrumentation as required to support new equipment.
5. VOIP phone system within facility will be considered during detailed design.
6. Secure access to facility as determined during detailed design.

771 – Silo

1. Field instrumentation as required to support new equipment.

772 - Nitrogen System

1. Field instrumentation as required to support new equipment.

775 - PSD Thickener

1. Field instrumentation as required to support new equipment.

900 – Tunnel

1. Field instrumentation as required to support new equipment.
2. Redundant network fiber will be run through the tunnel, and will be run in separate conduits with maximum physical separation between conduits.

910 – Tunnel

1. Field instrumentation as required to support new equipment.
2. Redundant network fiber will be run through the tunnel, and will be run in separate conduits with maximum physical separation between conduits.

Flowsheet Name: Influent Screening and Screenings Handling
Structure Number: 100
Structure Name: Main Building

Description

The purpose of the influent screening is to remove debris larger than the screen opening from the influent flow stream which could create obstructions or other detriments in the RWW Pumps and downstream facilities. The existing fine screens are installed in two channels, with a third channel for a screen bypass, the existing bar rack will remain installed in the bypass channel. Actuated gates will isolate each channel and the screen bypass gate will have an electrically actuator installed on the existing gate.

The overall operating schemes of each piece of equipment is as follows:

- Screens and conveyors would operate as they currently do with the addition of flushing water. Flushing water will be controlled on an operator-settable timed basis.
- The gates are for isolation purposes only and will be operated manually (locally or remotely).
- A high level float installed upstream of the gates would be used to alarm and automatically open the screen bypass gate and allow flow into the RWW Wetwell.

Rating

- Enclosed space: Class 1, Division 1.

Flowsheet Name: RWW Pumping
Structure Number: 100
Structure Name: Main Building

Description

The purpose of RWW pumping is to pump all of the raw wastewater to the grit removal system, normally all raw wastewater will be screened prior to being pumped. The discharge from the RWW Pumps can utilize two separate forcemains. Each forcemain has a control valve to distribute the pumped flow between the two mains. Flowmeters on the two forcemains shall be added together to get the total influent flow.

A pipe coming off of the pump discharge header will be routed to the the RWW wetwell for wetwell cleaning.

The overall operating schemes of each piece of equipment is as follows:

- RWW pumps will be operated on VFDs to maintain a setpoint level within the wetwell, backup floats will be provided.
- RWW pumps will be operated on VFDs. Two pumps will also have a bypass soft starter and an across the line starter, the other two will also have an across the line starter.
- The RWW FM valves will be operated based on flow to maintain adequate velocities through the forcemain.
- The RWW Recirculation Valve will be opened base on an operator-settable cycle timer.
- A RWW pump test mode will allow an operator to override the wetwell level and input a simulated wetwell level.

Rating

- Wetwell: same as Influent Screening and Screenings Handling.
- Pump Room: Unclassified if ventilated continuously at 6 air changes/hour.

Flowsheet Name: Digester Gas Compression, Storage, and Distribution
Structure Number: 100, 700, 750
Structure Name: Main Building, Digestion Building, Gas Sphere

Description

The purpose of the gas compression system it to allow storage of digester gas produced at a greater rate than consumption. Pressurization of gas to 50 psig allows four times the volume to be stored within the same storage volume of a low pressure system.

System will consist of two (one duty, one stand-by) reciprocating gas compressors with inlet moisture separators / filters and outlet aftercoolers / moisture separators.

SCADA system will monitor cover position on gas holding Digester No. 2, low pressure header pressure, and high pressure header pressure. With cover position greater than adjustable setpoint of 90% full and high pressure header pressure less than adjustable setpoint of 50 psig, lead compressor will run until either cover level falls below adjustable off setpoint of 75% or high pressure header reaches setpoint. Drop in low pressure header pressure below adjustable setpoint of 3 in. w.c. shall stop compressors.

Rating

- 100 Gas Handling Rooms - Class I, Division 1, Group D
- 700 Gas Handling Rooms - Class I, Division 1, Group D
- 750 - Class I, Division 1, Group D

Flowsheet Name: Grit Removal and Grit Handling
Structure Number: 200
Structure Name: Grit Building

Description

The purpose of the Grit Removal system is to remove heavy inorganic material from the waste stream before it can accumulate in downstream treatment processes and increase wear on equipment. Heavy grit particles in the flow stream be removed by settling in the vortex grit chamber. Settled grit from the bottom of the chamber will be extracted using a self-priming grit pump, fluidizing water will be added to the bottom of the grit chamber to reduce the likelihood of plugging. The grit pump will discharge to a grit classifier that also dewaters the grit. Organics overflow the classifier and are returned to the liquid treatment train and the settled grit material is augured up a discharge tube, then gravity dropped into a waste container for disposal.

The overall operating schemes of each piece of equipment is as follows:

- Within the vortex grit chamber, the Grit Propeller will be operated continuously.
- The Grit Pump will have the following runtime options: continuous, an operator-settable timed basis, or an operator-settable influent flow proportional basis.
- The Fluidizing Water Valves will open when the grit pump is running.
- The Grit Classifier will operate when the grit pump is running.

Rating

- Enclosed space: Class 1, Division 1.
- Sampler/Electrical Room: Unrated.

Flowsheet Name: Primary Influent Splitting
Structure Number: 200
Structure Name: Grit Building

Description

The purpose of the primary influent splitting system is to equally distribute flows to each of the four primary clarifiers. By splitting flows equally to each primary clarifier the sludge, scum, and grit loading should also be split equally to each primary clarifier.

The overall operating schemes of each piece of equipment is as follows:

- The electrically actuated, downward opening weir gates will be opened to a predetermined elevation when the corresponding clarifier is in service.
- At flows above an operator-settable influent flow (initially set at 26 mgd) all of the downward opening weir gates will be lowered to predetermined elevation to limit the water level through grit removal.

Rating

- Enclosed space: Class 1, Division 1.

Flowsheet Name: Primary Clarification
Structure Number: 310/320/330/340
Structure Name: Primary Clarifiers

Description

The purpose of the primary clarifiers are to remove larger particles from the flowstream, which reduces loadings to the aeration basins. The solids that have settled to the bottom of the clarifier, primary sludge, are scrapped into the center of the tank. The primary sludge will be pumped out of the clarifier. The solids that floats on the top of the clarifier, primary scum, are scrapped off by a skimmer arm and directed into the primary scum well. The primary scum well will be mixed and the primary scum well will be pumped out of the scum well. The clearer water, primary effluent, flows over the v-notch weirs and into the primary effluent trough. Primary effluent will flow through a pipe and into a new primary effluent channel to the secondary treatment processes. The primary effluent channel will be mixed with fine bubble aeration.

The overall operating schemes of each piece of equipment is as follows:

- The primary clarifier mechanism will operate continuously.
- The primary scum mixer will operate 5-minutes before the primary scum pump is called to operate and will operate continuously until the pump stops or the level within the well reaches a low-level cutout elevation.
- The primary effluent channel will be mixed continuously.

Rating

- Envelope 18” above the top of the tank and extending 18” beyond the exterior wall; envelope 18” above grade extending 10’ horizontally from the exterior walls is Class 1, Division 2.

Flowsheet Name: Aeration System
Structure Number: 400 & 410
Structure Name: Activated Sludge Building & Activated Sludge Tanks

Description

The purpose of the aeration system is to provide sufficient oxygen transfer to the biological treatment and mixing to the Activated Sludge Tanks. The blowers will also provide air for mixing of the PE effluent channel.

There are two criteria for aeration required for the biological process:

- mixing air: required to keep the microorganisms in suspension for access to the food
- process air: required to allow the microorganisms to uptake the food in the mixed liquor

Depending on what the flows and loadings into the Activated Sludge Tanks, either the mixing air or the process air requirements will dictate the minimum amount of aeration for the biological process. Air control valves, airflow meters, and DO probes will be provided in each pass of the activated sludge tank. A control valve and flowmeter will provide air for mixing of the PE channel.

The overall operating schemes of each piece of equipment is as follows:

- The blowers will maintain an operator settable header pressure.
- The air control valves will open and close to maintain an operator-settable DO in each pass of the activated sludge tank with a minimum mixing air flow-clamp. The strategy will include a most open valve control to maximize system efficiency.

Rating

- Blower Room: Unclassified if ventilated continuously at 6 air changes/hour.
- Activated Sludge Tanks: Unclassified.

Flowsheet Name: WAS Pumping
Structure Number: 400, 770
Structure Name: Activated Sludge Building

Description

The purpose of WAS pumping is to remove solids from the activated sludge system that are no longer needed. Waste activated sludge (WAS) piping is connected to the RAS pump suction piping upstream of the RAS flowmeter. There will be two WAS pumps in Structure 400 serving Secondary Clarifier 1 and 2; and there will be three WAS pumps in Structure 770 serving Secondary Clarifier No. 3 and 4. It is anticipated that the WAS pumps located in Structure 770 will primarily be used and the WAS pumps located in Structure 400 will be used as a backup.

The overall operating schemes of each piece of equipment is as follows:

- The WAS pumps will operate when called to run by the corresponding gravity belt thicker.
- The operator will have to enter which WAS pump is operating with which gravity belt thickener. Based on the gravity belt thickener feed rate, the PLC will adjust the speed of the WAS pumps to maintain the flow setpoint for that gravity belt thickener.

Rating

- Unclassified if ventilated continuously at 6 air changes/hour.

Flowsheet Name: RAS Pumping
Structure Number: 400, 770
Structure Name: Activated Sludge Building

Description

The purpose of RAS pumping is to remove solids that have settles within the secondary clarifiers and return them to the Selector. RAS pipes from each clarifier will be metered and pumped by a dedicated pump. The three existing RAS pumps located in Structure 400 will serve Secondary Clarifier No. 1 and 2; and three new RAS pumps located in Structure 770 will service Secondary Clarifier No. 3 and 4. Waste activated sludge (WAS) is connected upstream of the flowmeters.

The overall operating schemes of each piece of equipment is as follows:

- Total RAS removal rate will be based on an operator settable percentage of the influent flow (range 0-150%with a maximum RAS flow clamp of 9 mgd.
- The RAS flow from each secondary clarifier will be determined based on an operator percentage setpoint (Secondary Clarifier No. 1 & 2 each receive 20% of the flow and Secondary Clarifier No. 3 & 4 each receive 30%).
- The operator will have to enter which RAS pump is operating with which clarifier and then the PLC will adjust the speed of the RAS pumps to maintain the flow setpoint for that clarifier.

Rating

- Pump Room: Unclassified if ventilated continuously at 6 air changes/hour.

Flowsheet Name: Digester Gas Compression, Storage, and Distribution
Structure Number: 400
Structure Name: Activated Sludge Building

Description

The purpose of microturbine system is to generate electricity and hot water from available digester gas.

System will consist of two mircoturbines, each with a dedicated heat recovery pump. When microturbine is called to run, associated pump is energized. Controls integral to the microturbine adjust position of exhaust bypass damper to a minimum heat recovery of approximately 15,000 btu/hr. A water cooled heat dump may be added to system to reject any excess heat recovered that may not be beneficially used.

SCADA system will offer control selection of Auto or Minimum Output.

In Auto, output capacity of microturbines will be adjusted to maintain low pressure storage cover position. With fall in cover position and available volume in high pressure storage, gas from sphere will be returned to low pressure system to maintain minimum microturbine output. Upon fall in cover level and no high pressure storage, turbines will stop.

In Minimum Output, microturbines will run to satisfy adjustable minimum output setting. Upon fall in cover level and available high pressure storage, gas from high pressure storage will be returned to low pressure system as required to supply microturbines at output setting. Upon fall in cover position and no high pressure storage, turbines will stop.

SCADA system will monitor low pressure gas storage cover position and high pressure gas storage pressure. System will offer operator selection of digester gas consumption priority of Heat or Electrical Generation. Operator will have ability to set adjustable minimum cover position value to allow for the primary and the secondary digester gas consumer (boilers or microturbines) to energize, initially set to 30% full for primary and 75% full for secondary. When cover position is at least as high as selected priority setpoint, equipment will be allowed to fire on digester gas.

Rating

- 400 - Unclassified

Flowsheet Name: Hot Water Distribution
Structure Number: 400 and 700
Structure Name: Activated Sludge Building and Digestion Building

Description

The purpose of hot water pumping system is to distribute hot water between the heat producers (boilers and microturbines) and the heat consumers (digesters and buildings).

The system will have two pumped systems, a primary pumping system and a Blower Building pumping system.

The primary system consists of two adjustable speed pumps (one duty, one stand-by) and a pressure control valve. Lead pump will run with speed adjusted to maintain pressure setpoint in supply piping. With pump and minimum allowable flow and rise in system pressure, pressure control valve will modulate to bypass supply water to the return loop to maintain pressure setpoint. Lead pump will always run.

The Blower Building pumping system consists of two pumps (one duty, one stand-by). Lead pump will run whenever outside air temperature is below adjustable setpoint, initially 55°F, or if microturbines are called to run.

Rating

- 400 - Unclassified
- 700 - Unclassified

Flowsheet Name: Junction Structure And Anoxic Selector Tank
Structure Number: 404/405
Structure Name: Junction Structure and Anoxic Selector Tank

Description

The purpose of the junction structure is to control the distribution of the primary effluent flow: to the anoxic selector tank, wet weather flow to the end of the activated sludge tanks, or to bypass secondary treatment (flows over 26 mgd and only to protect infrastructure). Bypassing secondary treatment must be a manual process, per DNR. Bypass flow will be measured by subtracting the effluent flow from the influent flow. The wet weather flow mode will protect the activated sludge system by retaining more biology within the activated sludge tank and increasing secondary clarifier flow capacity by lowering the MLSS concentration into the clarifier.

The purpose of the anoxic selector tank is to create an F:M gradient to grow good-settling biology. The selector will also provide some denitrification to recover alkalinity.

The overall operating schemes of each piece of equipment is as follows:

- At flows over an operator-settable influent flow, a downward opening weir gate will be lowered in the junction chamber to provide an operator-settable flow to be maintained to the anoxic selector tank.
- The anoxic selector tank will be mixed continuously.

Rating

- Unclassified.

Flowsheet Name: Secondary Influent Splitting and Secondary Clarification
Structure Number: 500/510/515/520/530/535/540
Structure Name: Secondary Clarifier Splitter and Secondary Clarifiers

Description

The purpose of the secondary influent splitting system is to proportionally distribute flows to each of the four secondary clarifiers based on the clarifier's surface area. Distributing flows to each secondary clarifier based on the clarifier's surface area will equally load each clarifier to optimize clarifier performance throughout all flows.

The purpose of the secondary clarifiers are to separate the solids from the liquid. The mixed liquor enters the clarifier in the center and flow through a flocculating inlet to further enhance particle flocculation. The existing clarifiers will have flocculating inlets added to their existing mechanism. The biological and chemical solids that have settled to the bottom of the clarifier, return and waste activated sludge, are pumped out of the center of the tank.

The solids that floats on the top of the clarifier, secondary scum, are scrapped off by a skimmer arm and directed into the scum well and then will be pumped upstream of the primary clarifiers. The clearer water, secondary effluent, flows over the v-notch weirs and into the secondary effluent trough and into the secondary effluent pump station.

The overall operating schemes of each piece of equipment is as follows:

- The secondary clarifier mechanism will operate continuously.
- Secondary scum pumps will operate based on floats.

Rating

- None.
- Scum Manholes: Envelope 18" above the top of the tank and extending 18" beyond the exterior wall; envelope 18" above grade extending 10' horizontally from the exterior walls is Class 1, Division 2.

Flowsheet Name: Secondary Effluent Pumping
Structure Number: 600
Structure Name: Effluent Building

Description

The purpose of the Secondary Effluent Pumping is to lift secondary effluent from the Secondary Effluent Wet Well to the Influent Filter Channel. The four pumps will be adjustable speed to maintain wet well level based on setpoint. Each discharge pipe from the Secondary Effluent Pumps will have flow monitored via a flow meter.

When operating in automatic control:

- The duty SE Pumps will vary speed to maintain an operator adjustable level setpoint on the wet well. Backup float mode controller provided.
- The SE Flow Meters measure the flow of SE pumped to influent filter channel.

Rating

- Unclassified.

Flowsheet Name: Disc Filtration
Structure Number: 600
Structure Name: Effluent Building

Description

The purpose of the disc filters is to achieve low effluent phosphorus, BOD, and TSS concentration in the effluent. Each sand filter system will be removed and replaced with four disc filters each capable of passing 6.3 MGD of flow. The disc filter system consists of chemical feed system, Rapid Mix Tank, Coagulation Tank, Flocculation Tank, and disc filters. Flows greater than 19 MGD will be passively bypassed around the filters. Each of the Rapid Mix, Coagulation, and Flocculation Tanks will have constant speed mixers.

When operating in automatic control:

- Aluminum Sulfate is dosed in the Rapid Mix Tank. Polymer is dosed in the Coagulation Tank. Dosage rates will be operator settable and flow paced based on the filter flow rate.
- Flow from the Flocculation tank flows by gravity to each of the active filters. A manual valve is located upstream of the filters for isolation. Only filtered water flows to the collection tank. The inside-out flow path prevents solids accumulation in the tank. As solids collect on the inside of the media, the influent water level rises.
- The inlet water level is measured and the control system automatically initiates backwashing. The filtered effluent is pumped to the backwash spray nozzles, washing solids into the sludge trough as the discs rotate. The backwash water is typically 1% to 2% of the total flow to the filter, while the sludge return is typically <1%. Filtration is continuously maintained, even during backwash.

Rating

- Unclassified.

Flowsheet Name: UV Disinfection System
Structure Number: 600
Structure Name: Effluent Building

Description

The purpose of the UV disinfection System is to inhibit bacterial reproduction before effluent leaves the plant. UV is designed to treat up to 26 MGD of flow with a UVT of 52.5%.

When operating in automatic control:

- The UV System shall use flow signal input for control and allocate a flow distribution based upon an entered value per channel. Dosing of the UV system will be paced based on the plant effluent flow (secondary effluent flow minus the plant water and backwash flows) and the measured UVT.
- A bank in Auto is controlled by the Dose Pacing routine of the PLC. The PLC will control the number of banks that are operating and the power level of each bank to a level maintains the current delivered UV dose above an entered setpoint.
- Cleaning of the UV system will be based on an operator settable timer.

Rating

- Unclassified.

Flowsheet Name: W3 Effluent Pumping
Structure Number: 600
Structure Name: Effluent Building

Description

The purpose of the Plant Water Pumps is to pump filtered effluent to the W3 distribution system across the site. The Plant Water Pumps are a set of four adjustable speed pumps (3 firm capacity) designed to maintain pressure in the distribution system. The pumps will discharge to a common header and flow passes through a W3 Automatic Backwash Strainer. The strainer can be bypassed during strainer maintenance activities.

Sodium hypochlorite will be pumped to the discharge W3 water and be flow paced proportional to the W3 flowrate.

When operating in automatic control:

- The duty Plant Water Pumps will vary speed to maintain system pressure.
- Flow is measured via a flowmeter on the discharge header.

Rating

- Unclassified.

Flowsheet Name: Chemical Feed System
Structure Number: 610
Structure Name: P-Chem Building

Description

The purpose of the Chemical Feed System is to pump sodium aluminate solution to three locations at the plant: primary influent, aeration effluent, filtration influent. One feed system will pump chemical to the primary influent and the secondary clarifier influent locations while the other feed system will pump chemical to tertiary treatment for coagulation.

When operating in automatic control:

- The operator settable chemical dose to the primary clarifier influent will be flow paced based on the plant influent flow.
- The operator settable chemical dose to the secondary clarifier influent will be flow paced based on the secondary effluent flow.
- The operator settable coagulation dose to the tertiary treatment rapid mix tank will be flow paced proportional to the flow to the disc filtration system.
    - The concentration reading from Orthophosphate Analyzer in the UV influent channel shall be used to trim the coagulant dosage.

Rating

- Unclassified area but the environment will be corrosive.

Flowsheet Name: Filter Polymer Feed System
Structure Number: 610
Structure Name: P-Chem Building

Description

The purpose of the polymer feed system is to prepare and pump the polymer to the Coagulation Tank prior to disc filtration. Polymer will be pumped from a polymer tote and into the polymer mixing system, W2 water will be used for dilution and activation.

When operating in automatic control:

- The polymer feed system will activate when the PLC calls for it. The liquid polymer pump activates and the dilution water solenoid valve opens. Polymer is fed into the polymer mix chamber assembly where the polymer and dilution water are mixed.
- The operator settable polymer feed rate will be flow paced based on the flow to the filtration system (secondary effluent flow up to a maximum of 19 mgd).

Rating

- Unclassified.

Flowsheet Name: Digester Gas and Natural Gas Boilers
Structure Number: 700
Structure Name: Digestion Building

Description

The purpose of boiler system is to generate hot water for heating the Digesters and building heating. Hot water heat is provided to the Digestion Building, Tunnels, and Activated Sludge Building.

System will consist of two boilers capable of firing both digester gas and natural gas along with a third boiler designed to fire only natural gas. Each boiler has a dedicated boiler pump that will run whenever the associated boiler is allowed to fire. Each Digester Gas Boiler is installed with a three way valve, controlled to ensure that return water temperature to the boilers does not fall below an adjustable setpoint of 155°F to protect the boilers from thermal shock.

SCADA will control boiler temperature setpoint and alternation of boilers as required to maintain required system supply temperature. When digester gas is available, use of digester gas will be lead firing option. When digester gas is not available, natural gas boiler will be lead firing option.

SCADA system will monitor low pressure gas storage cover position and high pressure gas storage pressure. System will offer operator selection of digester gas consumption priority of Heat or Electrical Generation. Operator will have ability to set adjustable minimum cover position value to allow for the primary and the secondary digester gas consumer (boilers or microturbines) to energize, initially set to 30% full for primary and 75% full for secondary. When cover position is at least as high as selected priority setpoint, equipment will be allowed to fire on digester gas.

Rating

- 700 - Unclassified

Flowsheet Name: Thickened Sludge Feed / Gravity Overflow / Sludge Mixing
Structure Number: 700, 710, and 720
Structure Name: Digestion Building, Digester 1, and Digester 2

Description

The plant will have the capability to send Thickened Waste Activated Sludge (TWAS), Thickened Primary Sludge (TPSD) and Primary Scum (PSM) to Digesters No. 1 and No. 2 for reduction of solids by anaerobic digestion. Unthickened Primary Sludge (PSD) can also be sent to the digesters when the gravity thickener is out of service.

Each digester will have a dedicated electrical operated Open-Close feed valve.

The overall operating schemes is as follows:

- Feed to digesters will be evenly split by alternation of which digester receives feed. Operators will have ability to set feed duration time.

Rating

- 700 - Unclassified
- 710 and 720 - Tank Interior, 5 feet laterally from exterior wall, and 10 feet above gas dome at highest elevation: Class 1, Division 1
- 710 and 720 - 5 to 10 feet laterally from exterior wall and 10 to 25 feet above gas dome at highest elevation: Class 1, Division 2

Flowsheet Name: Thickened Sludge Feed / Gravity Overflow / Sludge Mixing
Structure Number: 700, 710, and 720
Structure Name: Digestion Building, Digester 1, and Digester 2

Description

The purpose of sludge mixing is to improve digester performance by minimizing scum accumulation, distributing heat, and keeping solids suspended within the digester.

The existing draft tube mixers (two each digester) will remain in service to provide mixing of both digesters. Each pump will be capable of servicing either digester. The existing pump will be relocated in the lower level of the Digestion Building, and the new pump will be installed in the lower level near the existing pump.

The overall operating schemes of each piece of equipment is as follows:

- Each pump will have an interval duration timer function to allow for part day run time.
- The mixing pumps will be adjustable speed with a manual speed setpoint.

Rating

- 700 - Unclassified
- 730 and 740 - Tank Interior, 5 feet laterally from exterior wall, and 10 feet above gas dome at highest elevation: Class 1, Division 1
- 730 and 740 - 5 to 10 feet laterally from exterior wall and 10 to 25 feet above gas dome at highest elevation: Class 1, Division 2

Flowsheet Name: Hot Water Distribution
Structure Number: 700, 710, and 720
Structure Name: Digestion Building, Digester 1, and Digester 2

Description

The purpose of heating Digester 1 and Digester 2 is to maintain a consistent temperature with the digesters for mesophilic digestion between 95 and 105°F.

Each digester has two existing draft tube mixers with integral hot water heat exchangers (refer to Mixing Strategies). This project will replace the heating water pumps and temperature control valves associated with these mixers.

The overall operating schemes of each piece of equipment is as follows:

- Heating water pump will run continuously.
- Sludge temperature entering heat exchanger will be monitored as a control parameter for heat addition. Upon fall in sludge temperature below adjustable setpoint, additional heat will be added by opening temperature control valve.

Rating

- 700 - Unclassified
- 710 and 720 - Tank Interior, 5 feet laterally from exterior wall, and 10 feet above gas dome at highest elevation: Class 1, Division 1
- 710 and 720 - 5 to 10 feet laterally from exterior wall and 10 to 25 feet above gas dome at highest elevation: Class 1, Division 2

Flowsheet Name: Digester Heating / Digested Sludge Transfer
Structure Number: 700, 730, and 740
Structure Name: Digestion Building, Digester 3, and Digester 4

Description

The purpose of dewatering feed system is to send digested sludge to the dewatering process. Three Dewatering Feed Pumps (two duty, one stand-by) will be installed to feed the two dewatering units. Pumps will be interlocked with dewatering equipment controls with adjustable speed drives controlling pump speed to maintain desired feed rate to dewatering equipment. The pumps are piped to have the capability to utilize two suction connections, one near the bottom of the digester and another at the sidewall, on both Digester 3 and Digester 4. These pumps will discharge to either of two pipes that will be routed to the Solids Building.

Dewatering Feed Pumps will also be piped to allow for pumped transfer between Digesters No. 3 and No. 4. Transfer operations will be a manual operation.

Rating

- 700 - Unclassified

Flowsheet Name: Digester Heating / Digested Sludge Transfer and Hot Water Distribution
Structure Number: 700, 730, and 740
Structure Name: Digestion Building, Digester 3, and Digester 4

Description

The purpose of heating Digester 3 and Digester 4 is to enable them to function as primary digesters.

Each digester will have a dedicated sludge recirculation pump, heat exchanger, heating water pump, and temperature control valve to keep it at a temperature of 95 degrees F. The recirculation pump will utilize two suction connections, one near the bottom of the digester and another at the sidewall. Recirculated sludge will be returned to digesters through two discharge connections, one above the liquid level and another opposite of the sidewall suction. The recirculation pump and heat exchanger will be located in the Digestion Building.

The overall operating schemes of each piece of equipment is as follows:

- The sludge recirculation pump will run continuously at an adjustable speed to maintain desired sludge flow rate.
- Heating water pump will run continuously.
- Sludge temperature entering heat exchanger will be monitored as a control parameter for heat addition. Upon fall in sludge temperature below adjustable setpoint, additional heat will be added by opening temperature control valve.

Rating

- 700 - Unclassified
- 730 and 740 - Tank Interior, 5 feet laterally from exterior wall, and 10 feet above gas dome at highest elevation: Class 1, Division 1
- 730 and 740 - 5 to 10 feet laterally from exterior wall and 10 to 25 feet above gas dome at highest elevation: Class 1, Division 2

Flowsheet Name: Thickened Sludge Feed / Gravity Overflow / Sludge Mixing
Structure Number: 700, 730, and 740
Structure Name: Digestion Building, Digester 3, and Digester 4

Description

The purpose of sludge mixing is to improve digester performance by minimizing scum accumulation, distributing heat, and keeping solids suspended within the digester.

The existing nozzle mixing systems and mixing pump will be coupled with an additional mixing pump to allow concurrent mixing of both digesters. Each pump will be capable of servicing either digester. The existing pump will be relocated in the lower level of the Digestion Building, and the new pump will be installed in the lower level near the existing pump.

The overall operating schemes of each piece of equipment is as follows:

- Each pump will have an interval duration timer function to allow for part day run time.
- The mixing pumps will be adjustable speed with a manual speed setpoint.

Rating

- 700 - Unclassified
- 730 and 740 - Tank Interior, 5 feet laterally from exterior wall, and 10 feet above gas dome at highest elevation: Class 1, Division 1
- 730 and 740 - 5 to 10 feet laterally from exterior wall and 10 to 25 feet above gas dome at highest elevation: Class 1, Division 2

Flowsheet Name: Digester Gas Collection / Waste Gas Burner
Structure Number: 700, 710, 720, 730, and 740
Structure Name: Digestion Building, Digesters 1 through 4

Description

The purpose of the gas handling systems is to safely collect digester gas generated within the four digesters, provide initial moisture removal and pass gas along to downstream users.

Digester No. 3 and No. 4 will be furnished new floating covers with gas vacuum/pressure relief assemblies. Digester No. 1 will keep the existing fix cover and Digester No. 2 will keep the existing gas holder cover.

Digester gas flow metering will be provided for Digesters 1, 3, and 4. Digester 2 will not receive metering because of the dual directional flow associated with gas storage.

A moisture/sediment trap will be installed on the digester gas piping from Digester 2 and a common trap for Digesters 1, 3, and 4.

All condensate collection from low pressure gas system within Digestion Building will be drained by gravity though a condensate accumulator. The water level of the accumulator will be monitored for low level condition to warn of potential lost gas seal.

Gas header pressure will be monitored.

Rating

- 700 Gas Handling Rooms - Class 1, Division 1, Group D

Flowsheet Name: Digester Gas Collection / Waste Gas Burner
Structure Number: 700 and 755
Structure Name: Digestion Building, Waste Gas Burner

Description

The purpose of the digester gas Waste Gas Burner is to safely remove unused digester gas from the system to avoid cover over pressurization and unregulated release through the pressure relief valves. The system is controlled by a local control panel which monitors gas system pressure. Plant SCADA will monitor cover position of Digester No. 1. Whenever cover position is below an adjustable setpoint, initially 95%, Waste Gas Burner will be locked out. With cover position above setpoint and upon rise in system pressure above setpoint, high pressure switch is activated which triggers lighting of pilot system and opens a solenoid valve in the pressure control valve sensing line. Continued rise of gas pressure lifts the diaphragm in the pressure control valve and allows gas to flow to the flare and be ignited by the pilot. Pilot gas system will be plumbed to supply natural gas.

The digester gas supply line will be provided with an automatic drip trap to drain condensate from the gas piping.

Rating

- 700 - Gas Handling Rooms - Class I, Division 1, Group D
- 755 - Class I, Division 1, Group D within 10’-0” of Burner. Division 2 additional 15’ above and 5’ out

Flowsheet Name: Primary Sludge Screening
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Primary Sludge Screening System is to remove debris from the primary sludge prior to thickening and digestion using one of two enclosed sludge screens. Thin primary sludge is pumped inside a cylindrical perforated screen where liquid and small solids pass through and the debris are retained. A screw transports debris to the discharge end where a pneumatic discharge pressure cone is used to squeeze water from the debris solids. Captured solids are dropped from the screen into a waste container below while the liquid passes on to the gravity thickener.

When operating in automatic control:

- Screens shall be setup in a duty/standby arrangement with sequencer controlling the electrically actuated inlet valves.
- Screens operate based on pressure on the inlet and discharge. The screen will start when the differential between inlet and discharge pressure exceeds a setpoint and the sludge inlet pressure has reached a start setpoint.
- Once the screen has started it will run until the pressure conditions are removed and an off-delay timer expires.
- See manufacturer sequence of operation for more details.

Rating

- Enclosed space: Unrated if ventilated continuously at 6 air changes/hour.

Flowsheet Name: WAS Thickening
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of WAS Thickening is to thicken WAS from ~0.6% solids to >5% solids to increase digester SRT and reduce the digester heating load. WAS thickening is accomplished using two 2-m gravity belt thickeners. Under normal operating conditions one belt will run for approximately 9 hours per day and under high loading conditions both belts will run for approximately 7 hours per day. Each belt will be assigned a WAS pump polymer feed system.

When operating in automatic control:

- The operator shall select which GBTs are in service, input the total volume to waste for the day, and manually start the thickening process.
- The WAS pump assigned to an in service GBT shall vary speed to meet a flow rate setpoint initially set for 400 gpm (200 gpm/m).
- The respective polymer feed system shall run whenever it's GBT is running.
- The WAS pumps and GBTs shall continue to operate until the daily flow total amount has been met.
- Upon shutdown the GBT will enter a Washdown mode to clean the equipment for an operator adjustable time period before shutting down.
- A camera shall be provided for each GBT to allow remote viewing of its performance.

Rating

- Sludge Thickening: Unrated if ventilated continuously at 6 air changes/hour.

Flowsheet Name: Primary Sludge Thickening
Structure Number: 770/775
Structure Name: Solids Building/PSD Thickener

Description

The purpose of the Primary Sludge Thickening System is to thicken the thin (~0.75%) primary sludge from the clarifiers or primary sludge screens up to 4% or more to reduce the volumetric loading the digesters to increase digester SRT and reduce heating demands. The gravity thickener operates similar to clarifier with solids settling to the bottom of the tank and liquid overflowing the top. Thickened primary sludge is withdrawn from the bottom using two (one standby) air operated diaphragm pumps. The thickener overflow is directed to the recycle wet well in the Solids Building. The thickened primary sludge flow rate shall be calculated by counting pump strokes.

The thickener will have three modes for automatic control:

- Sludge Blanket Control
  - A sludge blanket detector will monitor the level of solids at the bottom of the thickener and the TPSD pumping rate will be varied to maintain an operator adjustable blanket level.
- Torque Control
  - The thickener mechanism will be equipped torque monitoring device. The TPSD pump speed will be varied to maintain an adjustable torque setpoint.
- Flow Control
  - The TPSD pumping/stroke rate will be set by the Operator.

Rating

- Sludge Pumping in 770: Unrated if ventilated continuously at 6 air changes/hour.
- PSD Thickening: Class 1 Div 1 inside tank, Class 1 Div 2 envelope 18” up and 10 ft out.

Flowsheet Name: TWAS Pumping
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the TWAS Pumping System is convey thickened WAS from the gravity belt thickeners to the digesters. Thickened sludge from each GBT falls into a steel TWAS Hopper with an open throat progressive cavity TWAS Pump mounted underneath it. The hoppers are equipment with a flushing nozzle system to assist in cleaning them out. The TWAS pumps are equipped with revolution counters to compare expected flow vs. measured flow to alert staff when the pumps begin to wear.

When operating in automatic control:

- The TWAS pumps vary their speed to maintain a level setpoint inside their respective hopper.
- Total TWAS flow to digesters is measured using a magnetic flow meter.

Rating

- Sludge Pumping: Unrated if ventilated continuously at 6 air changes/hour.

Flowsheet Name: GBT Polymer Feed
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the GBT Polymer Feed System is to dilute, age, and feed emulsion polymer to the gravity belt thickeners for WAS thickening. Two polymer mixing systems (one redundant) dilute emulsion polymer from totes and pump it into an aging tank to allow it to activate. Two polymer feed systems (one for each GBT) draw polymer from the aging tank, dilute the polymer solution a bit more, and feed it to the GBTs.

When operating in automatic control:

- Polymer feed unit flow rate is controlled by dose setpoint set by the operator (X lbs of polymer per gpm of WAS).
- The polymer mixing system speed shall vary to maintain a level set point in the aging tank.

Rating

- Unrated

Flowsheet Name: Sludge Dewatering
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of Sludge Dewatering is to dewater anaerobically digester sludge from ~3% solids to >18% solids to reduce the amount of water that must be evaporated by the dryer and/or reduce the volume of cake sludge that must be stored. Sludge dewatering is accomplished using two 1.5-m belt filter presses. Under normal operating conditions sludge will be withdrawn from the storage tank, dewatered, and sent to the dryer. When the dewatering/drying train is in operation it is expected to run 24 hours/day, 5 days/week. One press is redundant when feeding the dryer. If the dryer is out of service or the operator wishes to make cake both presses can be run at the same time. Ferric chloride shall be fed to the BFP filtrate to control recycle phosphorus loading.

When operating in automatic control:

- The operator shall select which BFPs are in service and manually starts the dewatering process.
- The feed pump assigned to an in service BFP shall vary speed to meet a flow rate setpoint initially set for 57 gpm.
- The respective polymer feed system shall run whenever its BFP is running.
- The feed pumps and BFPs shall continue to operate until the storage tank reaches a low level set point or the process is stopped manually.
- A camera shall be provided for each BFP to allow remote viewing of its performance.

Rating

- Sludge Dewatering: Unrated if ventilated continuously at 6 air changes/hour.

Flowsheet Name: BFP Polymer Feed
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the BFP Polymer Feed System is dilute, age, and feed emulsion polymer to the belt filter presses for sludge dewatering. Two polymer mixing systems (one redundant) dilute emulsion polymer from a bulk storage tank and pump it into an aging tank to allow it to activate. Two polymer feed systems (one for each BFP) draw polymer from the aging tank, dilute the polymer solution a bit more, and feed it to the BFPs.

When operating in automatic control:

- Polymer feed unit flow rate is controlled by dose setpoint set by the operator (X lbs of polymer per gpm of DS).
- The polymer mixing system speed shall vary to maintain a level set point in the aging tank.

Rating

- Unrated

Flowsheet Name: Cake Pumping
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Cake Pumping system is to convey dewatered sludge cake to the dryer or a waiting truck for disposal. The cake sludge discharge from each belt filter press falls into a wide cake sludge hopper with two twin screw feeders at the bottom. The hopper opening extends beyond the belt press discharge to allow cake sludge hauled into the building to be pushed into the hopper.

Four wet cake pumps are located under the hopper arranged in pairs (duty/redundant) to feed the two dryer dosing trains. The screw feeders run forward to feed sludge to one of their pumps and in reverse to feed the other. The discharge of the wet cake pumps is controlled using pneumatically actuated valves to feed the dryer dosing trains or bypass the dryer and discharge wet cake directly to a waiting truck.

When operating in automatic control:

- The screw feeders will operate in forward or reverse to feed cake to their duty wet cake pump.
- The duty wet cake pumps operate at an adjustable constant speed to feed the dryer as dictated by the dryer manufacturer provided control panel.

Rating

- Unclassified at 6 AC/h continuous.

Flowsheet Name: Dryer Dosing Pumps
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Dryer Dosing Pump system is to deposit wet cake sludge inside the dryer. The wet cake pumps feed two sets of four wet cake dosing pumps. The dosing pumps pump cake sludge through nozzles into the dryer and a rotating depositor cuts the ribbons of wet sludge and deposits them onto the upper belt of the dryer.

When operating in automatic control:

- The dosing pumps run whenever the dryer and the wet cake pump feeding them is running.
- The depositor runs whenever the dryer is running.

Rating

- Class 2 Division 1 inside equipment processing dried biosolids.
- Class 2 Division 2 envelope around equipment processing dried biosolids.

Flowsheet Name: Sludge Drying
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of Sludge Drying is to increase the solids content of the dewatered sludge cake from 18% to >90% to reduce the volume for disposal by evaporating water in a belt dryer.

Sludge is deposited evenly onto a slowly moving upper belt. When it reaches the end of the belt it falls to a lower belt and from the lower belt it falls into an extraction screw for removal. The dryer is split onto a Warm Zone and an End Zone. In the Warm Zone two fans circulate air within the dryer blowing it across a thermal fluid heat exchanger to increase the temperature. The End Zone operates at lower temperature but utilizes two fans blowing air across a thermal fluid heat exchanger to maintain temperature.

When operating in automatic control:

- The fans and belt drives operate continuously while the dryer is in operation.

Rating

- Class2 Division 1 inside equipment processing dried biosolids.
- Class 2 Division 2 envelope within 10 ft of equipment processing dried biosolids.

Flowsheet Name: Drying Air Treatment
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Drying Air Treatment System is to remove water evaporated by the dryer form the warm air before it is recirculated back to the dryer. Moist air with the water evaporated within the dryer is sent through a spray condenser to lower the temperature and remove the water from the air prior to returning it to the dryer and discharging a portion of it to the atmosphere. A Drying Air Treatment Fan sucks air from the dryer through the condenser where water sprays are used to reduce the temperature. A Vacuum Fan exhausts a portion of treated air to the atmosphere.

When operating in automatic control:

- The fans and spray valves operate continuously while the dryer is in operation.

Rating

- Unclassified.

Flowsheet Name: Dried Biosolids Handling and Storage
Structure Number: 770/771/772
Structure Name: Solids Building/Silo/Nitrogen System

Description

The purpose of the Dried Biosolids Handling and Storage System is to transport dried biosolids from the dryer to a silo for storage until they can be disposed of. Dried biosolids are removed from the dryer using an Extraction Screw conveyor through a rotary Discharge Valve. A tubular drag conveying system will carry the dried product into a storage silo. A nitrogen purge system is provided to fill the silo with nitrogen if increased temperatures are detected within the silo to smother any fire. Dried product is removed from the silo using a retractable discharge spout and pneumatically actuated discharge gate.

When operating in automatic control:

- The conveyance system runs whenever the dryer does.
- The nitrogen system activates when a high temperature is detected in the silo.
- Dried product is removed from the silo to a waiting truck using local controls.

Rating

- Class 2 Division 1 inside equipment processing dried biosolids.
- Class 2 Division 2 envelope around equipment processing dried biosolids.

Flowsheet Name: Thermal Fluid System
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Thermal Fluid system is to provide heat to dryer by burning natural gas and using circulation pumps and temperature control valves to adjust the temperature in thermal oil lines to and from the heat exchangers in the dryer.

When operating in automatic control:

- The thermal fluid system runs whenever the dryer does and operates to maintain its temperature setpoints.

Rating

- Unclassified.

Flowsheet Name: Recycle Pumping
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the Recycle Pumping system is to return sidestreams from the solids handling processes to the liquid treatment train. These sidestreams include the GBT and BFP filtrate, dryer condensate and drains, and the gravity thickener overflow. The sidestreams enter a recycle wet well which is pumped down using two dry pit Recycle Pumps (one duty, one redundant). Recycle loadings on the liquids train are monitored using a recycle flow meter and a sampler.

When operating in automatic control:

- The duty Recycle Pump varies speed to maintain an operator adjustable level setpoint on the wet well. Backup float mode controller provided.
- The Recycle Flow Meter measures the volume returned to the plant.
- The Recycle Sampler collects samples proportional to the measured flow rate.

Rating

- Unclassified.

Flowsheet Name: Compressed Air System
Structure Number: 770
Structure Name: Solids Building

Description

The purpose of the compressed air system is to provide high pressure air throughout the plant for air operated diaphragm pumps, pneumatic actuated valves, etc. The system includes two compressed air systems with screw compressors and desiccant dryers (one duty and one standby) feeding one receiver with two condensate filters before entering the distribution system.

When operating in automatic control:

- The duty compressed air system runs to maintain the operator adjustable pressure setpoints for the compressed air system.
- The automatic drain valves open and close based on timers.

Rating

- Unclassified.

Flowsheet Name: Primary Scum Pumping
Structure Number: 900
Structure Name: Tunnel

Description

The purpose of the Primary Scum Pumping system is to remove scum from the four primary clarifier scum wells and send it to the digesters. Two pumps are provided, one duty and one standby. Pump operation is controlled using floats in each of the scum wells and pneumatically actuated valves on the pump suction lines.

The overall automatic operating strategy is as follows:

- The pumps are off and all four pneumatically actuated valves are shut.
- The level in a primary clarifier scum well reaches the pump start float level.
- The corresponding pneumatically actuated valve opens.
- The duty Primary Scum Pump starts and runs until the active scum well reaches its pump stop float elevation or an adjustable run duration timer expires (expiration of the timer will generate an alarm indicating the stop float has hung up or some other abnormal condition is present).
- The open pneumatic valve closes.
- If another primary scum well pump start float is tripped while a well is being pumped the new valve will not open until the current well has finished its pumping cycle. The control system will cycle through the wells in the order the start floats were activated until all the wells are pumped out.
- The duty and standby pumps shall automatically switch roles based on an operator adjustable schedule.
- If the duty pump fails the standby pump shall take over as the duty pump.

Rating

- Enclosed space: Unrated if ventilated continuously at 6 air changes/hour.

Flowsheet Name: Primary Sludge Pumping
Structure Number: 900
Structure Name: Tunnel

Description

The purpose of the Primary Sludge Pumping system is to remove settled sludge from the bottom of the primary clarifiers. Four pumps are provided (one for each clarifier) with each pump being able to draw from two clarifiers to provide redundancy. The pumps shall be designed to handle grit that passes through the grit removal system in high flow events (Wemco Model C or Fairbanks C). Sludge is either sent to the primary sludge screens, gravity thickener, or the digesters.

The overall operating strategies are as follows:

- Normal Operations:
    - Primary sludge will be pumped thin (~0.75%) from the primary clarifiers to minimize chances for grit plugging the clarifiers or pump suction lines to the primary sludge screens.
    - One pump (pumping from one clarifier) will run at a time and cycle through each on an adjustable interval/duration timer.
    - The operating pump shall vary speed to meet an adjustable flow rate setpoint initially set to 100 gpm (maximum flow clamp set at PSD screen capacity of 284 gpm) and increase speed proportionally to plant influent flow.
- Thickener Operation:
    - In the event both primary sludge screens are out of service manual valves can be adjusted to send thin primary sludge to the gravity thickener. Pumps control would be the same as normal operation.
- Digester Operation:
    - In the event the gravity thickener is out of service primary sludge can sent directly to the digesters. In such case it must be allowed to thicken to ~4% in the clarifiers to preserve digester HRT and heat.
    - The pumps would operate on a second set of setpoints for flow (~50 gpm) and interval/duration timers (pumping less often) to allow solids to thicken in the clarifiers.

Rating

- Enclosed space: Unrated if ventilated continuously at 6 air changes/hour.

Appendix F

Public Hearing Materials

OFFICIAL NOTICE AND AGENDA
of a meeting of a City Board, Commission, Department Committee, Agency, Corporation, Quasi-Municipal Corporation, or Sub-unit thereof.

A Meeting of **Wausau Water Works Commission** will be held in the **Council Chambers, 1st Floor City Hall, Wausau, WI 54403** at **1:30 p.m.** on **Tuesday, January 8. 2019.**

AGENDA

1. Approve Minutes of December 4, 2018 Meeting.
2. Director's Report on Utility Operations
   - Thank You from Warbird Rendezvous
   - Staff Addressing Records and Maintenance Items
   - End of Year Information for Compliance Reporting
   - Rehab Work on Wells 3 & 7
   - Village of Maine Water Agreement
   - WWTP Meeting Permit Limits
   - New Sewer Maintainer – Bill Olsen
   - Hauling Sludge to Landfill
   - WWTP New Portable Generator
   - Ken Bloom Provided Data to UWSP Class Research Project
   - November 2018 Financial Charts
3. Discussion and Possible Action on the Purchase of Bulk Polymer for 2019.
4. Sanitary Sewer Overflow Closeout/No Further Action Letter From the WDNR.
5. Discussion and Possible Action on the Final WPDES from the WDNR.
6. Update on the City of Wausau Wage Study Results.
7. WWTF Presentation and Update by Donohue (15 – 20 min).
8. Discussion and Possible Action on Submission of the WWTF Facilities Plan to the WDNR.
9. WTF Presentation and Update by Donohue/Becher Hoppe (15 – 20 min).
10. Discussion and Possible Action on Relocating the Water Treatment Plant to Bugbee Avenue.

Adjourn.

Signed by: /s/ Robert B. Mielke
Presiding Officer or Designee

** Next Water Commission Meeting Scheduled for February 5, 2019.*

THIS NOTICE POSTED AT CITY HALL AND EMAILED TO CITY PAGES AND DAILY HERALD: January 4, 2019 at 1:00 pm.

In accordance with the requirements of Title II of the Americans with Disabilities Act (ADA), the City of Wausau will not discriminate against qualified individuals with disabilities on the basis of disability in its services, programs, or activities. If you need assistance or reasonable accommodations in participating in this meeting or event due to a disability as defined under the ADA, please call Michelle Weasler/Wausau Water Works at (715) 261-7289 or the City's ADA Coordinator at (715) 261-6620 or e-mail clerk@ci.wausau.wi.us at least 48 hours prior to the scheduled meeting or event to request an accommodation.

Another Wastewater Project Update

Utility Commission
Wausau, WI

January 8, 2019

DONOHUE | BECHER HOPPE

An Aging Facility

One of Wausau's Most Valuable Assets

* Based on recent new 24-mgd nutrient-removing treatment facility for Denver, CO. Grand opening 2017. Cost = $417M. [CCI 2018 = 10,959. CCI 2011 = 9070. Cost = $504M in $2018. Includes a 7-mile forcemain.]

For Significant Facility Upgrades, EPA and WDNR Require a 20-Year Plan | Facility Plan

- Upgrade Considerations
  - Safety, Reliability, Performance
  - Capacity
  - Regulations
- Facility Plan Required for Clean Water Fund Funding

The Foremost Plan Objectives

- The Recommended Plan
  - Maximize Benefit of Existing Infrastructure
  - Maximize Return on Previous Investment

Comprehensive Condition Assessment All Processes and Structures

Example Phosphorus-Removing Chemical Storage and Feed System

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations		■

Capacity

The storage and feed capacity is adequate for the current WPDES Permit limit; however, both will be inadequate for the future phosphorus TMDL limit. Moreover, the Facility will need the ability to feed phosphorus-removing chemicals to multiple locations – e.g., upstream primary settling, upstream secondary settling, upstream filtration, and to the belt-filter press underflow.

Configuration

- Number of Chemical Storage Tanks = 1
- Number of Chemical Feed Pumps = 2
- Type of Chemical Feed Pumps = diaphragm
- Storage Volume = 4,800 gal

Description

The Facility uses aluminum sulfate (alum) to comply with its current 1 mg-TP/L limit. Alum is stored in a single 4,800-gal chemical storage tank and fed to the grit system upstream of primary settling. This is currently the only alum feed point. The Facility currently uses roughly 350 gpd on average.

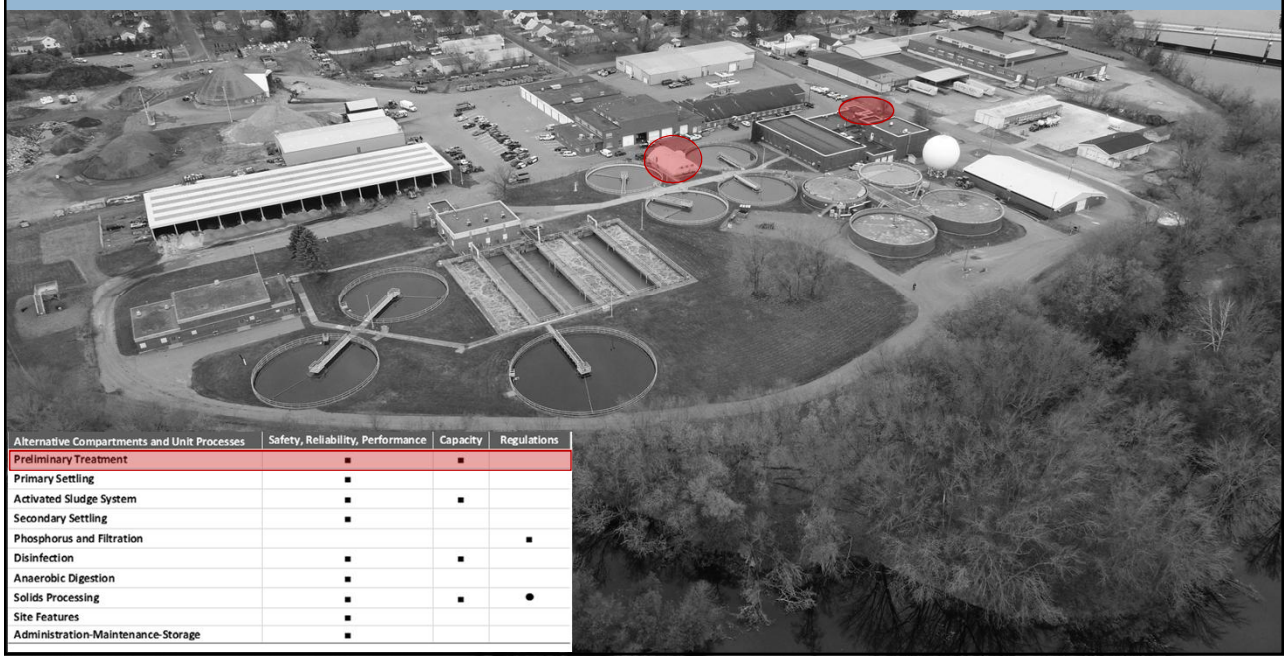
Issues

- The current system lacks storage volume to meet the demands of the impending phosphorus TMDL. Moreover, the Facility might be best served by feeding multiple chemicals.
- The existing system feeds alum to a single location. The impending phosphorus TMDL will require multiple feed locations.
- The chemical storage tank lacks adequate containment. This is a safety concerns.

Condition Assessment Summary

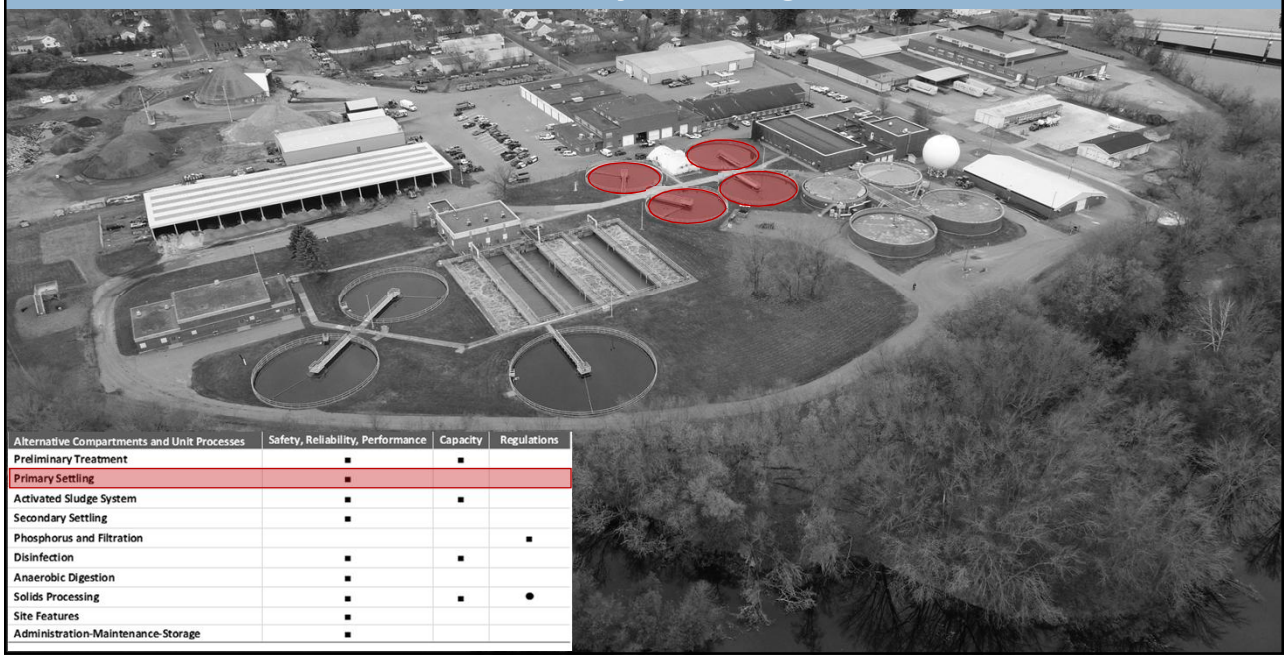
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Preliminary Treatment



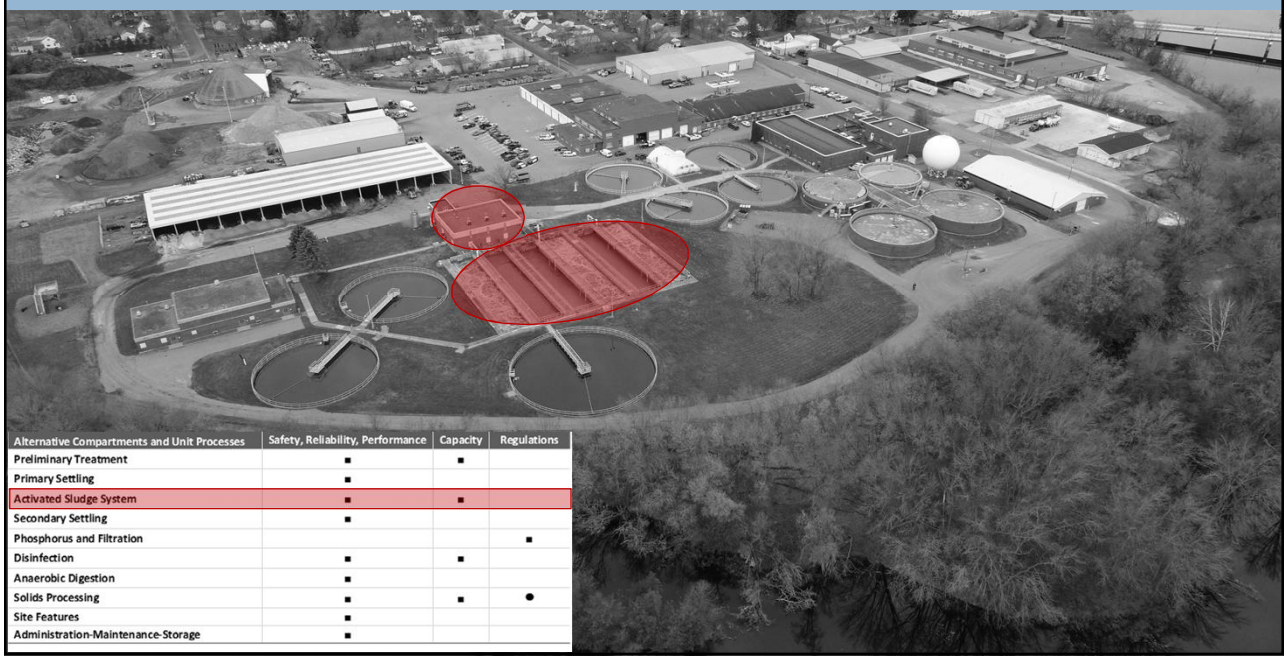
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Primary Settling



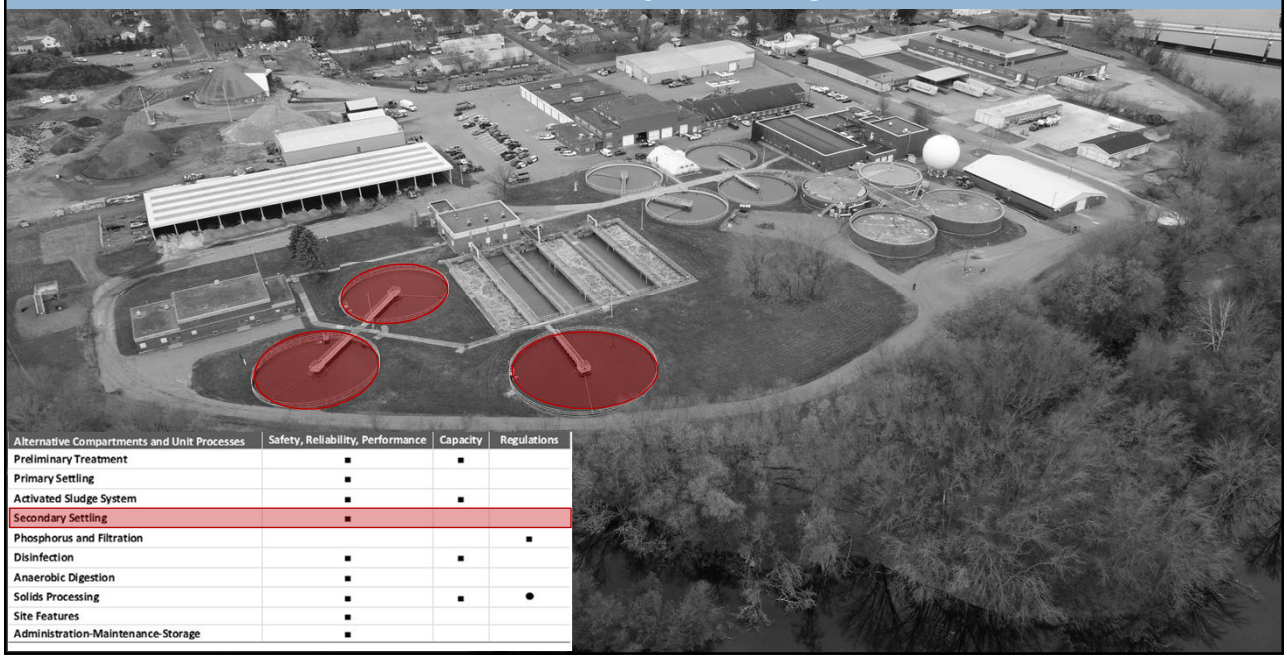
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Activated Sludge System



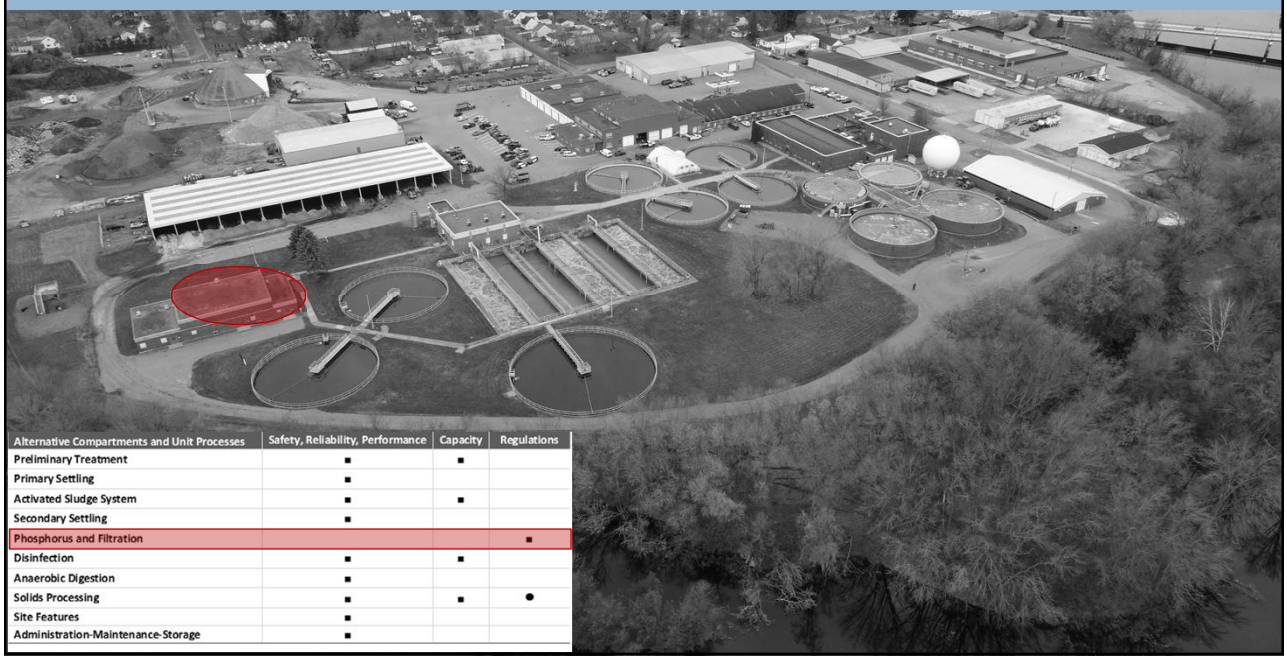
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Secondary Settling



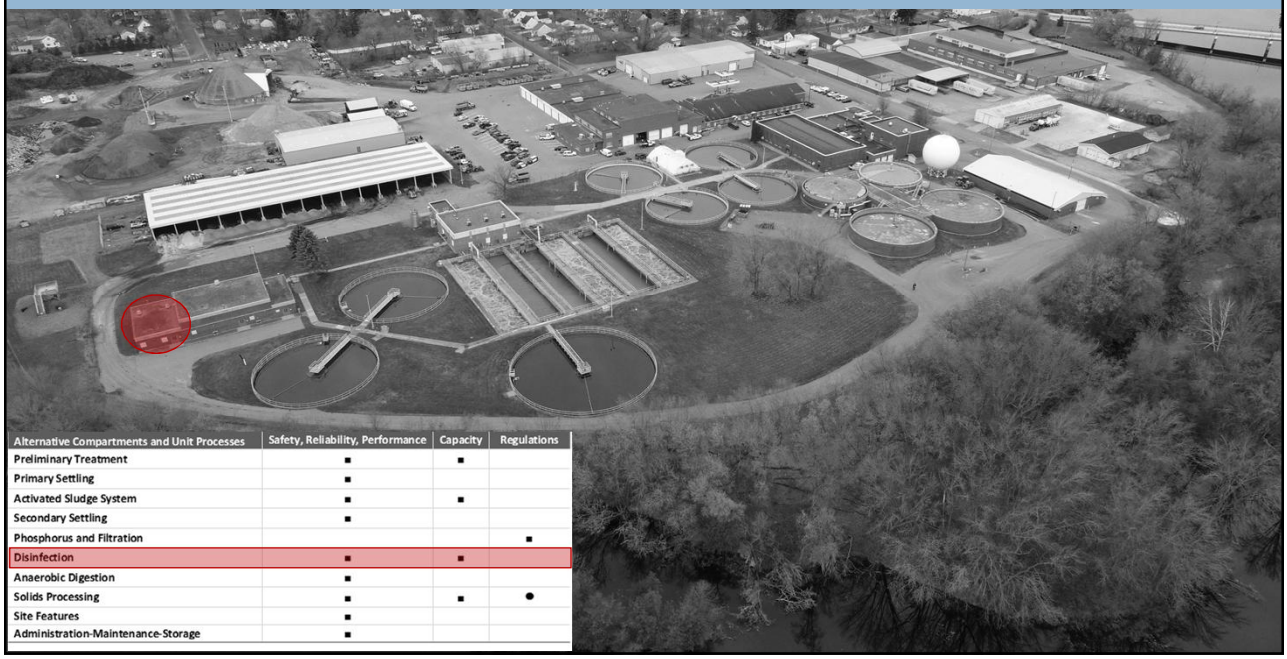
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Phosphorus and Filtration



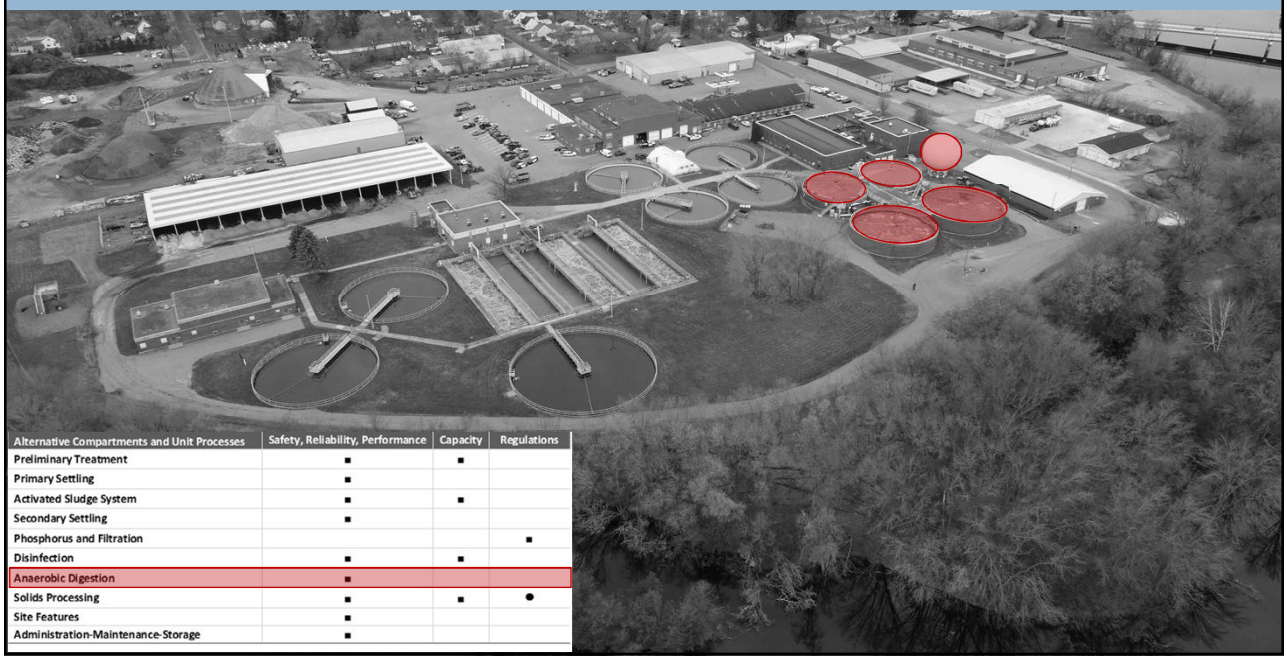
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Disinfection



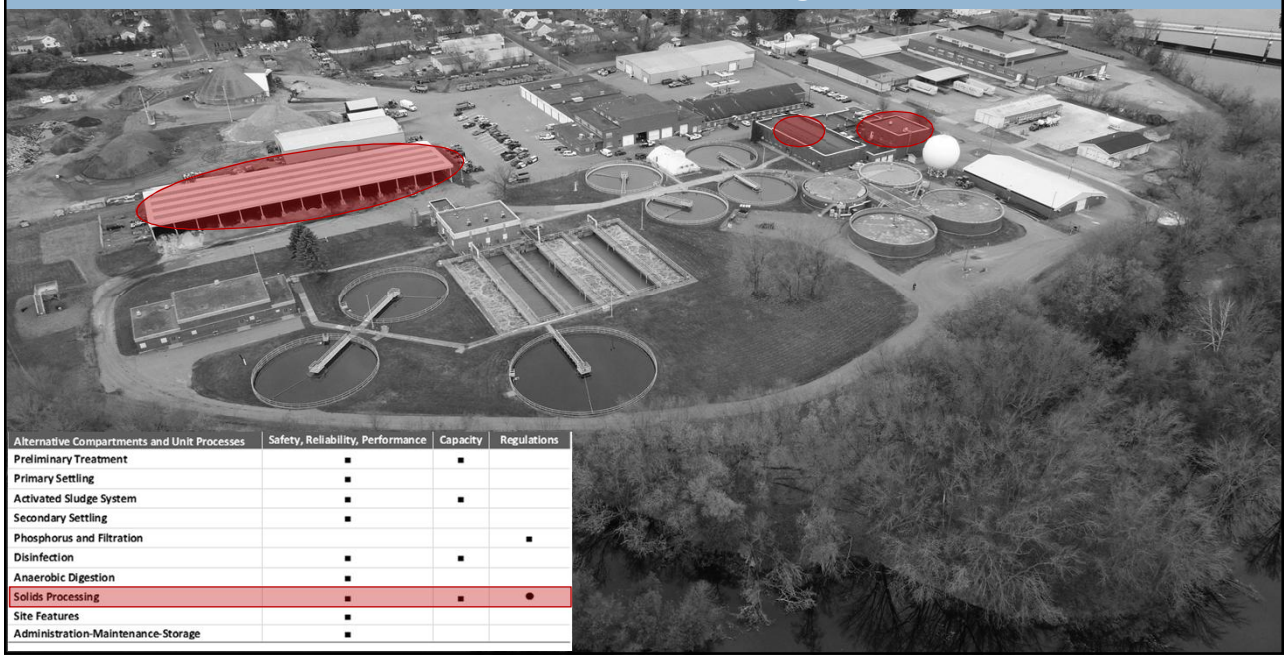
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Anaerobic Digestion



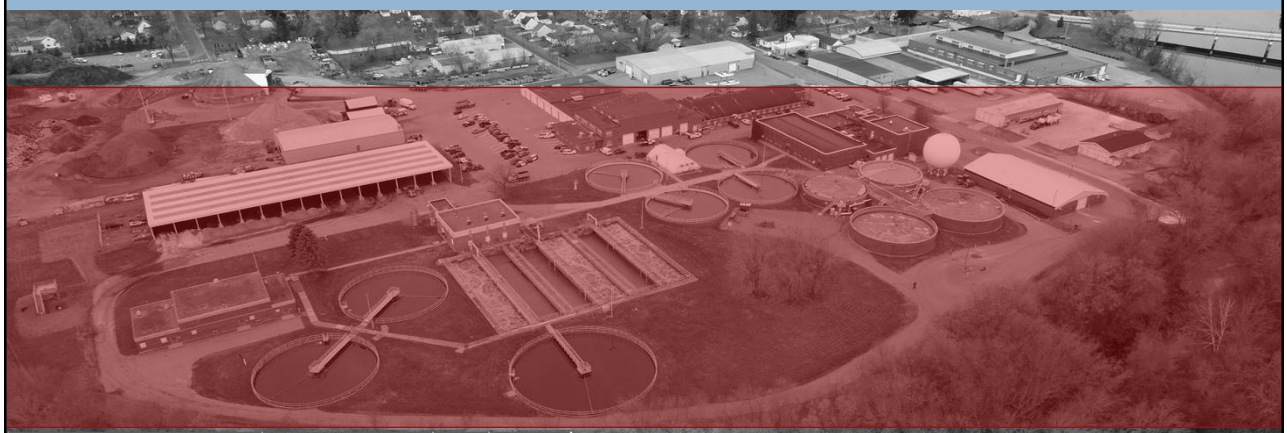
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Solids Processing



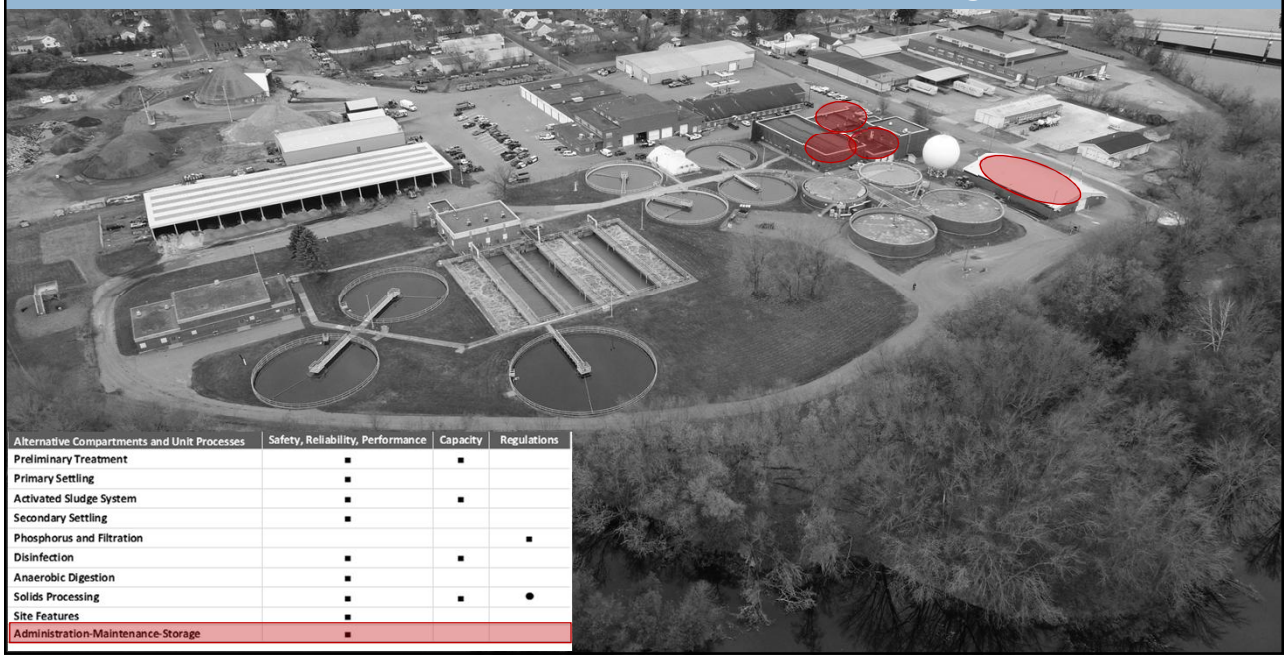
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Site Features



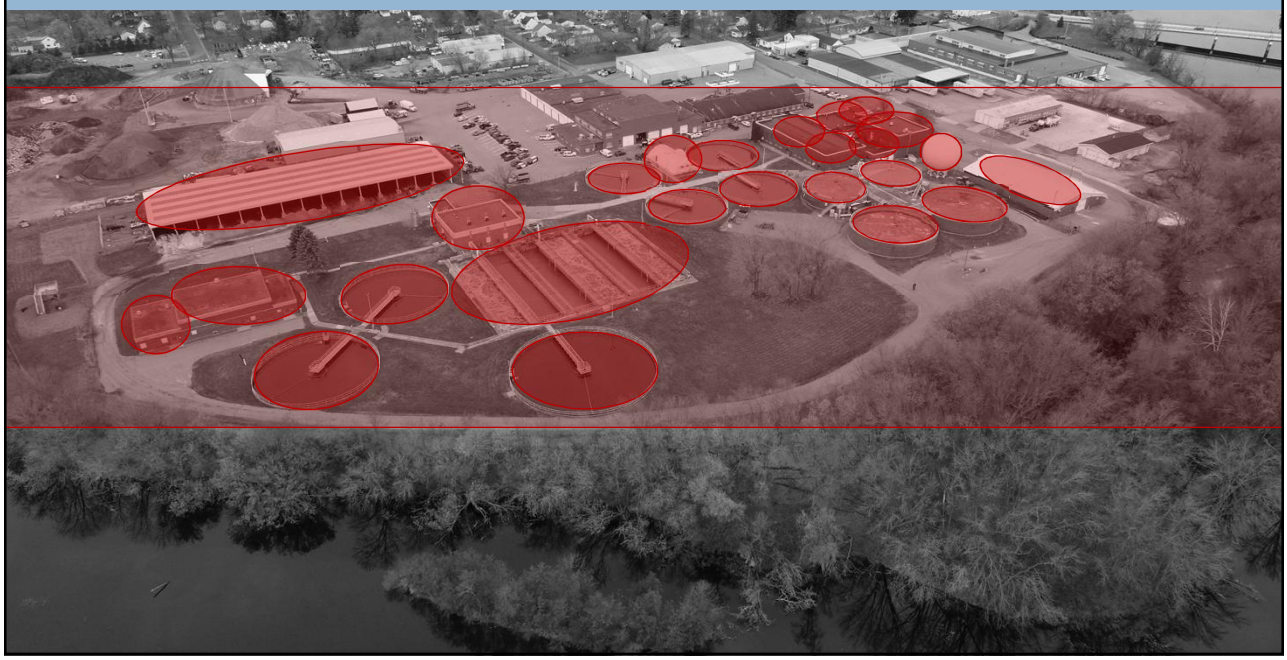
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Administration-Maintenance-Storage

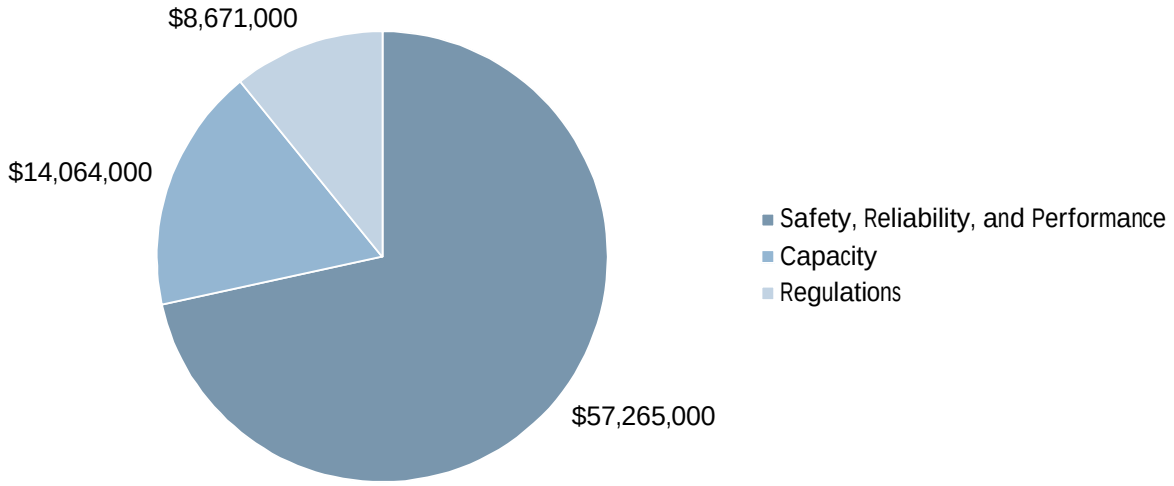


Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

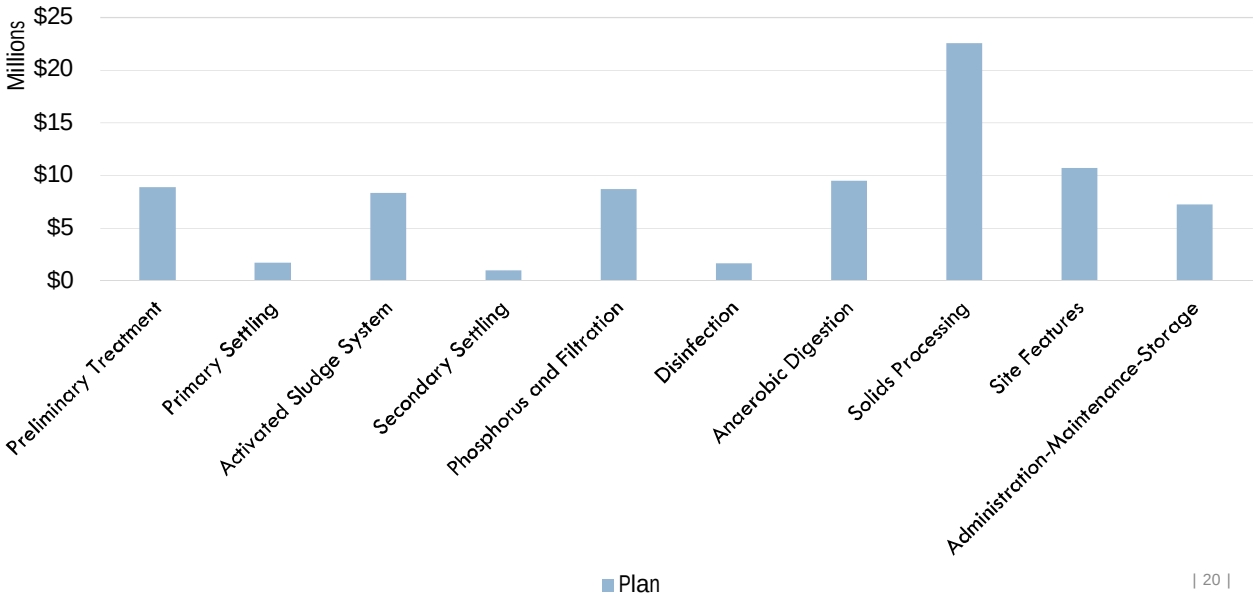
The Issues are Pervasive



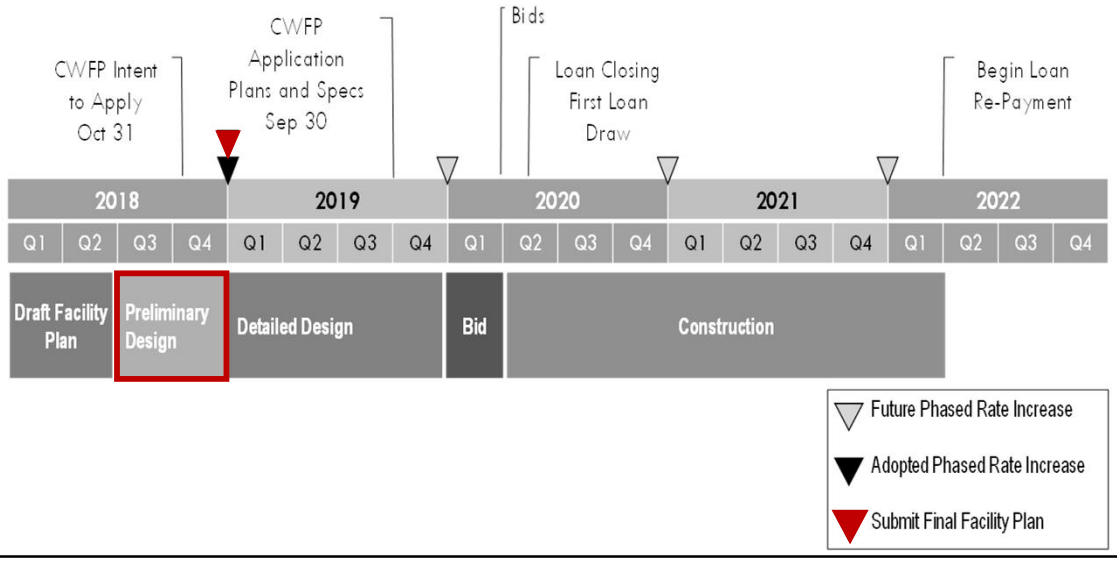
Planning-Level Costs ▶ $80M



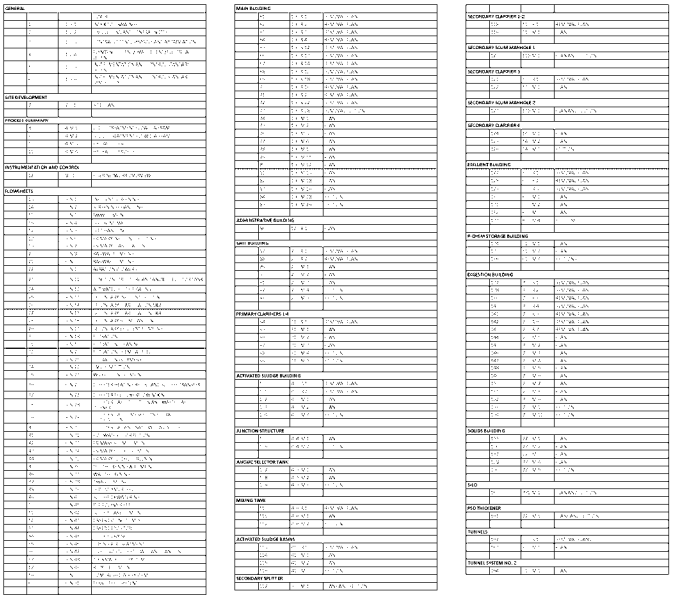
Planning-Level Costs ▶ $80M



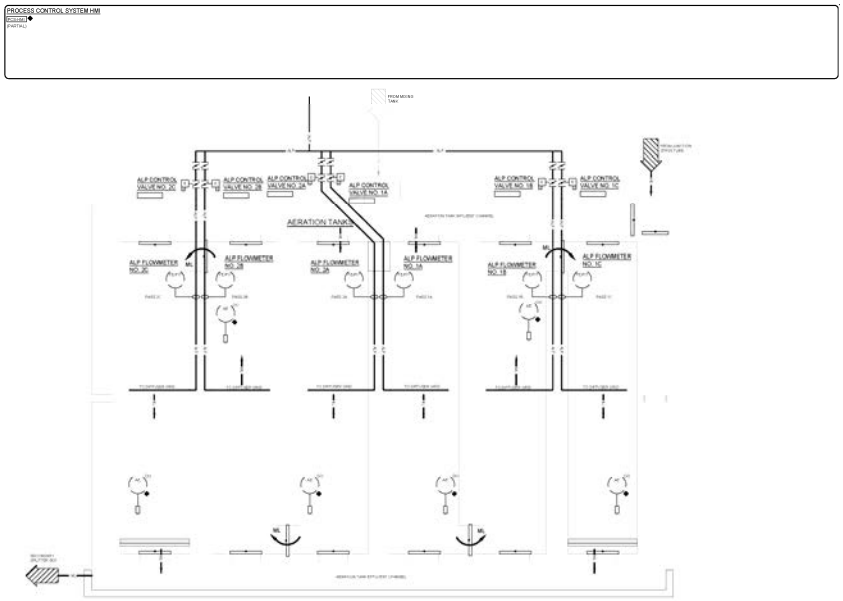
Schedule



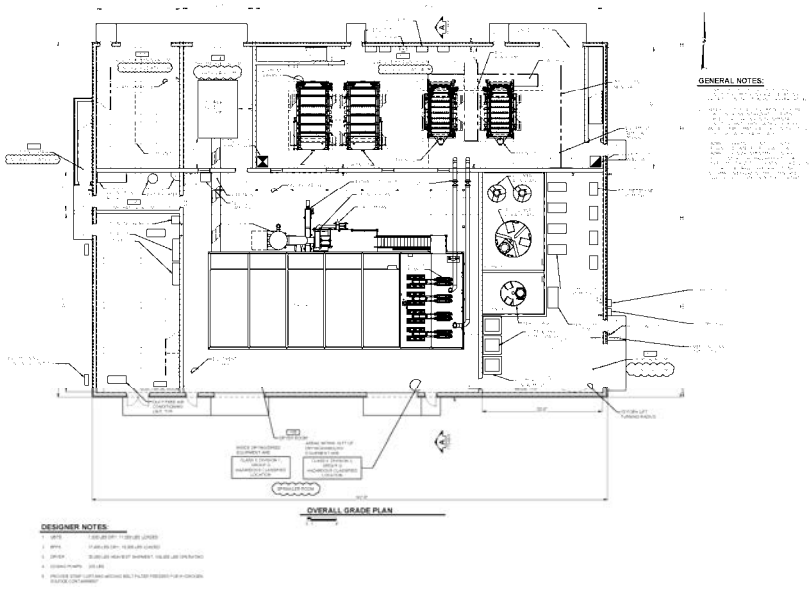
Preliminary Design Drawings



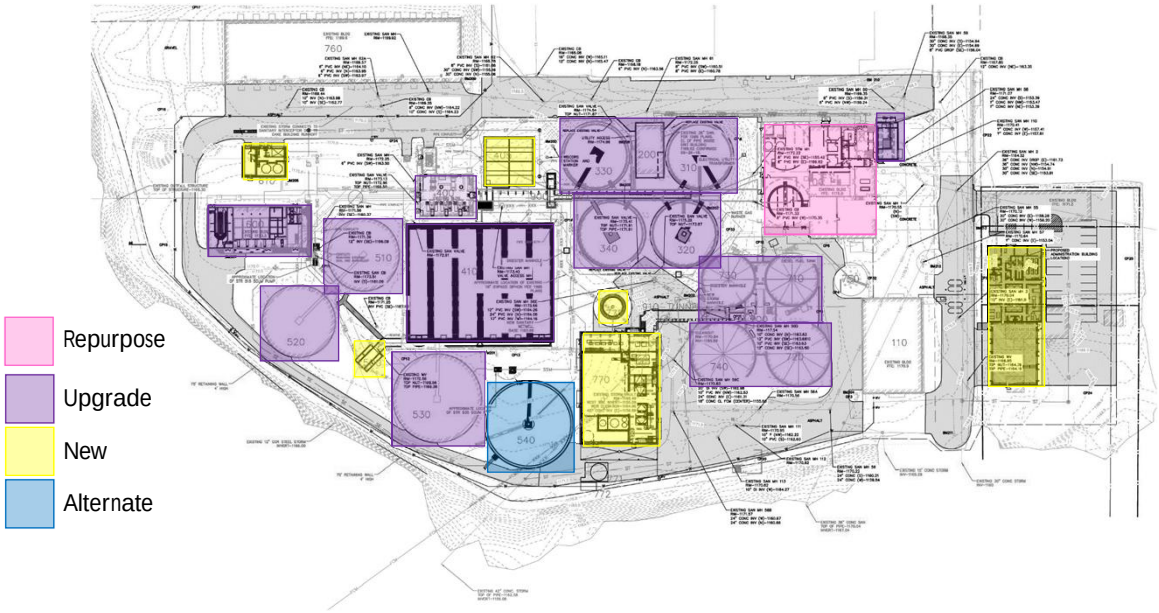
Process Design and Flowsheet Drawings



Preliminary Design Drawings

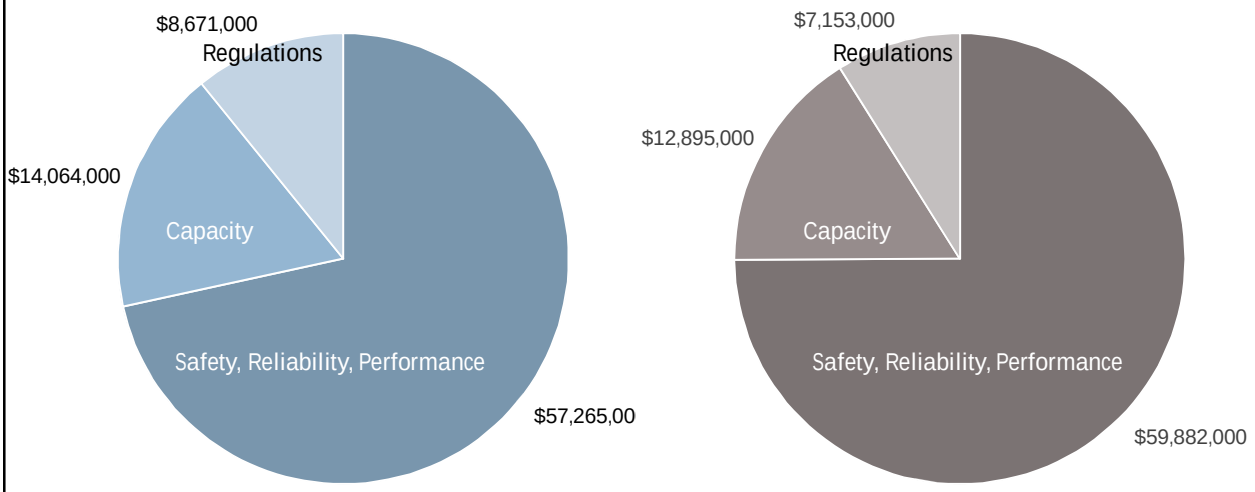


Preliminary Design Site Plan

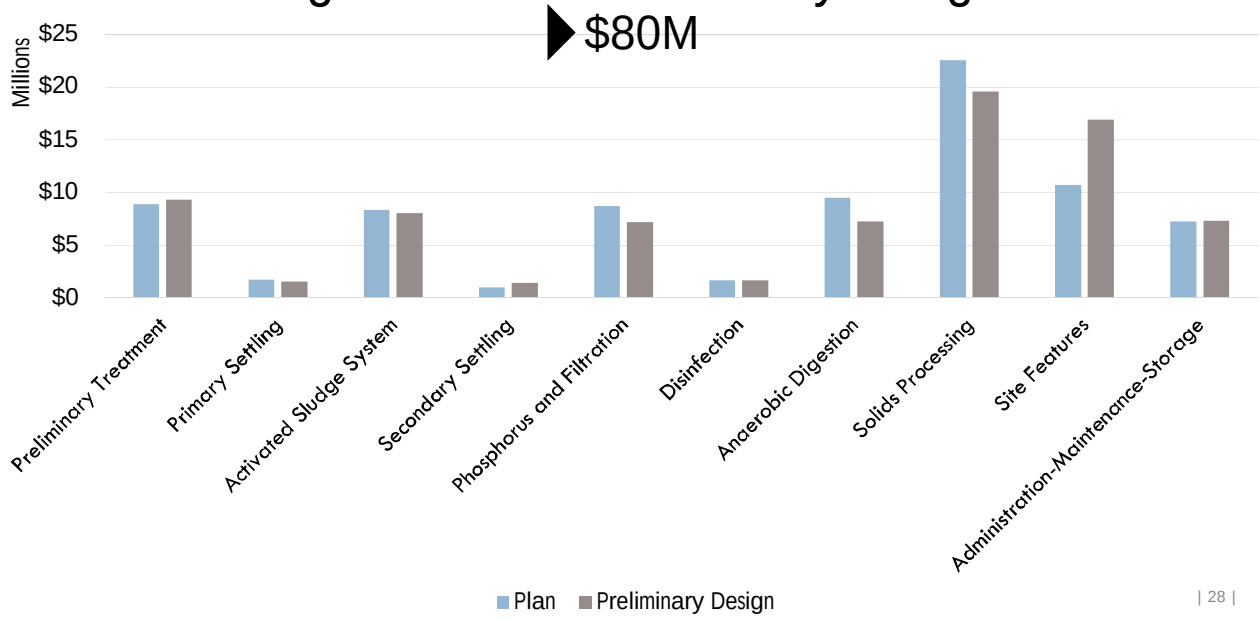


Preliminary Design Site Plan | New Structures

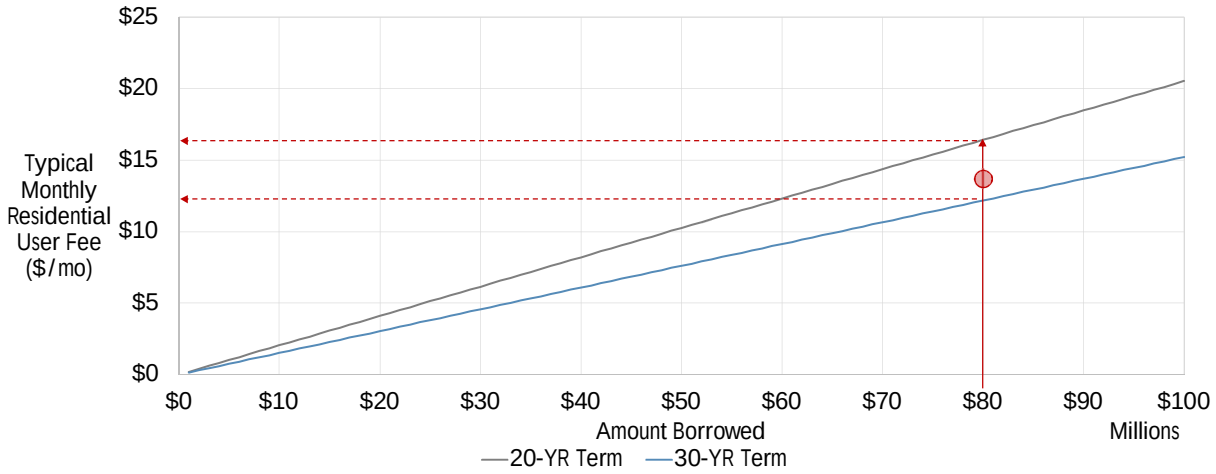
Planning-Level and Preliminary Design Costs
▶ $80M



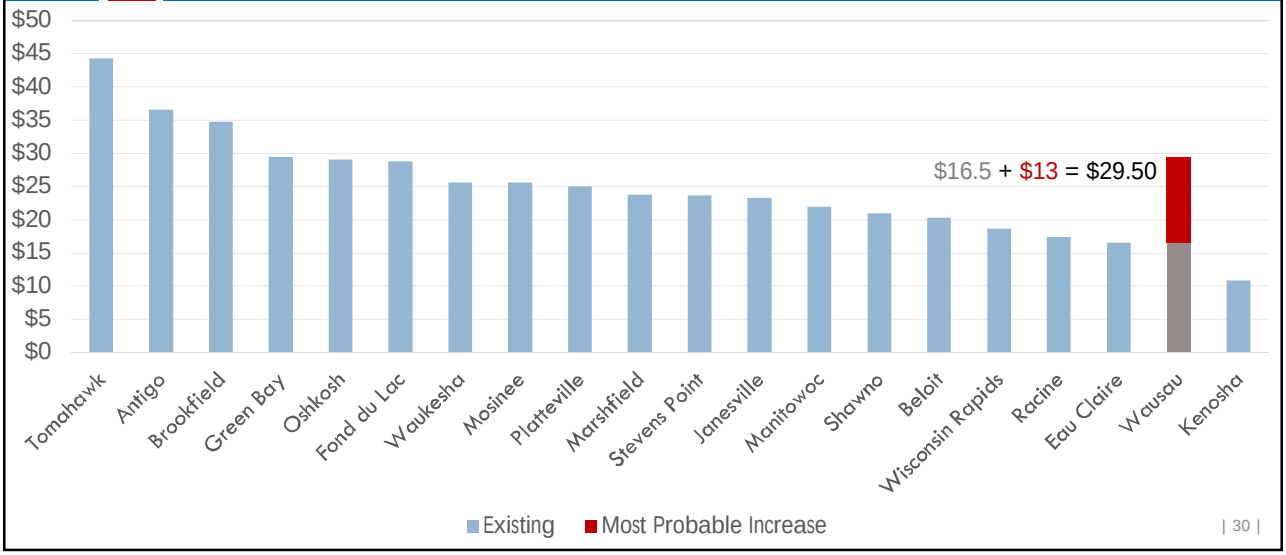
Planning-Level and Preliminary Design Costs
▶ $80M



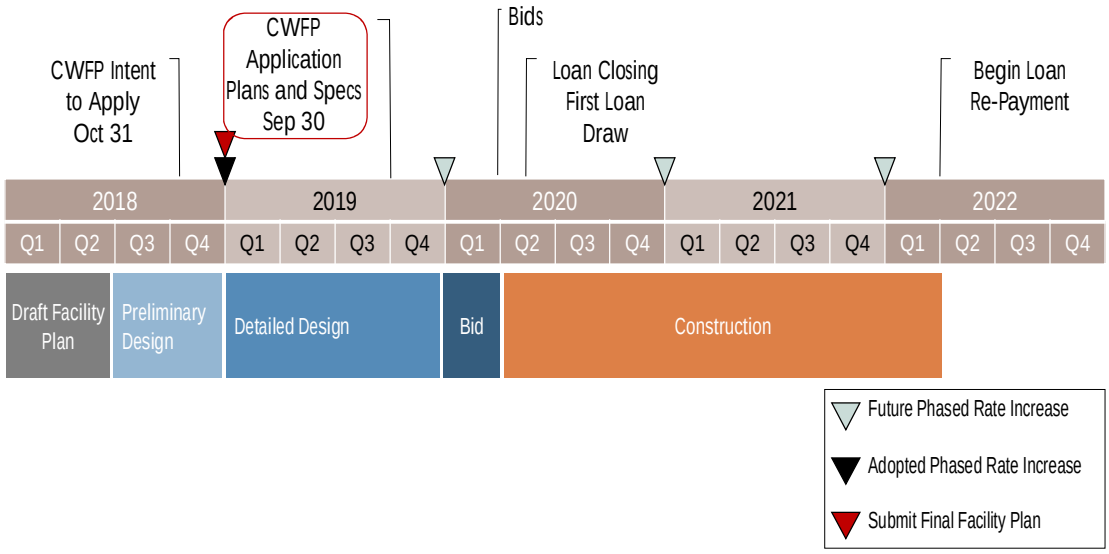
Typical Monthly Residential User Rates



Comparison of Future Monthly Residential Wastewater Bills [37 kgpy]



Project Schedule



Action Items

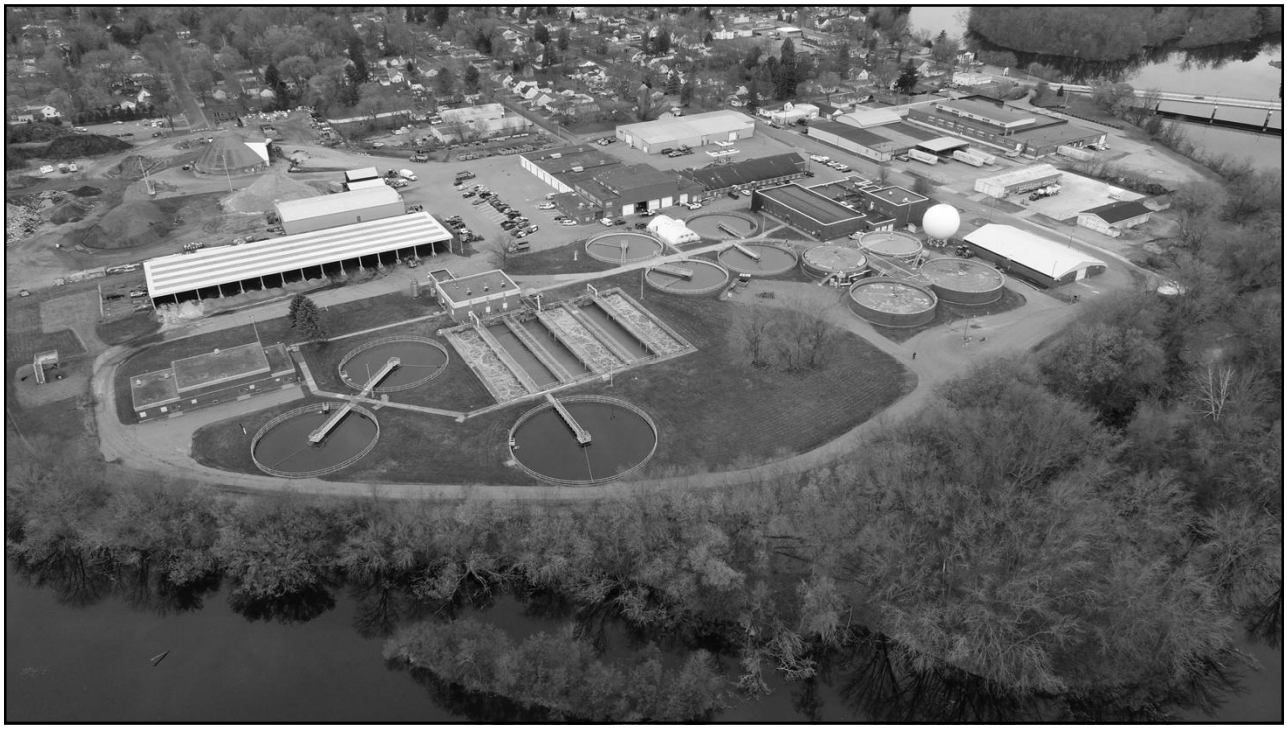
- City Approve Facility Plan in January 2018
- Submit Facility Plan to WDNR in January 2019
- Proceed with Final Design in January/February 2019
- Submit Reviewable Plans and Specifications to WDNR by Sep 30, 2019

Questions and Discussion

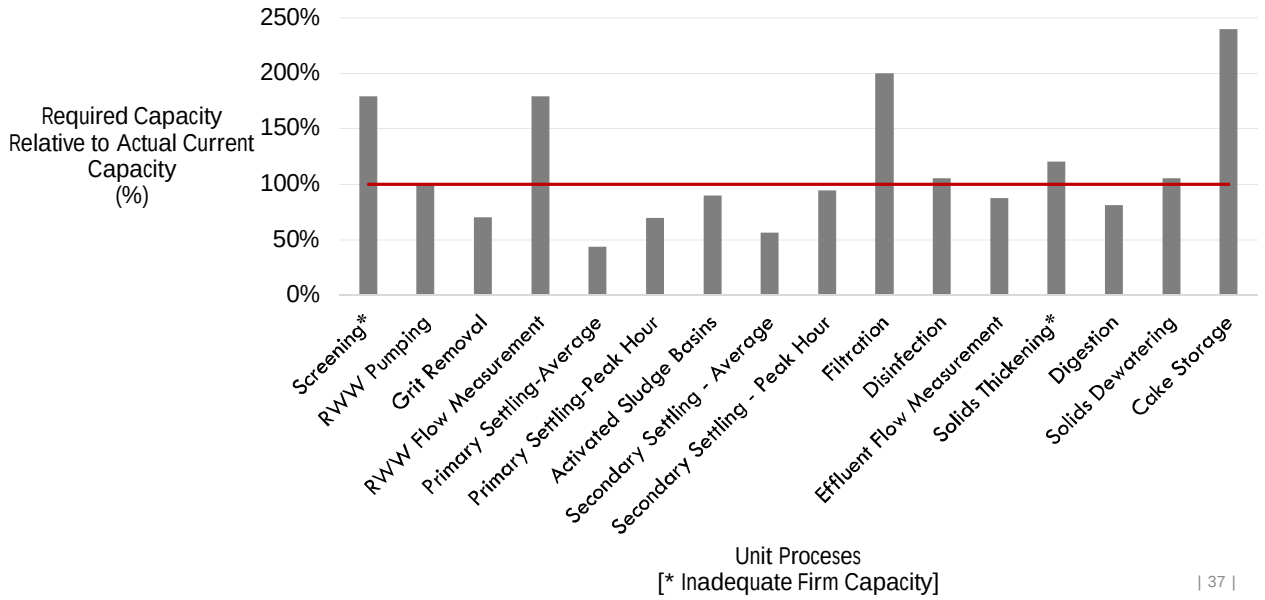
?

Thank You

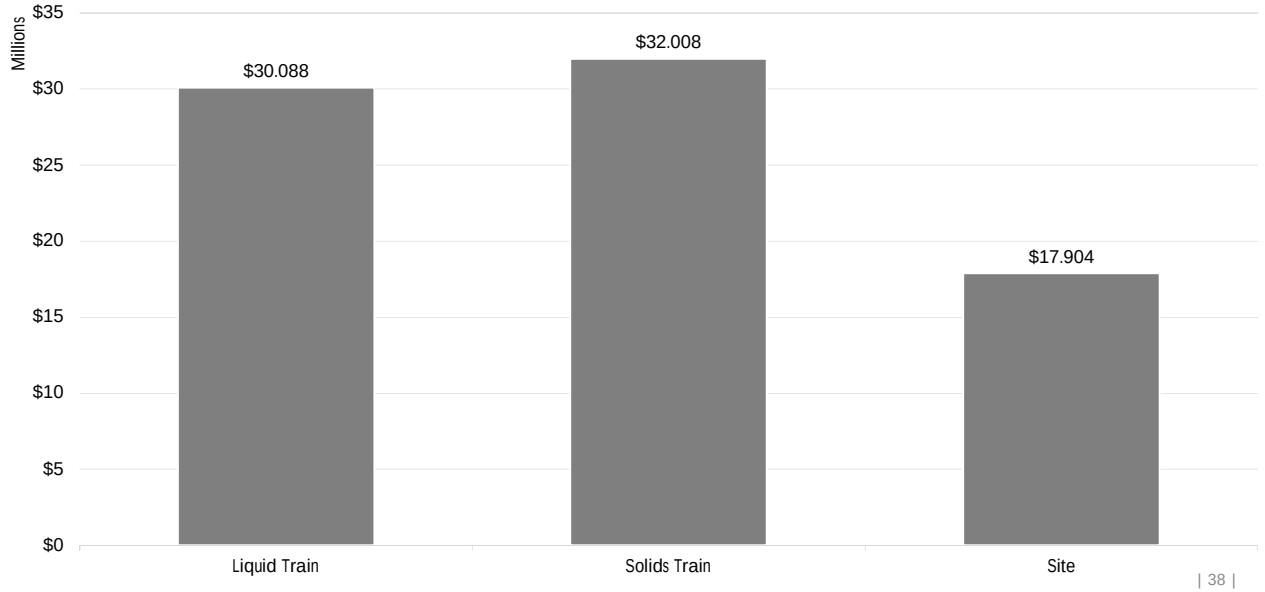
Backup Materials



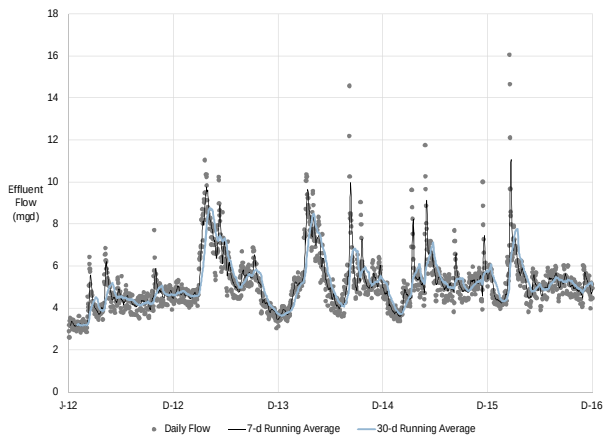
Simple Unit Process Capacity Analysis

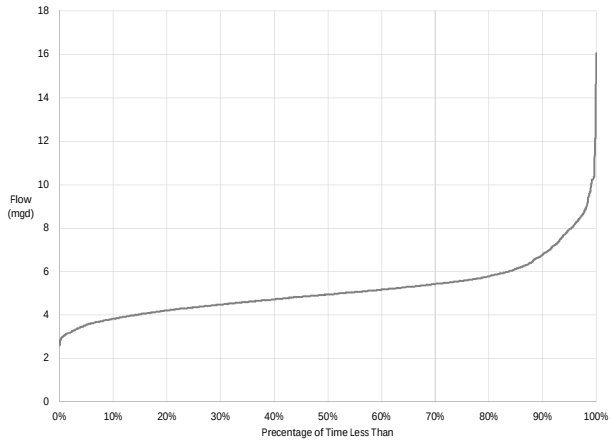


Costs by High-Level WWTF Function

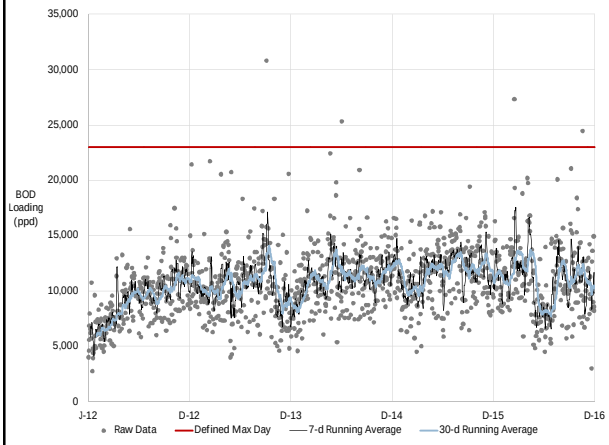


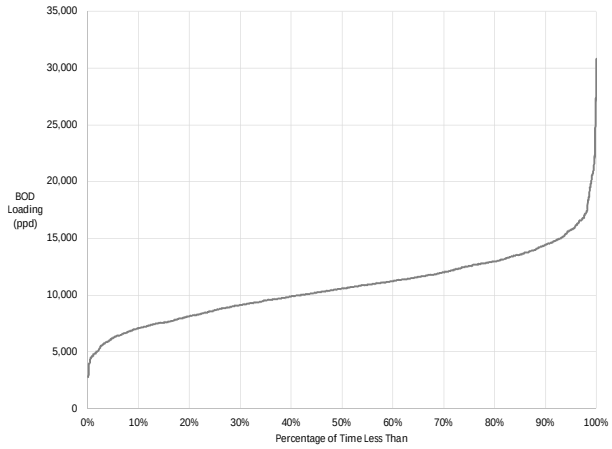
Historical Flows



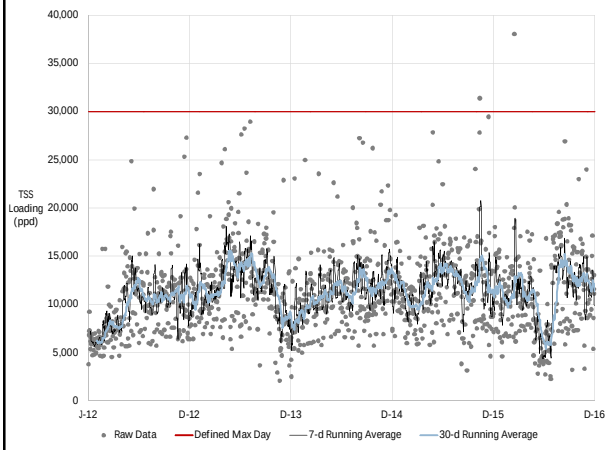


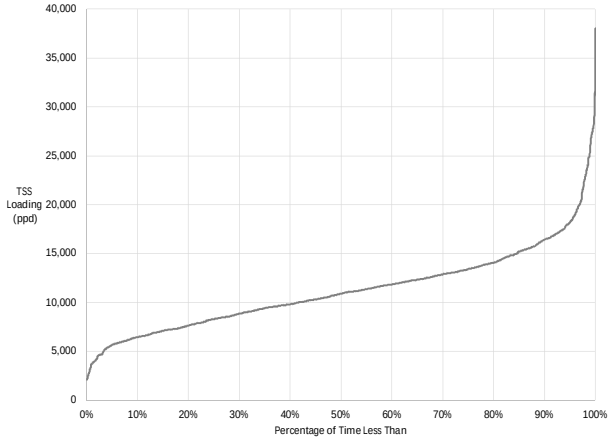
Historical BOD Loadings



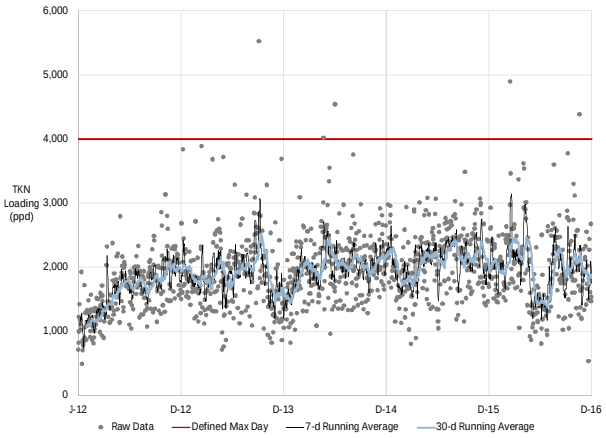


Historical TSS Loading

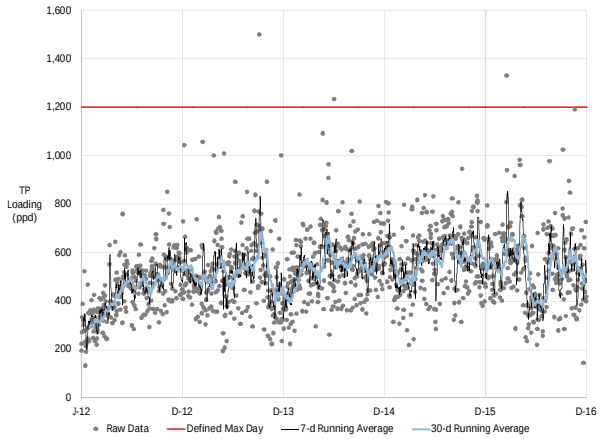




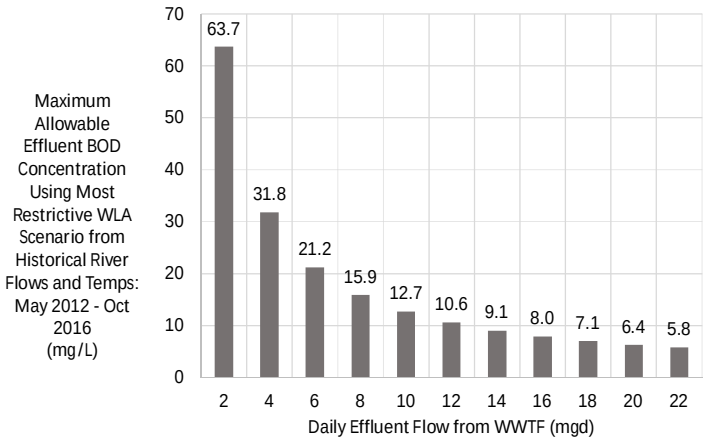
Historical TKN Loading



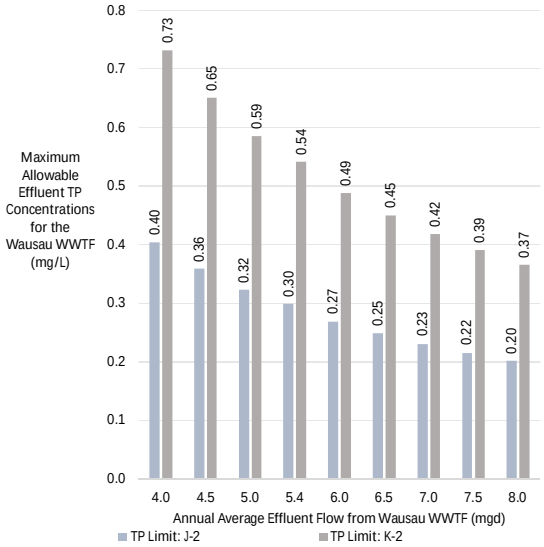
Historical TP Loading



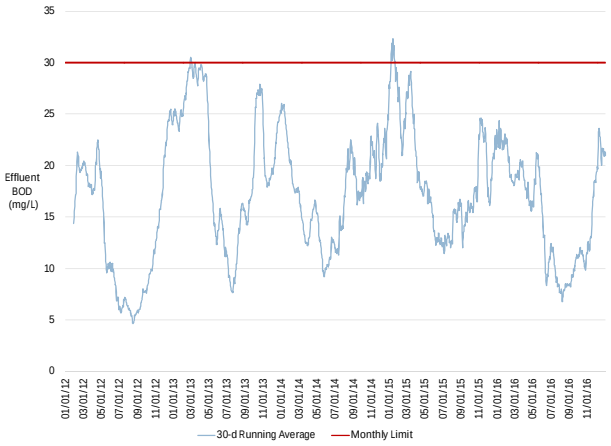
Effluent WLA BOD Limit



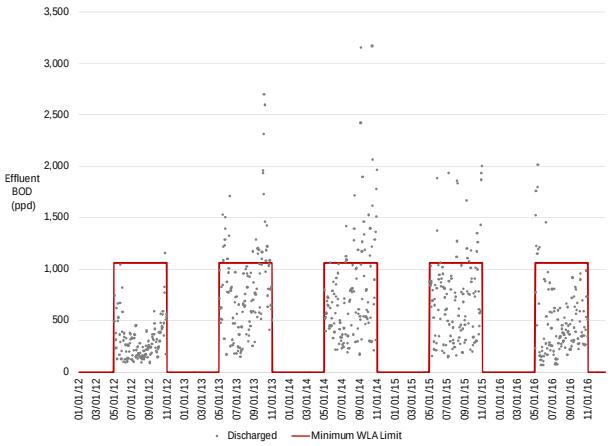
TMDL Phosphorus Limit



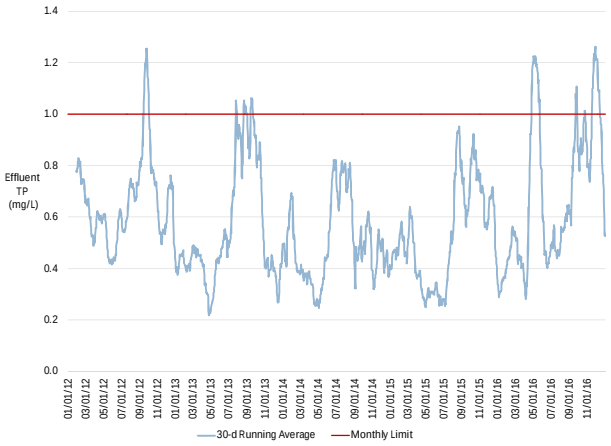
Historical Effluent BOD



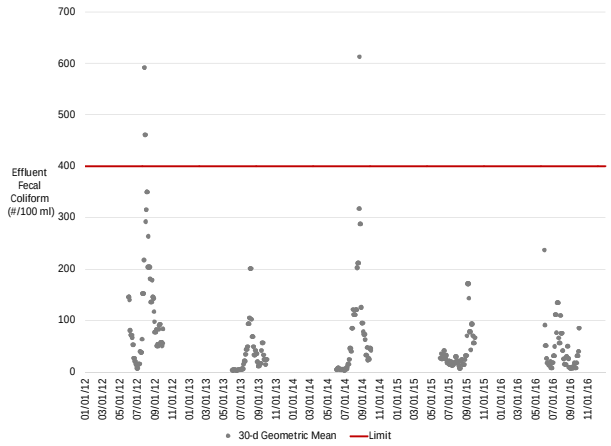
Historical Effluent BOD and Minimum WLA Limit



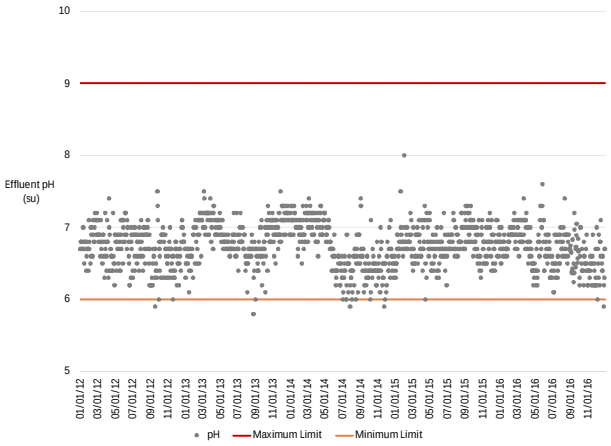
Historical Effluent TP



Historical Effluent Fecal Coliform



Historical Effluent pH

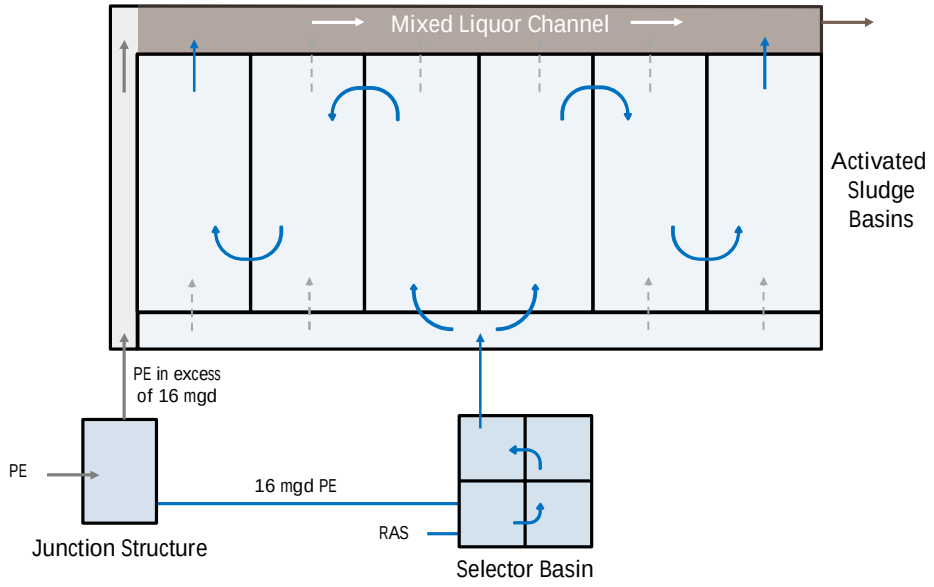


Future Design Values

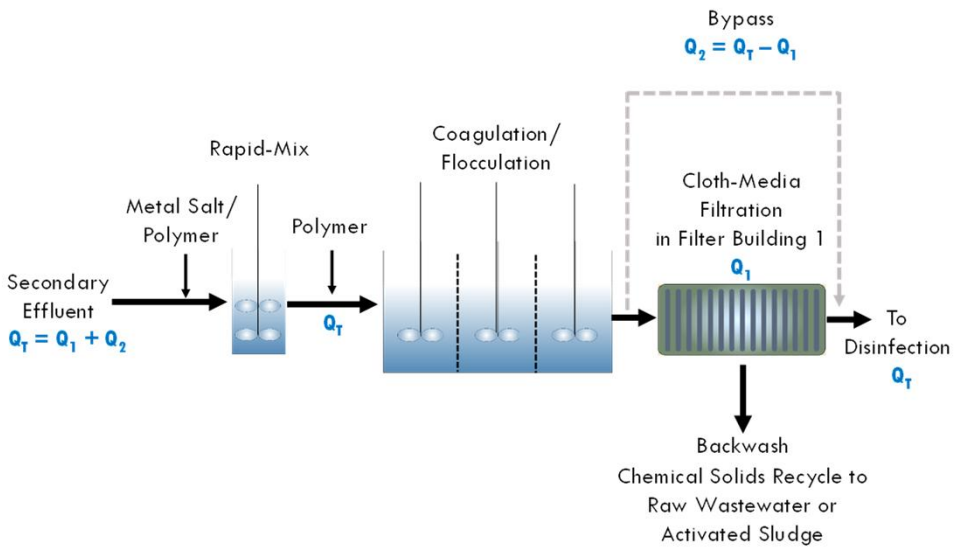
Flow	Flow (mgd)	Peaking Factor
Average	5.4	
Maximum Month	9.2	1.69
Maximum Week	11.6	2.14
Maximum Day	16.8	3.10
Peak Hour	22.0	4.06
Peak Instantaneous	35.8	

Parameter	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)
BOD	11,190	14,438	17,458	24,108
TSS	11,763	16,361	19,005	31,445
TKN	2,004	2,586	3,130	4,193
TP	545	703	850	1,258

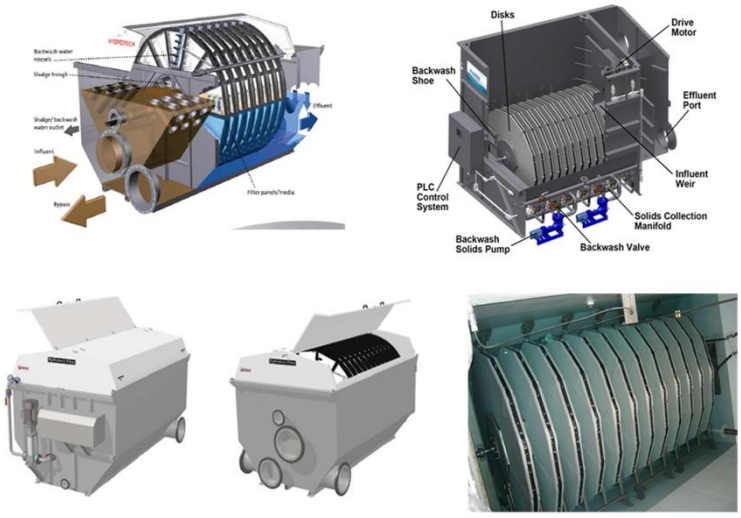
Activated Sludge System Configuration



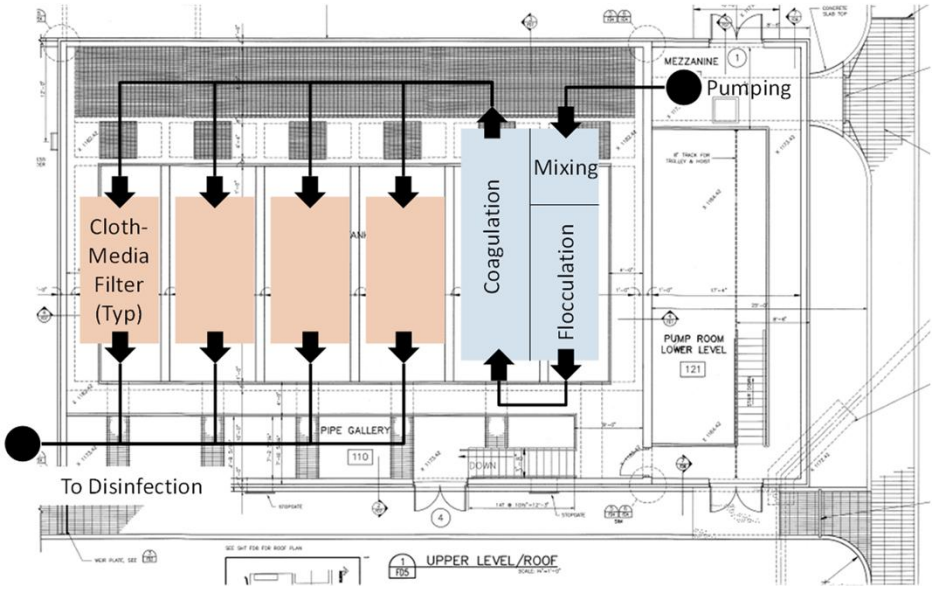
Low-Level Phosphorus and WLA BOD Compliance



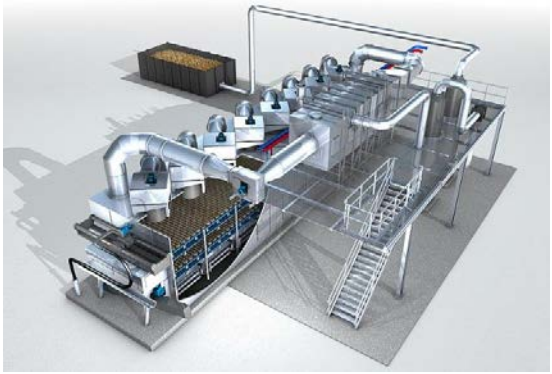
Cloth-Media Filters



Low-Level Phosphorus and WLA BOD Compliance



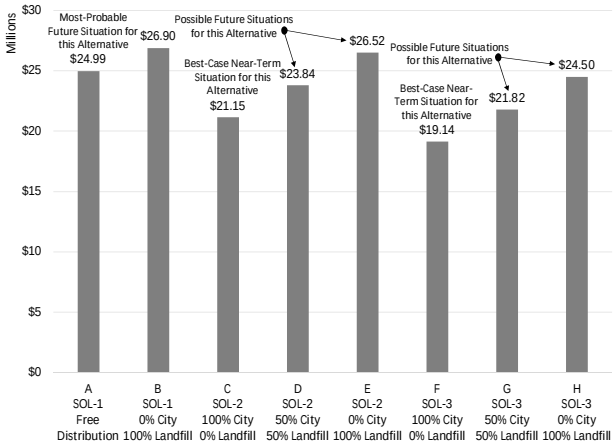
Medium-Temperature Belt Dryer



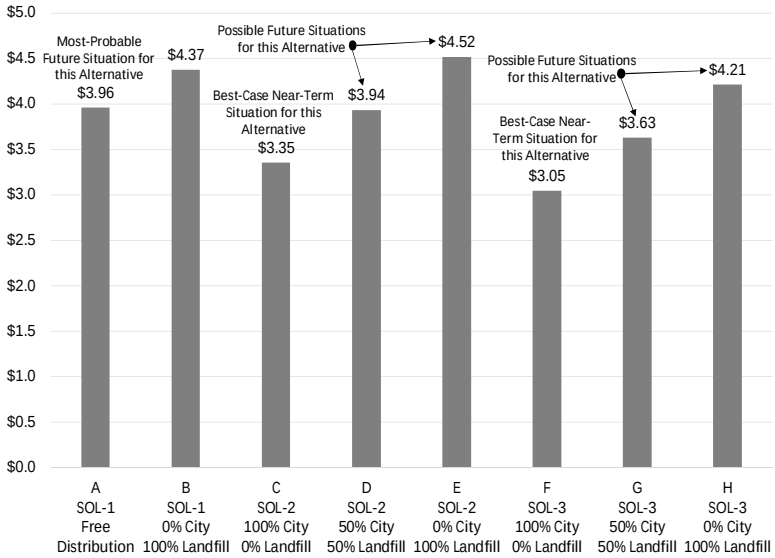
Class A EQ
Biosolids Product

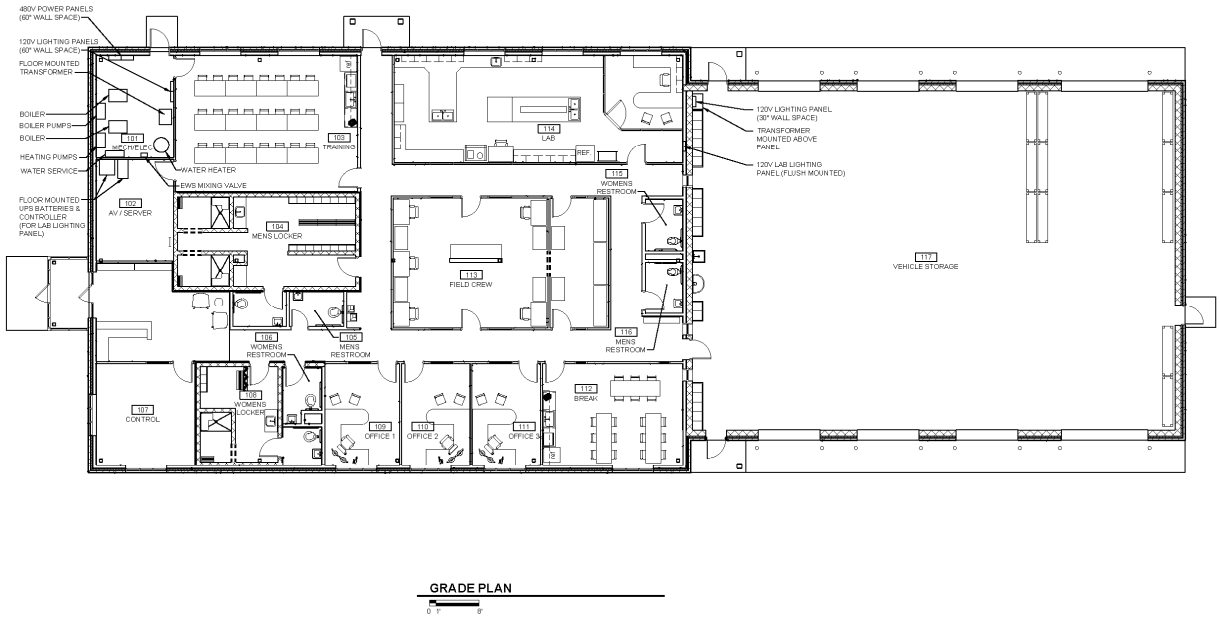
Solids Processing Economic Analysis

Scenarios	A	B	C	D	E	F	G	H
	SOL-1 Free Distribution	SOL-1 0% City 100% Landfill	SOL-2 100% City 0% Landfill	SOL-2 50% City 50% Landfill	SOL-2 0% City 100% Landfill	SOL-3 100% City 0% Landfill	SOL-3 50% City 50% Landfill	SOL-3 0% City 100% Landfill
Annual Costs								
Electricity	$40,000	$40,000	$0	$0	$0	$0	$0	$0
Heat	$135,000	$135,000	$0	$0	$0	$0	$0	$0
City Disposal	$0	$0	$150,000	$75,000	$0	$150,000	$75,000	$0
Landfill Tip	$0	$91,000	$0	$209,000	$418,000	$0	$209,000	$418,000
Landfill Haul	$0	$45,000	$0	$57,000	$114,000	$0	$57,000	$114,000
Total	$175,000	$311,000	$150,000	$341,000	$532,000	$150,000	$341,000	$532,000
20-Year Present Worth Cost								
Annual	$2,459,000	$4,370,000	$2,108,000	$4,792,000	$7,476,000	$2,108,000	$4,792,000	$7,476,000
Capital	$22,528,000	$22,528,000	$19,043,000	$19,043,000	$19,043,000	$17,027,000	$17,027,000	$17,027,000
Total	$24,987,000	$26,898,000	$21,151,000	$23,835,000	$26,519,000	$19,135,000	$21,819,000	$24,503,000
Monthly Residential Cost								
Capital	$3.42	$3.42	$2.89	$2.89	$2.89	$2.59	$2.59	$2.59
Annual	$0.53	$0.95	$0.46	$1.04	$1.63	$0.46	$1.04	$1.63
Total	$3.96	$4.37	$3.35	$3.94	$4.52	$3.05	$3.63	$4.21



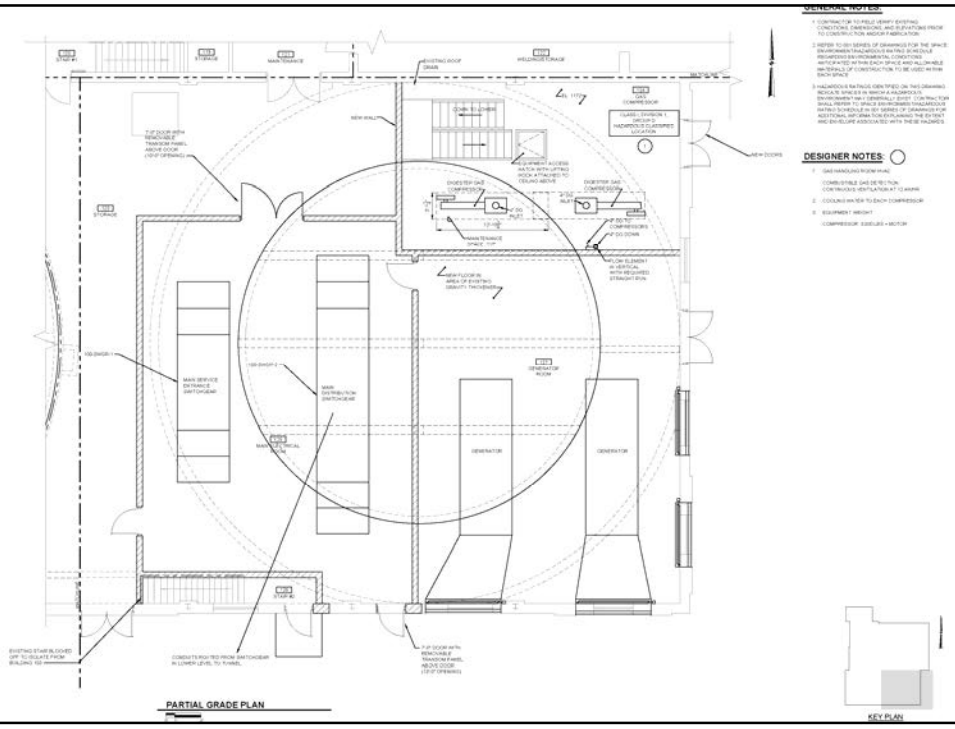
Solids Processing User Costs





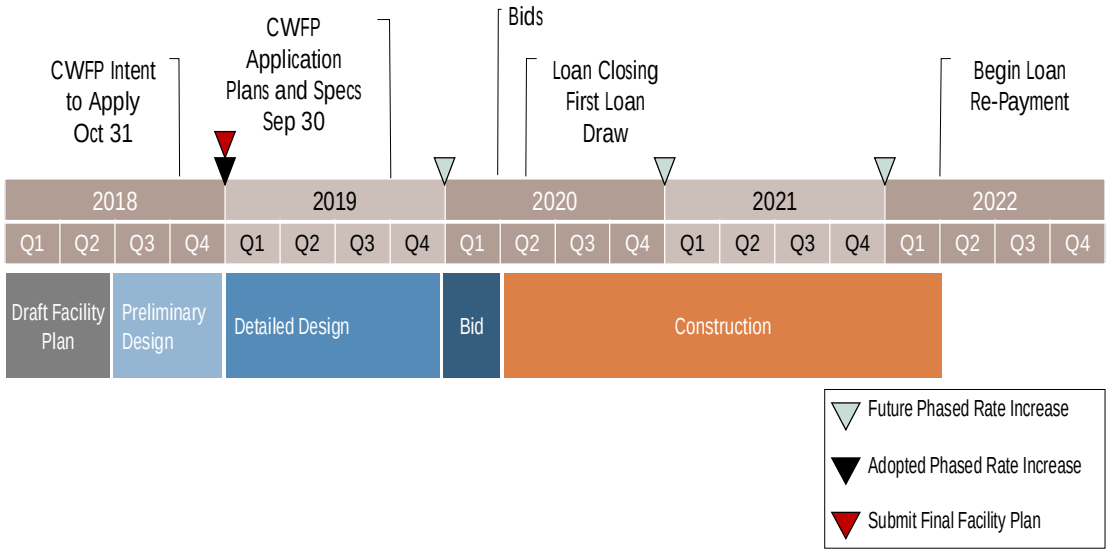
GRADE PLAN

0 8'

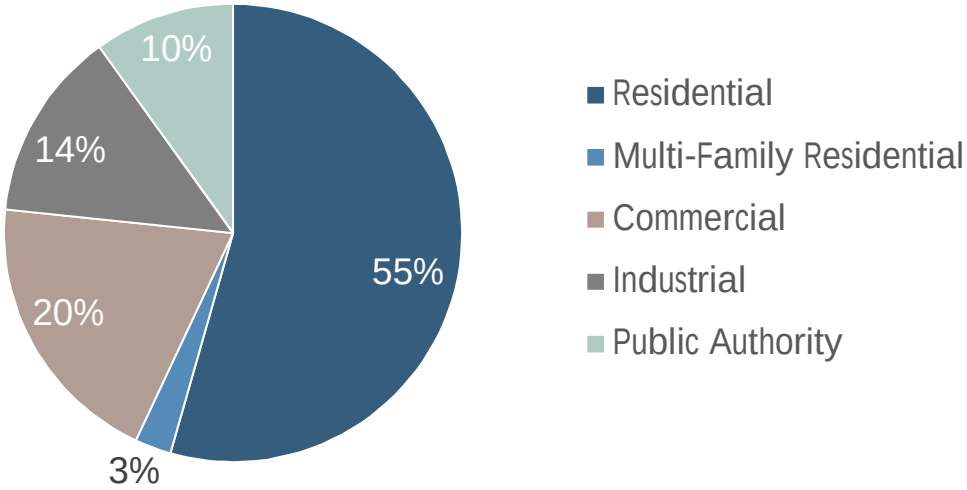


PARTIAL GRADE PLAN

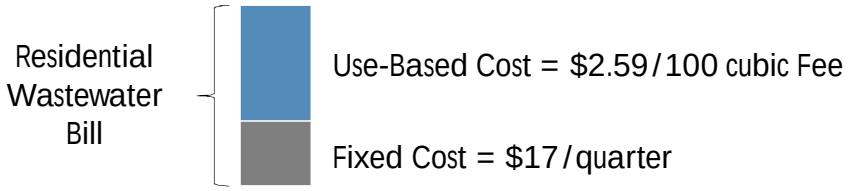
Schedule



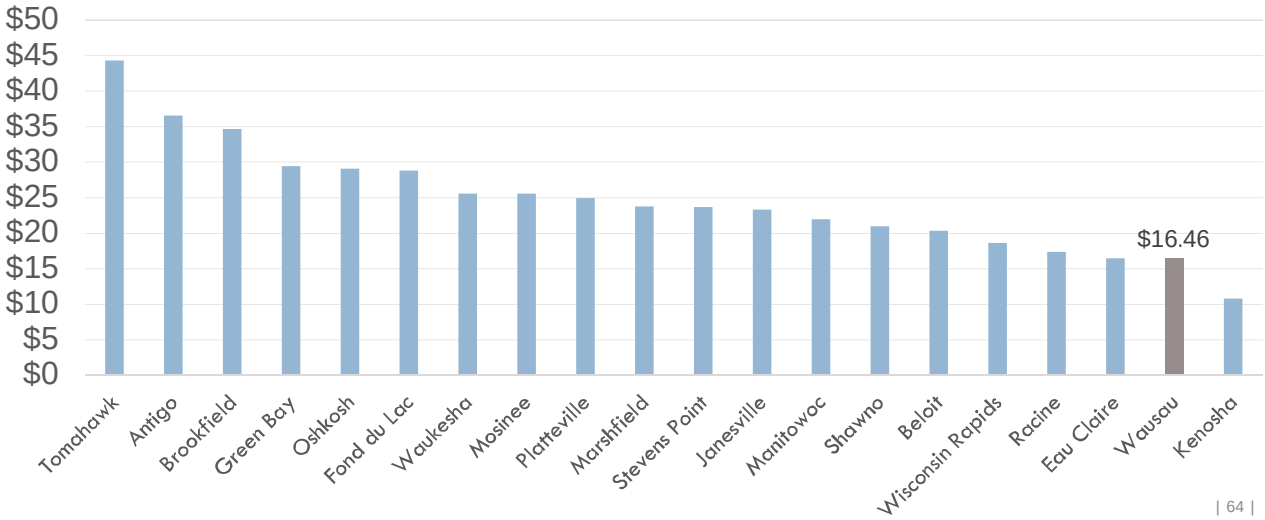
Primary Revenue Sources for Wausau Wastewater Utility



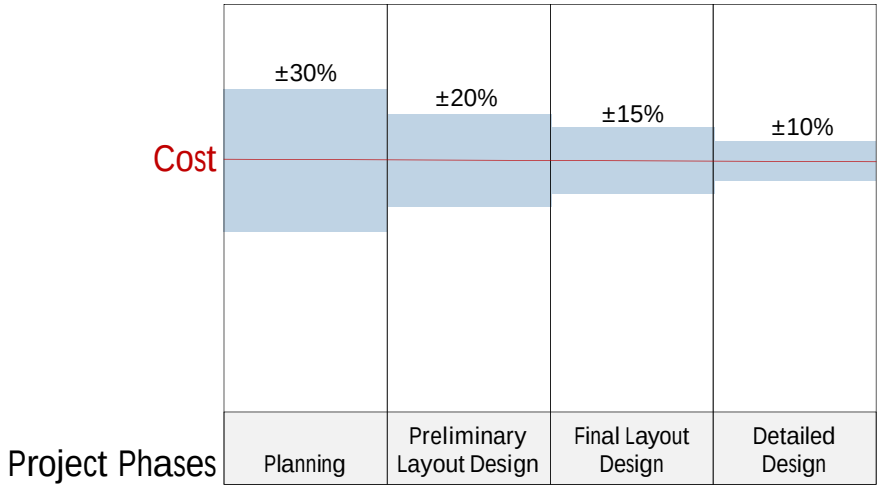
The Structure of a Residential Wastewater Bill



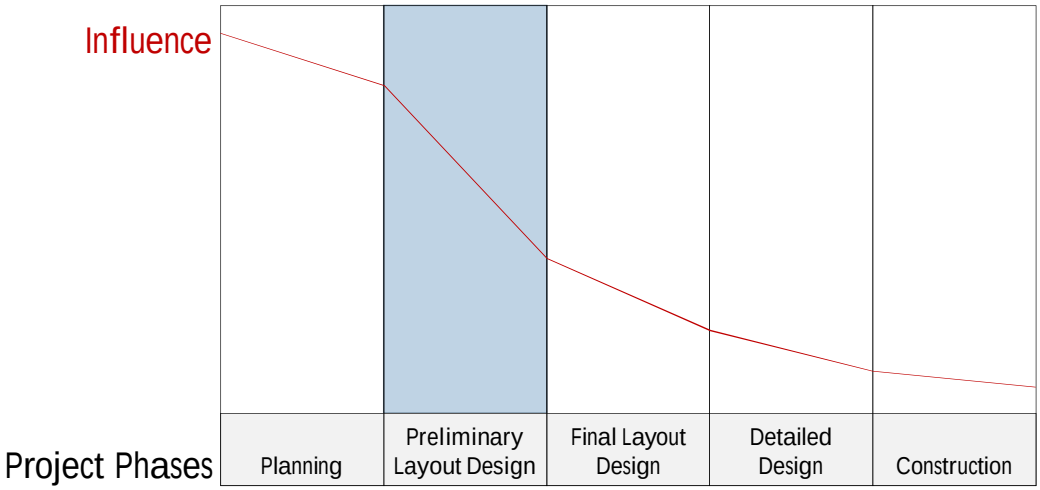
Comparison of Current Monthly Residential Wastewater Bills [37.4 kgpy]



Cost Opinion Accuracy



Opportunity to Influence Cost



Minutes of January 8, 2019

A meeting of the Wausau Water Works Commission was called to order at 1:30 p.m. in City Hall on January 8, 2019. In compliance with Wisconsin Statutes, this meeting was posted and receipted for by the Wausau Daily Herald on January 4, 2019.

Members present: President Mielke, Commissioners Herbst, Rebman, Gehin, Force.
Others present: Eric Lindman, Dave Erickson, Scott Boers, Valerie Swanborg, Steve Opatik, Becher Hoppe; Diane Thoune, Clark Dietz; Mike Gerbitz, Donohue; Ken Ligman, Becher Hoppe; Susan Wojtkiewicz, Donohue.

1) **Approve Minutes of the December 4, 2018 Meeting.**
   Gehin moved to approve the minutes of the December 4, 2018 meeting. Seconded by Rebman and the motion carried unanimously 5-0.

2) **Director's Report on Utility Operations.**
   Force asked about the SCADA system and the need to find a replacement. There was a comment made that whatever we chose as a replacement would be compatible with the new system going in. Did we look into that or is the timing not right. The second issue is the high strength waste from Stevens Point, whether that issued developed into anything and why there was a revenue stream involved with that. Erickson responded in talking to Donohue, we do have the software specifications for the SCADA system and we think we can make it work. With the holidays he has not heard back from Van Ert so we don't have it on the schedule yet. Regarding the high strength waste from Stevens Point, they were able to find a manure storage tank where they could store their sludge.
   Gehin advised he heard the presentation with the students at the University of Stevens Point regarding the UV transmission issue. He thought it was a neat study and helped us understand some things that we may not have fully understood. He doesn't think they came up with a final resolution though. Erickson advised that from his understanding they didn't get a definitive answer but may have rolled out some things. He was not able to attend the presentation and Ken Bloom could probably offer more information.
   Motion by Gehin to approve the Director's Report as presented and place on file. Seconded by Rebman and the motion carried unanimously 5-0.

3) **Discussion and Possible Action on the Purchase of Bulk Polymer for 2019.**
   Erickson advised when they buy polymer it can be complicated because one product might cost more but last longer. In order to compare products, we need to run a trial test by setting up a bench scale test in the lab. If there is a product that is potentially better, we order a 275 gallon

tote and run a trial on the machine in the plant. We had been using a product from Nalco and it worked very well but then we tried a product form Aquachem and the performance was very similar. Either one would be acceptable but the prices came out better for the Aquachem product so that is what we recommend going with. We've gone approximately 6 months since filling the tank so we should expect to get that or more out of this next bulk load.

Gehin asked if we need to clean the tank when going with a different polymer. Erickson advised we do not. We draw the new polymer out of the tote, run it for a day or so to flush out the old polymer and ultimately switch over to the new polymer in the bulk tank.

Motion by Force to approve the purchase. Seconded by Gehin. Motion carried unanimously 5-0.

4) Sanitary Sewer Overflow Closeout/No Further Action Letter From the WDNR.

Lindman wanted to make sure we brought this forward for the record. We've had several conversations with the DNR regarding the overflow that happened. This letter was received in December closing out this case. One of the items in our discussions was their concern with the estimated 600 pounds of phosphorous that was discharged into the Wisconsin River. We looked back in our records and we have been consistently and significantly below the 1mg/L phosphorous level on our discharge permit. Although we had an overflow, we corrected it in a timely manner and have maintained a phosphorous level below what is on our discharge permit.

Gehin made the point that he thinks the 600 pounds of phosphorous was based on a one sample grab and thinks that poundage was actually a lot less but there is no way to prove that.

5) Discussion and Possible Action on the Final WPDES from the WDNR.

Lindman stated that we had the draft discharge permit and we've made comments on that. The DNR has come out with their final determination and they did not make any changes. They have included responses to our comments with their submission of the final determination on our WPDES. Lindman had a conference call with Vanessa Wishart of Stafford Law and she helped us from a legal perspective with putting our comments together. Lindman, Erickson and Kevin Fable, City of Wausau Environmental Engineer, had a conference call with Vanessa on January 7, 2019 and she feels that it is reasonable for us to move forward with contesting the 0.1 mg/L permit level that the DNR had given us. She feels we have a very good argument and if the case is contested and accepted by the DNR it will stay at that limit until that is resolved. That will also allow time for the TMDL's to come out. Some other information that was just received is that the TMDL was submitted to the US EPA on December 21st and that is the first notice that we've received that the new TMDL's had been forwarded to the US EPA for their determination. He anticipates that may be delayed with the government shut down. He'd like to open this up for any discussions by the commission members and also a consensus on whether they are in agreement to prepare a document to contest the 0.1 mg/L for phosphorous.

Gehin indicated on page 4 of the WPDES Permit handout under the phosphorous category, mathematically what they are proposing is impossible. Our goal is to have something more in the 0.2mg/L-0.4mg/L range.

Force advised his concern continues to be the emphasis by the DNR and other regulators on municipal dischargers of phosphorous and very little on the impact of other sources of phosphorous pollution from farm fields and urban areas. He noticed the January 3rd memo from Lindman regarding the discussion of municipalities starting to fund phosphorous runoff production in rural areas through phosphorous trading options. From what he's read this is a reliable alternative but the way this one is structured it would put more of a burden on municipalities. He thinks this is wrong and we should contest this based on the 0.1mg/L being unreasonable but also continue to discuss with regulators that the agricultural and urban area run

off issues need to be addressed as well. This is an expensive proposition and it is not clear that what we discharge here at Wausau is having any impact on the downstream bodies of water.

He's not sure where we are with the Wisconsin River Discharge Group but he knows that we are a member and urges us to continue to support that group to come to a reasonable phosphorous control policy up and down the river for all of us.

Lindman advised that we are going to reach out to the Wisconsin River Discharge Group and let them know what the decision is in regards to contesting this.

Motion by Force to contest the 0.1 mg/L with the DNR. Seconded by Rebman. Motion carried unanimously 5-0.

6) Update on the City of Wausau Wage Study Results.

Lindman wanted to give an update to the commission. Over the past couple of years we had talked about wages and a wage study going forward. The wage study results do show that there is some misalignment within our workforce from market rate. There are 3 options to make those adjustments. Option 1 just brings everyone up into their grade scale, Option 2 would bring everyone up to their midpoint and Option 3 would be to bring everybody into the range where they should be as if we had a step structure already. Option 1 would cost about $40,000.00, Option 2 about $300,000.00 and Option 3 about $600,000.00. That $600,000.00 needs to be disbursed amongst the different departments, we don't know how much of that would be for the utility. Human Resources and Finance will be working on that breakdown. He has spoken with Swanborg and our estimates show that the utility is capable of doing option 3 based on our number of employees. He expressed his opinion to the HR committee and he thinks we need to fund the wage study under option 3 to bring everyone up to where they should be in their wage scale. We have some who have been with the city for up to 40 years and they're still not at the top of their wage scale. We need to make those corrections, the workforce has been waiting a long time. Once the final dollars come out this will go to HR, Finance and then Council for approval.

Force asked if this $600,000.00 is an annual expense. Lindman advised yes, it is salary so that additional amount will need be to be budgeted annually but we do not yet know the financial impact on the utility as it hasn't been broken down yet.

Gehin indicated that he remembers when he was on the City Council we would hire and train employees and then they would go to another community or utility where they could make more. He feels if we are going to go through the process of training we should be paying whatever the market will bear. He would support or recommend to HR that we proceed.

Lindman advised that a motion is not needed but thinks that it would help to move forward with their consensus for option 3. The consensus of the Commission was to move forward with option 3.

7) WWTF Presentation and Update by Donohue (15 – 20 min).

Lindman advised Donohue has been the lead engineer on the wastewater treatment facility upgrades and proposed work. Today's presentation is more focused on the processes and where the $80 million for the project is being spent. This presentation will walk us through the wastewater treatment plant, the processes and what level of funding needs to be allocated to each process.

Gerbitz stated that the intent of this presentation is to give everyone an understanding as to how this adds up to $80 million and where that money is allocated throughout the facility.

Gerbitz indicated that the draft of the facility plan that is in the packet has since been updated. At some point this will need to be submitted to the DNR for their review and approval. He reminded everyone that this is an aging facility. The oldest structures are roughly

80 years old, the second 50 years old and the newer being 30 years old. A considerable amount of the equipment is 30 years old as well. If we had to build a wastewater treatment facility today it would cost approximately $175 million which does not include the collection system improvements.

The city is contemplating moving forward with a generational project, it's been 30 years since the last comprehensive upgrade. When there are projects like this with rate implications, the DNR and EPA require a facility plan and the plan must look at a generation which is 20 years.

We've broken the issues down into 3 broad categories; Safety, Reliability and Performance, largely age related issues and updated safety standards; Capacity, some of the processes have or will have capacity issues; Regulations, some of the processes are struggling to meet the current regulations that have been in place for a long time. In this particular instance we are focusing on new regulations such as lower phosphorous levels and what will be the cost.

We've talked about using the clean water fund, the last time we talked the interest rate was 1.87%, that's gone up slightly to 1.98%. To have access to that funding we need to have an approved facility plan approved by the DNR.

Our objective is to make use of the existing facility and maximize the benefit of the existing infrastructure. We are repurposing and rehabbing almost every structure that is at the facility and only building a handful of things that are new.

For every process under each broad category, Safety, Reliability and Performance; Capacity; Regulations, we assigned a pass/fail conditional assessment to help keep track of the various issues around the facility.

Under the solids process, there is a regulation that you have 180 days of bio-solids/wet cake storage, which is not really being met today. Staff has been able to make that work over the years but by the strict engineering numbers, it is marginal at best.

Gerbitz highlighted the various issues within each process;

Preliminary Treatment – the grit system is from 1988, the pumps, valves and almost all of the piping are from 1967. The screens are fairly new but the screening handling system has been a maintenance issue. The primary clarifiers, 2 are from 1967 and 2 are from 1988, this plan replaces internals & mechanisms and address some of the structural issues.

Gehin indicated under the conditions the wastewater does not flow equally into the 4 clarifiers, how is that resolved and do we create splitter boxes? Gerbitz advised yes, over time standards have changed and design has evolved to make performance better. We would add splitters to control the flow evenly to each of the clarifiers.

The activated sludge system is where the majority of the treatment occurs. The aeration basins and building are from 1967. The proposed improvements would reconfigure the sludge system so it has a more stable performance and provides a better effluent quality. 2 of the clarifiers in the secondary clarifier process go back to 1967 and the larger one goes back to 1988. We would replace the internal equipment, the tanks are in good shape.

Gehin asked about the algae building up and how we will control. Gerbitz responded we would put fiberglass covers over the launders to prevent sunlight from hitting them and that will eliminate the problem immediately.

Gerbitz advised there are 2 different sized clarifiers here as well and no ability to balance the flow so a flow splitter will need to be installed.

The filter building is from 1988 and most of that is devoted to effluent filters which have not been upgraded in 30 years. This project would replace the sand filters with cloth media filters, increase the hydraulic capacity of the filtration system which would allow us to consistently comply with the TMDL phosphorous limit and also comply with the waste load BOD limit into the Wisconsin River, in the summer that can become stringent and we struggle with that now.

Gehin asked if we would remove the roof from the building to install those units. Gerbitz wasn't sure if there was a roof replacement in the facility plan or if we would remove a wall. He will get back to him on that but does know the roof is in need of replacement.

Gerbitz added that the chemical storage and feed system is thrown in here too. Everything in this process will address the low level phosphorous limit that is coming.

The disinfection system will be nearly 10 years old. There are some hydraulic, capacity and flood issues. If the Wisconsin River is at a high level it inhibits its hydraulic capacity. The decision was made to replace the UV equipment now so everything is replaced together for use within the same generation.

The 2 primary bio solid digesters have been upgraded. The secondary digesters have not, so those will be rehabilitated into primary digesters as well to increase biogas.

The solids handling process for waste activated sludge thickening for wet cakes and storage has capacity issues and we will discuss that alternative.

Site wide piping upgrades and $8 million worth of electrical improvements are needed throughout as well.

The administration, maintenance and storage facility goes back to 1939 and 1967 with no improvements since then. The vehicle storage building will not need improvements however, it may be wise to build a new administrative building and use the old strictly for maintenance and storage.

The issues are pervasive. The overall project will cost $80 million; $57 million for conditional upgrades, $14 million for capacity improvements and $8.7 million to meet the low level phosphorous.

The intention of the preliminary design is to better understand the cost of each process and make sure the $80 million figure is correct. We've put together about 170 preliminary design drawings, schematics, flow sheets along with getting quotes for everything from vendors and develop a cost opinion. The objective is to maximize the use of the existing infrastructure.

At planning time we established a cost of $80 million. After going through preliminary design, we revisited the cost opinion with far more detail and came up with a very similar cost. The cost of regulation and capacity improvements went down slightly but the site wide improvements went up slightly however, the sum total is very similar at just under $80 million for total project cost.

The typical residential rate increase is still at approximately $13.00/month if the city elects to use a 30 year term for the majority of the loan. This will bring Wausau to a rate comparable to our peers around the state.

The hope is that we submit the facility plan and the city moves forward with detailed design. The Clean Water Fund has a deadline for the end of September and they want to see reviewable plans and specs. This preserves our eligibility for principle forgiveness. If this year is like other years, it looks as if the city will receive $750,000.00 in principal forgiveness/grant money.

The action item is for the city to approve the facility plan at the Council level and then they will submit it to the DNR for their review and approval, proceed with final design in January/February so that by September 30th the city is in a position to submit their plans and specs to the DNR.

Gehin noticed the solids handling by drying was pretty high in cost. It was clarified in a discussion prior to this meeting that it has to run for 24 hours for approximately 7 days, then it will be off for a week. How would we staff that? Gerbitz responded that we looked at different alternatives. For many years Wausau has produced a class B cake or a wet cake. They looked at expanding that or making it more feasible. Mother Nature is in control of a wet cake class B program. It was a tough fall and we are now hauling to a landfill. Farming practices have changed and it's made the situation more difficult. They looked at a 365 day storage capacity

and right now we are just shy of 180 days. They looked at a class A cake, a class B cake and a dryer. The dryer is a medium temperature belt dryer that produces a class A exceptional quality material that is effectively unregulated. It has been used to burn in energy production facilities and it's been known that if the agricultural community is aware that it is available they'll be willing to just come and take it. The strategy is to run it 24/7 and in the evenings it would be unattended. It has been done at other facilities very successfully.

Force asked if that is run with biogas. Gerbitz explained we could but what they've assumed in the economics is that it would be run on natural gas. The reason for that is because if you have access gas production and exceed the capacity of the micro turbines you could burn them out in the dryer. The kilowatt hours are worth more than the therms so they've assumed all natural gas.

Force asked for clarification that it is a 24/7 operation but it wouldn't be manned. Gerbitz confirmed it would not be manned in the evenings, it would be automated. Force asked Erickson what we work now in shifts as far as staffing. Erickson advised they just run one shift. Gerbitz advised that this is not the lowest cost alternative. However, this comes out to be 1/5 the volume of what we produce today. Farming and weather patterns are going to make what we do today more difficult. If 50% of what we produce today has to be hauled to a landfill, the cost becomes somewhat similar to the cost of a dryer, assuming the material is taken away by local users. It is in the best interest of the community to invest in the future rather than invest in something that might be short lived and doesn't solve the core problems.

Force questioned the disposal of the class A material. The assumption is that we'll be able to get rid of this material. Gerbitz responded that we are surrounded by agriculture and it's reasonable to assume that if it doesn't cost anything, local agriculture will be interested in this material. Force asked if it makes sense to ask the potential end users to see if they think this is a good idea. Gerbitz responded we can do that but they are very confident since this is free class A unregulated fertilizer it's going to find a home.

Gehin asked how often the lime sludge from the water plant is dumped at the wastewater treatment plant. In the past that was done when staff couldn't get onto the fields. Boers confirmed that is the same as what we do today, Mother Nature dictates that as well.

Gehin indicated that if we are going to be doing any dewatering on site we will need to minimize movement of contamination in the area. Gerbitz advised those costs are built in.

Force asked if we've done an operational cost analysis for the old plant vs. the new plant. Gerbitz stated that they've tried to capture what costs are different. Force brought forth his concern that there may be costs associated with the new plant that we've not anticipated. Gerbitz advised we looked at all non-common costs from the old plant, he hasn't shared that here but will share that.

Gehin stated there was a discussion about the UV system and that we'd have a problem discharging if there were a 100 year flood event. Gerbitz advised that with the nature of the new system it can better accommodate a flood event. Measures are being taken but we don't need a pump or anything like that.

Force asked Erickson about training staff. Erickson confirmed there will be new equipment to operate so there will be time involved in training.

Force advised he didn't see anything on automation and control. Gerbitz said those were all built into these costs he just hadn't included it in the presentation.

8) Discussion and Possible Action on Submission of the WWTF Facilities Plan to the WDNR.

Lindman thinks if the commission is comfortable with the recommended processes, we would like to submit this to the DNR as written.

Force wanted to re-emphasize that the public be given the opportunity to see why the money is being spent and why it needs to be done. Mielke advised that is why we are having these meetings videotaped and they have been speaking with the neighborhood groups. He urges anyone with questions to come forward.

Motion by Gehin to approve the facilities plan. Seconded by Rebman. Motion carried unanimously 5-0.

9) WTF Presentation and Update by Donohue/Becher Hoppe (15 – 20 min).

Opatik began his presentation advising that they will be talking more on the planning level for the Water Facilities Plan and basically go over what they've learned after looking at the facility. They've gone through gathering information and an evaluation phase. There are alternatives and they've gone through some practical testing and pilot testing to confirm what sort of chemicals and technology to use in terms of water treatment.

Aesthetic quality; we already do a lot of removal of manganese but it is something that can cause color and staining issues. As an industry they are learning that for communities that supply their drinking water from ground water wells, there are indications that they can be susceptible to viruses and that viruses can transport through groundwater. One of the movements is to improve disinfection to make sure we have the ability in the treatment system to do virus inactivation.

37% of the services in the city are lead services. Any treatment methods that go forward will take into consideration lead services for corrosion control and reduce the potential for lead to leach out into the drinking water.

Susceptibilities and site risks; this speaks to virus inactivation but also anytime you are storing water is has to be out of the water table and if not, above ground. That is a definite risk for the existing site. The facility also has the usual aging infrastructure.

At this time, we do a good job at manganese removal but the processes they are proposing do a really good job of getting below the cosmetic and aesthetic limits established by the EPA. These are recommended limits and are not a health hazard.

Wausau has had a water system since the late 1800's and since then, the water has been supplied to the city out of the same basic area and that is where the water treatment facility is located today. The water treatment facility is located right on the river bank on North River Drive. If we were to build this today, more than likely the DNR wouldn't allow it to be constructed in that area. It is within the 500 year flood plain and one of the things noted on the sanitary survey last time was that our drinking water storage or clear well is below the water table.

The majority of the plant including the filters and administration building is over 55 years old, built in 1961. There was an addition in 1974 to improve solids handling and lime sludge. There was an addition in 1984 for some additional water treatment with some air strippers installed. The last major upgrade was done 20 years ago in 1999 with some duplication of equipment and additional electrical controls, the SCADA system.

The water treatment plant is operated by a staff of 3 people. Not only are they responsible for the plant but all of the maintenance at all of the pump stations, water towers and booster stations as well. Automation is heavily relied upon and that is over 25 years old. The system must perform 24/7, 365 days a year. You need the ability to produce water, you can have some intermittent shutdowns due to the water stored but it can't be for very long at all.

Wausau's ground water is challenging to treat. The average groundwater system has manganese levels in the .4mg/L range. Wausau's levels are over 2mg/L, above the 95th percentile for manganese levels. This is not a primary contaminate, it's a secondary issue but is at very high levels making it a challenge to treat.

Similarly, as we talk about color is the amount of organic carbon. With all the fields and trees we are essentially making tea anytime the rain falls and drains through all of those leaves. Most groundwater systems see levels in the 2mg/L range and communities that get their water from lakes and rivers see levels in the 3.5mg/L range. The levels in most of the wells for the City of Wausau average higher than 3.5mg/L.

Wojtkiewicz explained that one of the issues with total organic carbon is not only the color and making it more challenging to treat the water but also for the distribution system in addressing things like disinfection byproducts and dealing with the lead and copper issues.

Opatik continued, we've looked at either staying with the existing system or changing to potassium permanganate. Those are the 2 primary alternatives we've looked at and we've confirmed through pilot testing that using potassium permanganate is a viable and their suggested method of changing how we treat the water. Cost wise it is in the range of lime but it's much easier to operate this type of plant. There are some logistics that are less of a concern and just the overall hands on maintenance is much better.

They are in the process of testing the best method to remove color and are looking at 2 different products.

They can update the treatment facility at the existing site or build a new facility at a new site. In terms of cost, we have challenging water to treat, we have old equipment and legitimate risks about the location of the existing facility. The planning level costs for upgrading the existing facility is $27 million for the treatment plant itself and an additional $3 million for additional well & distribution upgrades.

For $8 million more, we could construct an entirely new plant and since the wells currently pump to the existing facility, we would have to do some additional distribution upgrades to get it to the new site for an additional $3 million. The net total increase for an entirely new site would be $11 million.

Gehin asked if we would still try to maintain well 3 which is on the east side. Opatik explained that the majority of our wells are on the northwest part of the city by the Hanz pit that the commission purchased a couple years ago. The costs do reflect well 3 still in use. If we do not use that well, there may be some cost savings.

If we were to upgrade at the existing site, we would use the majority of the building but would need a couple of new facilities. We would need one for color removal technology which would house some additional pumps and equipment. The biggest change would be the addition of two 500,000 gallon concrete tanks. These would be approximately 70 feet in diameter and 20 feet tall. Some challenges we would have is that the Bridge Street bridge is about 100 yards from this facility causing site constraints, we would need to perform the upgrades while the plant is still running and always have the risk of flooding being so close to the river.

If we were to build a new plant, the city owns a parcel up near the well fields, adjacent to Bugbee and the Hanz pit, at the end of E Campus Dr. They are estimating a new facility to be 15,000 sq. ft. The advantages of this site is that there is ample room for the facility, it would be close to the existing wells, would cut down on maintenance time , it's out of the flood plain and the elevation will also help with getting water to the plant.

Wojtkiewicz explained the pros and cons of either utilizing the existing facility or investing in a new plant at the new site. They looked at longevity, ease of construction, operating costs, room for potential expansion and the overall site risks. At the new site there are minimal site risks and much easier construction potential. The old site has a considerable existing infrastructure investment but also has considerable risks and will be more challenging to construct.

Mielke asked if we build a new facility how long would it be until we do any updates or

improvements. Wojtkiewicz stated that when planning for new facilities we are looking at a generation. Longevity of a new facility is estimated at another 50 years or longer. That doesn't mean equipment and components won't need to be fixed or upgraded however, a new facility is once in a lifetime, once in a generation. Now would be the time to do it.

Gehin noticed it appears after upgrading the existing facility we may need to re-pump to move the water through. Ligman explained with a new facility the wells will pump through the first several treatment processes and then re-pumping, just as we are doing now, to get it out into distribution. At the existing facility there could be potentially 2 re-pumping stages. Gehin stated that would be an additional energy cost at the existing facility, Ligman advised that is correct.

Opatik explained where Wausau's water rates fall in relation to our peers in rough numbers. Wausau's water usage is approximately 37,300 gallons per user per year with the average bill being about $175.00 per year for residential users.

Force said the issue here is what we are going to add to the rate since we are already adding to the wastewater side.

Wojtkiewicz said we are assuming we will be borrowing from the Clean Water Fund for a 20 year loan term at a 1.98% interest rate and principal forgiveness/grant money of approximately $500,000.00. They've also built in a cost increase due to operations, which is estimated right now to cost each user about $1.00/month. The projected rate increase per user for upgrading the existing plant is approximately $6.00/month and the rate increase to build the new plant to be approximately $7.50/month. This is all based on the average residential user. Force asked if that included all the re-piping for the new facility. Wojtkiewicz confirmed it does.

Ligman indicated he knows in the past people have asked how we compare to other local communities. The other communities are becoming more aware of the issue with manganese and iron. Rothschild added a water treatment plant 15 years ago and users are paying $250.00/year, Merrill added a plant 2 years ago and users are paying $230.00/year, Marathon City users are paying $340.00/year. Rib Mountain and Kronenwetter are also currently looking at this issue. Customers today expect more as far as water quality.

Force asked what is driving our need to improve the water facility. Opatik responded that there is the DNR requirements. There is a lot of work to be done at the current water plant. The filter media is original. If we are doing all of this work we should do it to improve our water quality and address the customer complaints as to the cosmetic and aesthetic appearance.

Opatik stated that the plans for the Water Facility need to be completed by the end of June.

Force asked just to be clear the DNR deadline to raise the clear water well is 2022. Opatik confirmed that is correct.

Wojtkiewicz wanted to also clarify that although manganese is not classified by the EPA as a primary contaminate, it is a secondary contaminate. There is research showing that it can contribute to corrosion and lead levels. It wasn't as much of a concern until Flint.

Opatik explained that the next step is to choose the water treatment plant location so we can meet a June deadline for our plans and specs.

Force asked how close we would be to residents at the new water plant location. Mielke and Lindman advised there is really nobody close by. It would be close to the north side of the property and most of the residents are on the south side. Force asked about truck traffic. Opatik advised we might have the ability to come in off of East Campus Drive which is basically a truck route now.

Force asked where the distribution shop would go. Boers advised he would like it to be attached to the new plant. Opatik clarified that there is a footnote on the cost estimate that it did not include relocating the meter shop. That is certainly something we can look at.

Gehin thinks we should still pursue closing down well 3 for cost savings. Ligman advised in their opinion there is not a reason to pretreat well 6 or well 3 any longer and they have tried reaching out to the DNR and EPA and they've not heard back. Using the existing site, there will be no room for expansion in the future. Also, all of Wausau's wells are relatively shallow and in the future could be classified as being under the direct influence of surface water and will require additional processes. At the new site they could accommodate those additional processes.

10) Discussion and Possible Action on Relocating the Water Treatment Plant to Bugbee Avenue.

Force indicated this will result in a 50% increase on rates for both the wastewater and water projects. Mielke can appreciate the impact on the user however, this is our future.

Mielke and Lindman confirmed the public will be notified through public hearing, committee of the whole, neighborhood groups as well as all of the information being available on the website. Mielke stated that most people do understand and they get it. They've not heard too many negatives.

Motion by Gehin to approve the recommendation of moving the water plant to the new location. Seconded by Rebman. Motion carried unanimously 5-0.

Dennis Urbanek, 1505 Pine View Lane brought forward his concerns;

We are looking at $120 million worth of expenditures. Having a moderate familiarity with water quality in industrial water and sanitary situations, the Wisconsin River is tea colored with a highly organic content. The cheaper solution may be to relocate the wells however, then we have manganese problems and he's not sure what that all means in terms of how to do it. We should be more concerned about saving money rather than time and the bottom line as to what it does to the taxpayer. He's unsure when we look at the dollar amount what the end point is from a cost standpoint. It's going to require outside resources to start up all of the equipment and there is always something that doesn't work right and in need of modifications. He's not sure if contingencies are built in, it's unclear. We need a good solid contract so the taxpayers aren't on the hook for additional costs. People look at how much it is going to cost to live in a community.

11) Adjourn.

There being no further business to discuss, motion was made by Herbst to adjourn the meeting. Seconded by Gehin. Motion carried 5-0.

Michelle Weasler, Recording Secretary
S:\WaterWorks\Common\WaterCommission\2019\February\WWWC_20190108_Minutes.doc.

All present are expected to conduct themselves in accordance with our City's Core Values

OFFICIAL NOTICE AND AGENDA

of a meeting of a City Board, Commission, Department, Committee, Agency, Corporation, Quasi-Municipal Corporation, or sub-unit thereof.

REVISED TO POSSIBLE QUORUM

Meeting of the:	**POSSIBLE QUORUM OF THE COMMITTEE OF THE WHOLE**
Date/Time:	**Wednesday, January 23, 2019, 6:00 p.m.**
Location:	**City Hall (407 Grant Street) - Council Chambers**
Members:	Patrick Peckham, Michael Martens, David Nutting, Tom Neal, Gary Gisselman, Rebecca McElhaney, Lisa Rasmussen (C), Karen Kellbach, Dawn Herbst, Mary Thao, Dennis Smith, Mayor Robert Mielke

---

1 Presentation #3 of the proposed Wastewater Treatment Facility Upgrade project and schedule
2 Presentation #1 on the Water Treatment Facility proposed upgrade and alternatives

It is possible that a quorum of the Committee of the Whole may be at a Presentation of the proposed upgrade to the Wastewater Treatment Facility and the Water Treatment Facility
No action will be taken.

To view the Wastewater Facilities Plan Report (draft B) go to: www.ci.wausau.wi.us Minutes & Agendas

Lisa Rasmussen
City Council President

This Notice was posted at City Hall and emailed to the Daily Herald newsroom on January 15, 2019 @ 10:00 am

In accordance with the requirements of Title II of the Americans with Disabilities Act (ADA), the City of Wausau will not discriminate against qualified individuals with disabilities on the basis of disability in its services, programs or activities. If you need assistance or reasonable accommodations in participating in this meeting or event due to a disability as defined under the ADA, please call the City's ADA Coordinator at (715) 261-6620 or email clerk@ci.wausau.wi.us at least 48 hours prior to the scheduled meeting or event to request an accommodation.

Another Wastewater Project Update

Wausau City Council
Wausau, WI

January 23, 2019

DONOHUE | BECHER HOPPE

An Aging Facility

One of Wausau's Most Valuable Assets

* Based on recent new 24-mgd nutrient-removing treatment facility for Denver, CO. Grand opening 2017. Cost = $417M. [CCI 2018 = 10,959. CCI 2011 = 9070. Cost = $504M in $2018. Includes a 7-mile forcemain.]

For Significant Facility Upgrades, EPA and WDNR Require a 20-Year Plan | Facility Plan

- Upgrade Considerations
  - Safety, Reliability, Performance
  - Capacity
  - Regulations
- Facility Plan Required for Clean Water Fund Funding

The Foremost Plan Objectives

- The Recommended Plan
  - Maximize Benefit of Existing Infrastructure
  - Maximize Return on Previous Investment

Comprehensive Condition Assessment All Processes and Structures

Example Phosphorus-Removing Chemical Storage and Feed System

Condition Categories	Pass	Fail
Safety, Reliability, Performance		■
Capacity		■
Regulations		■

Capacity

The storage and feed capacity is adequate for the current WPDES Permit limit; however, both will be inadequate for the future phosphorus TMDL limit. Moreover, the Facility will need the ability to feed phosphorus-removing chemicals to multiple locations – e.g., upstream primary settling, upstream secondary settling, upstream filtration, and to the belt-filter press underflow.

Configuration

- Number of Chemical Storage Tanks = 1
- Number of Chemical Feed Pumps = 2
- Type of Chemical Feed Pumps = diaphragm
- Storage Volume = 4,800 gal

Description

The Facility uses aluminum sulfate (alum) to comply with its current 1 mg-TP/L limit. Alum is stored in a single 4,800-gal chemical storage tank and fed to the grit system upstream of primary settling. This is currently the only alum feed point. The Facility currently uses roughly 350 gpd on average.

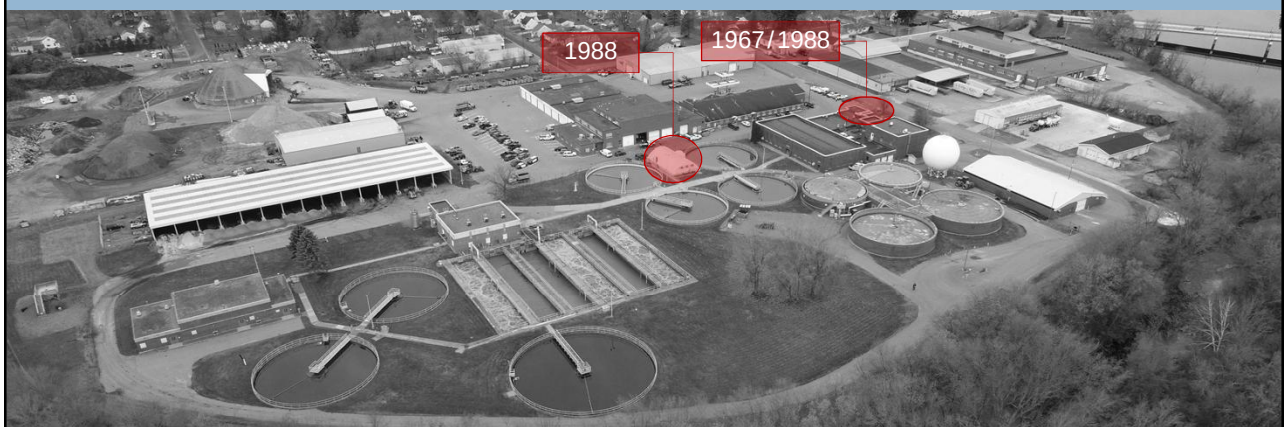
Issues

- The current system lacks storage volume to meet the demands of the impending phosphorus TMDL. Moreover, the Facility might be best served by feeding multiple chemicals.
- The existing system feeds alum to a single location. The impending phosphorus TMDL will require multiple feed locations.
- The chemical storage tank lacks adequate containment. This is a safety concerns.

Condition Assessment Summary

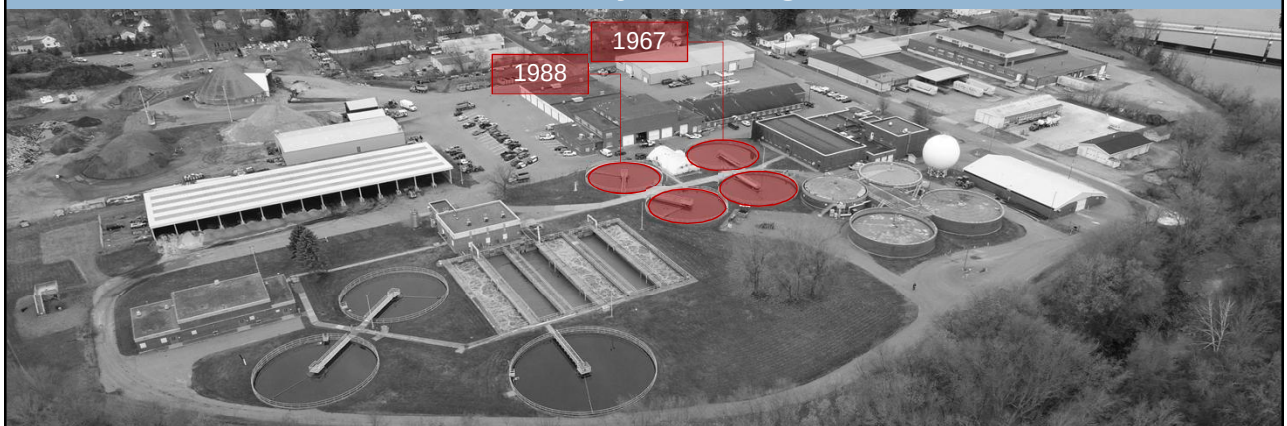
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Preliminary Treatment



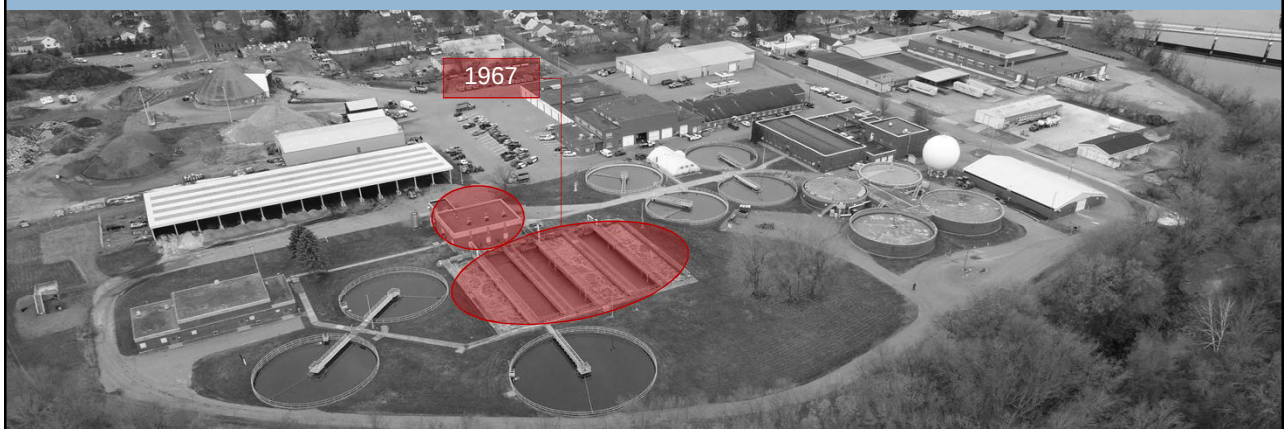
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Primary Settling



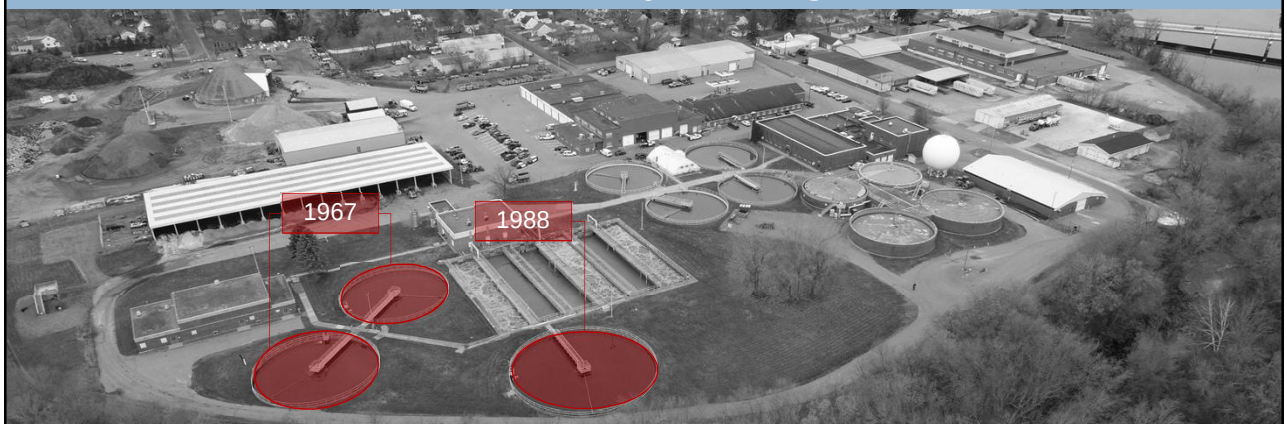
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Activated Sludge System



Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Secondary Settling

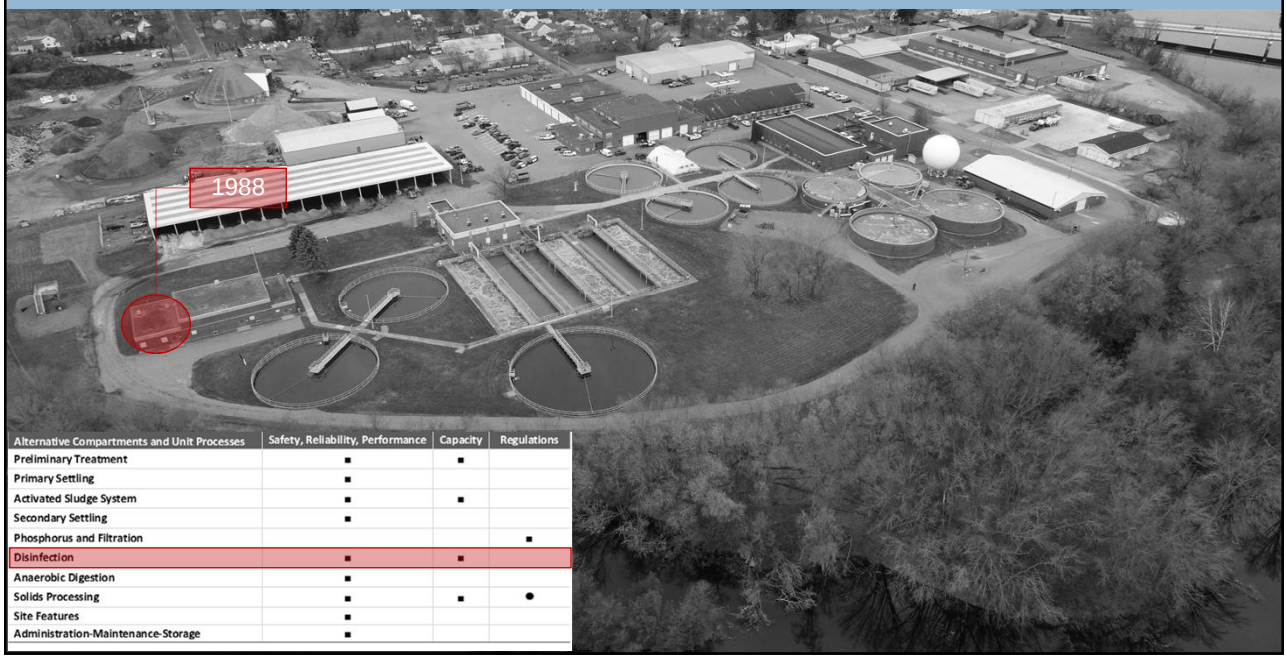


Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Phosphorus and Filtration

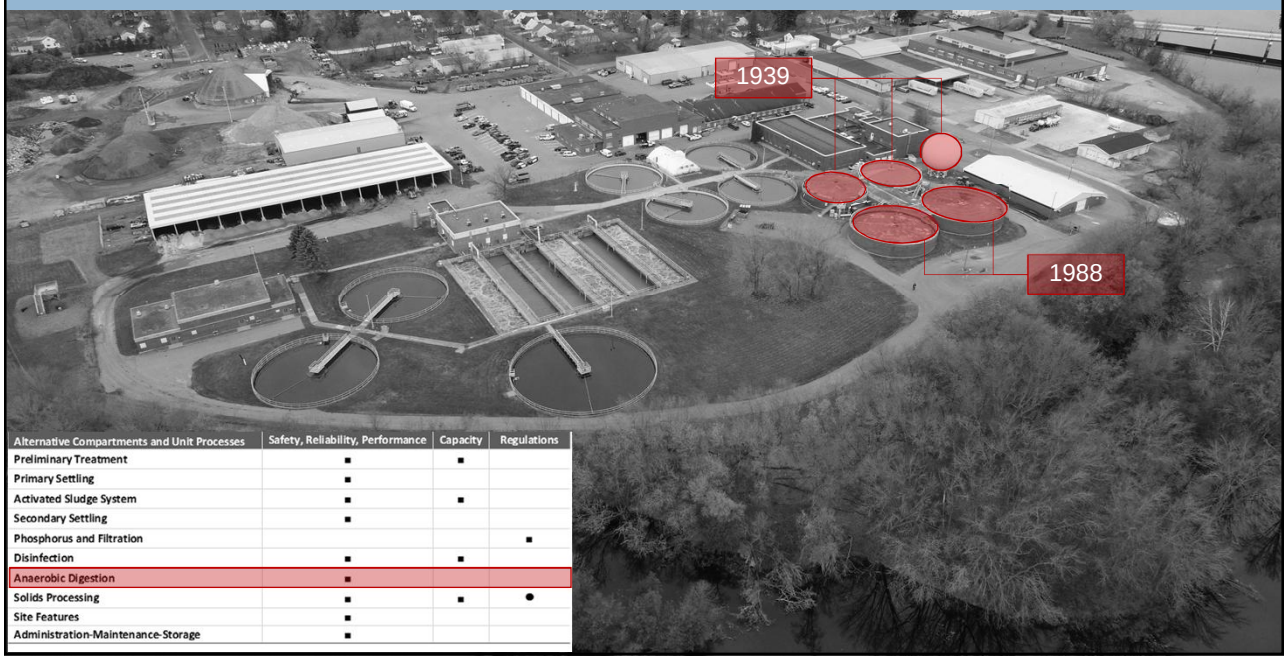
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Disinfection



Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Anaerobic Digestion

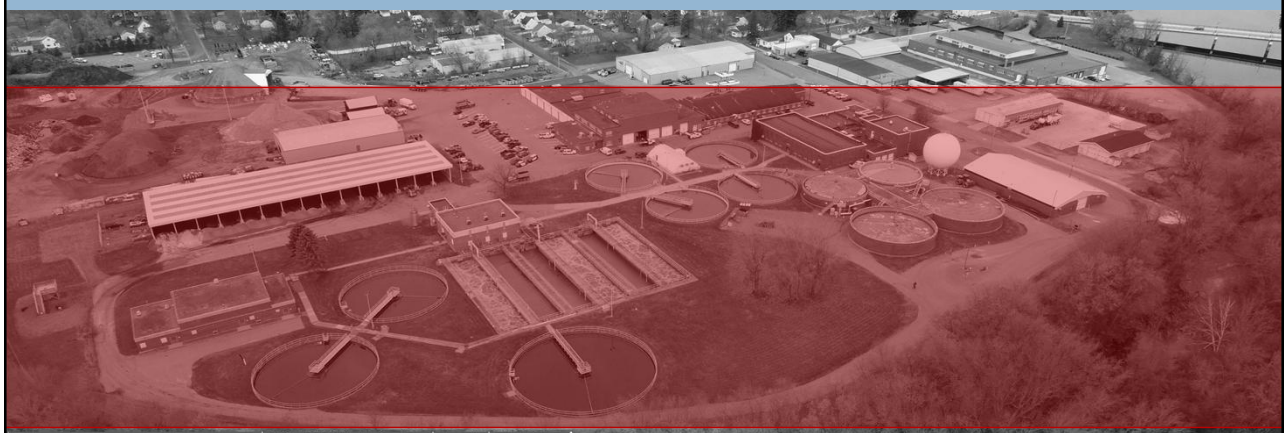


Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Solids Processing

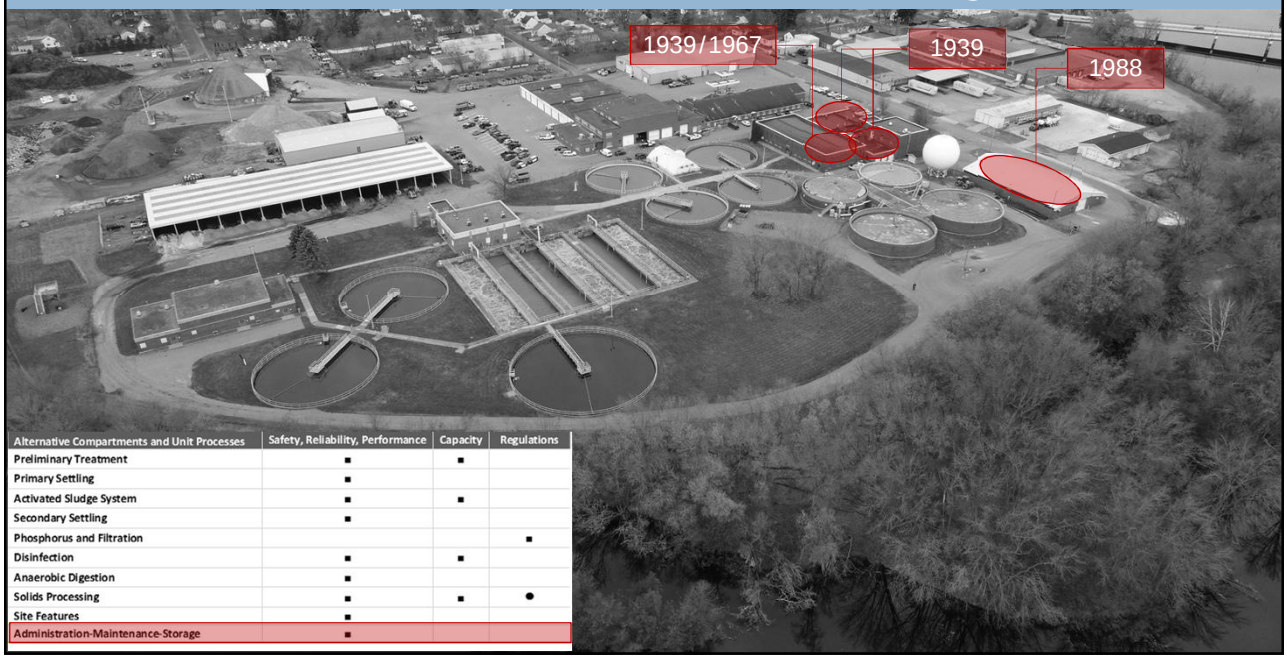
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Site Features



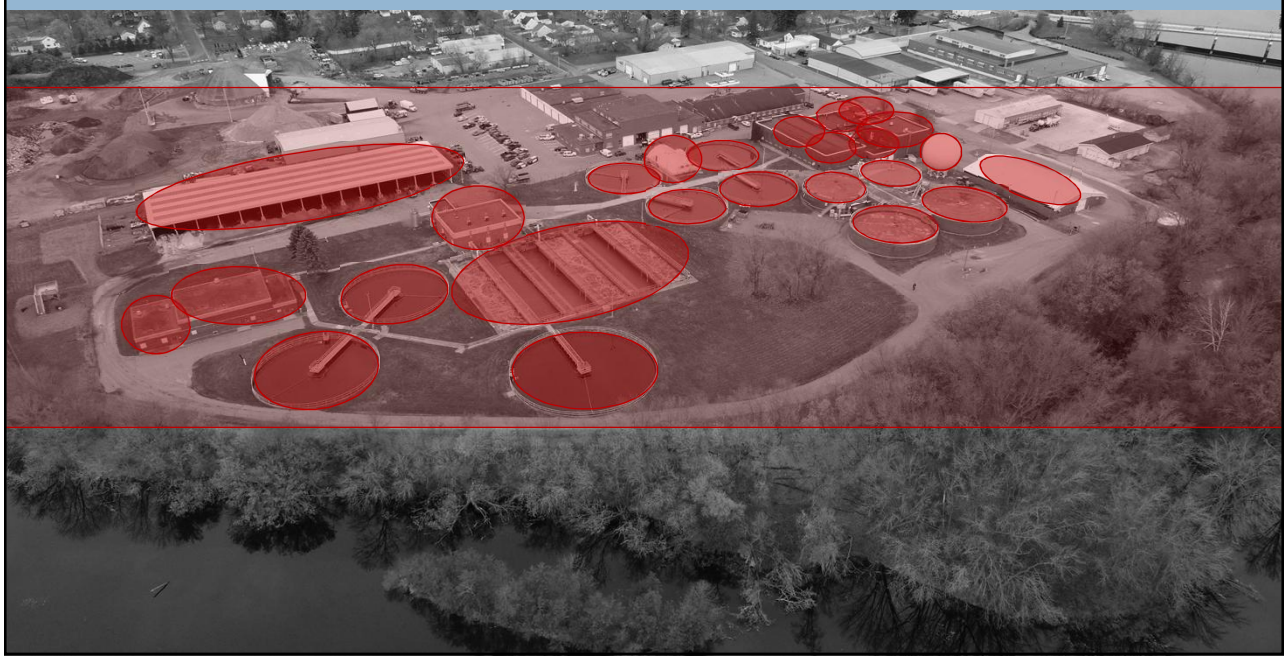
Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Administration-Maintenance-Storage

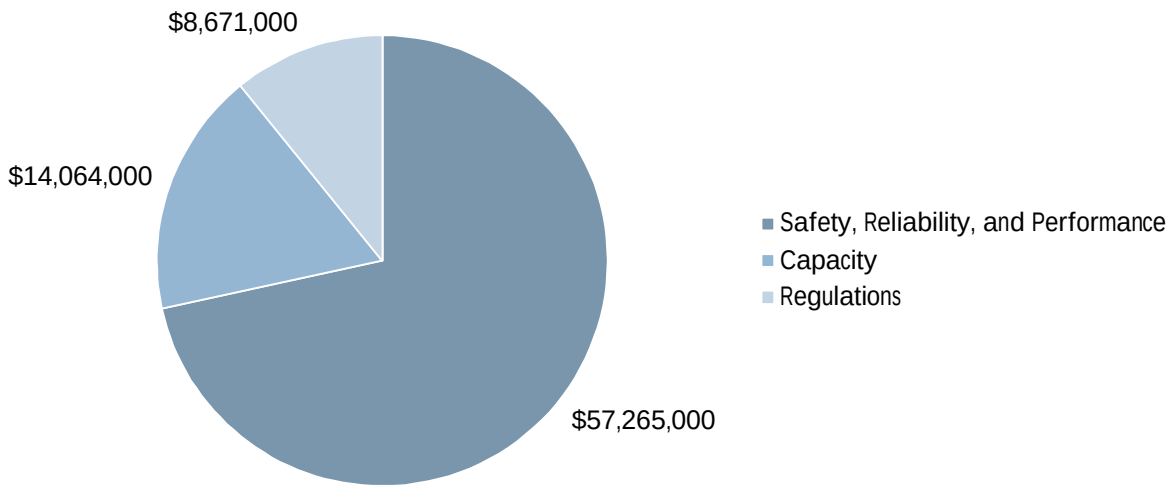


Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
Preliminary Treatment	■	■	
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

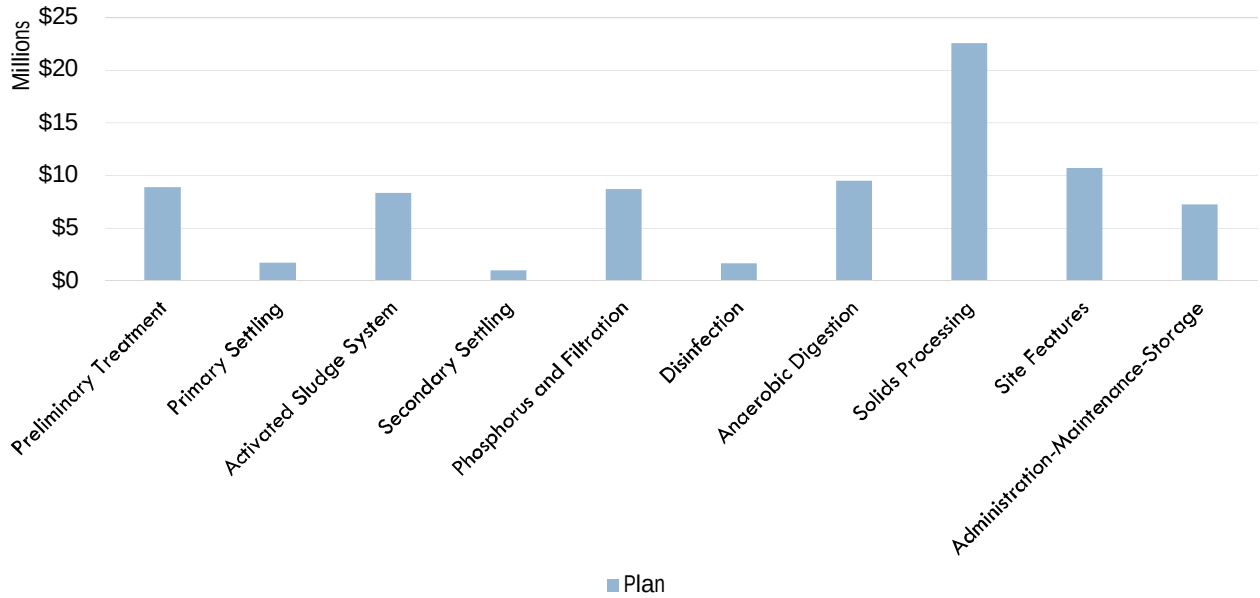
The Issues are Pervasive



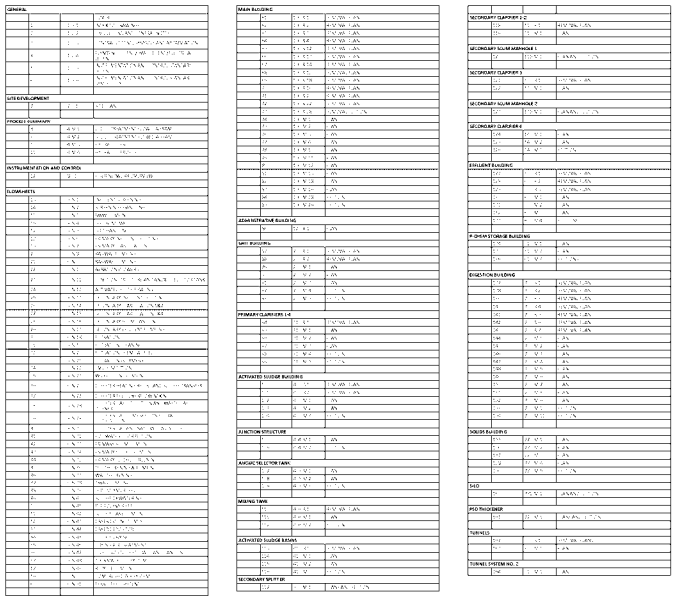
Planning-Level Costs ▶ $80M



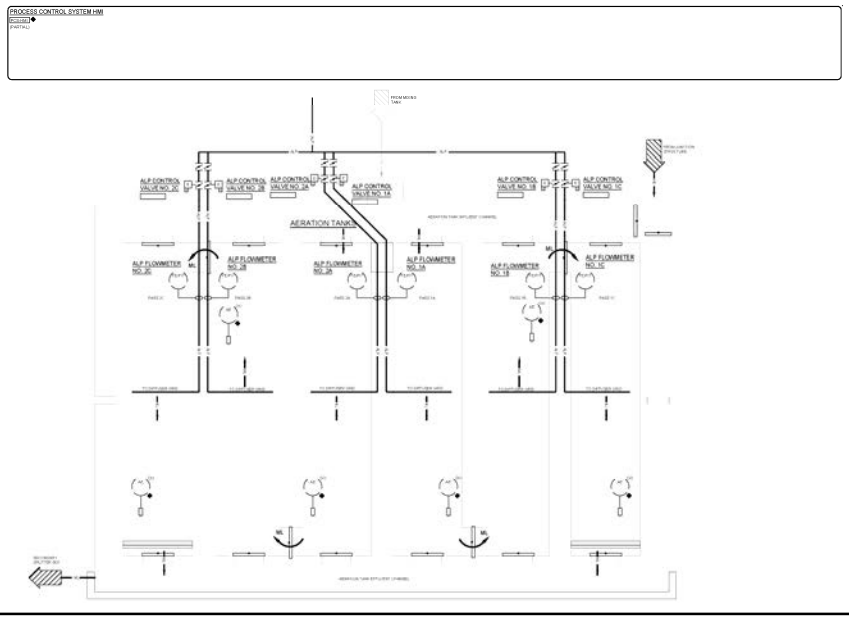
Planning-Level Costs ▶ $80M



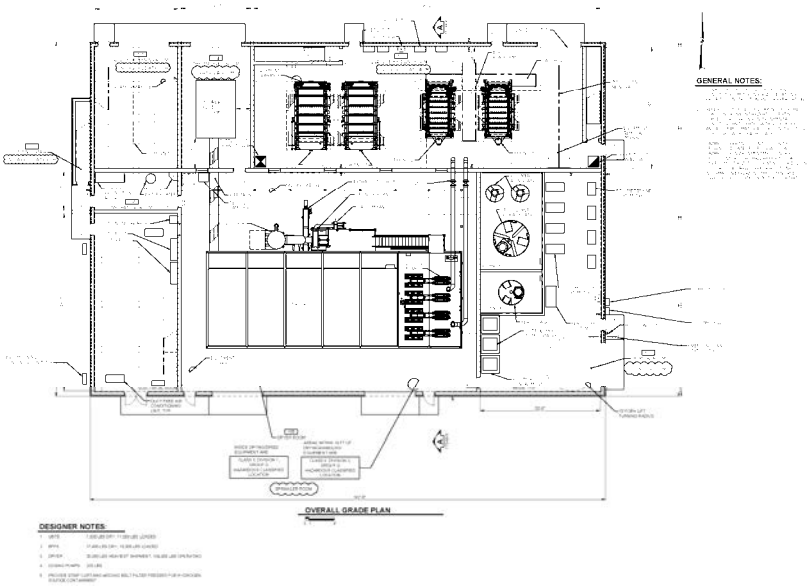
Preliminary Design Drawings



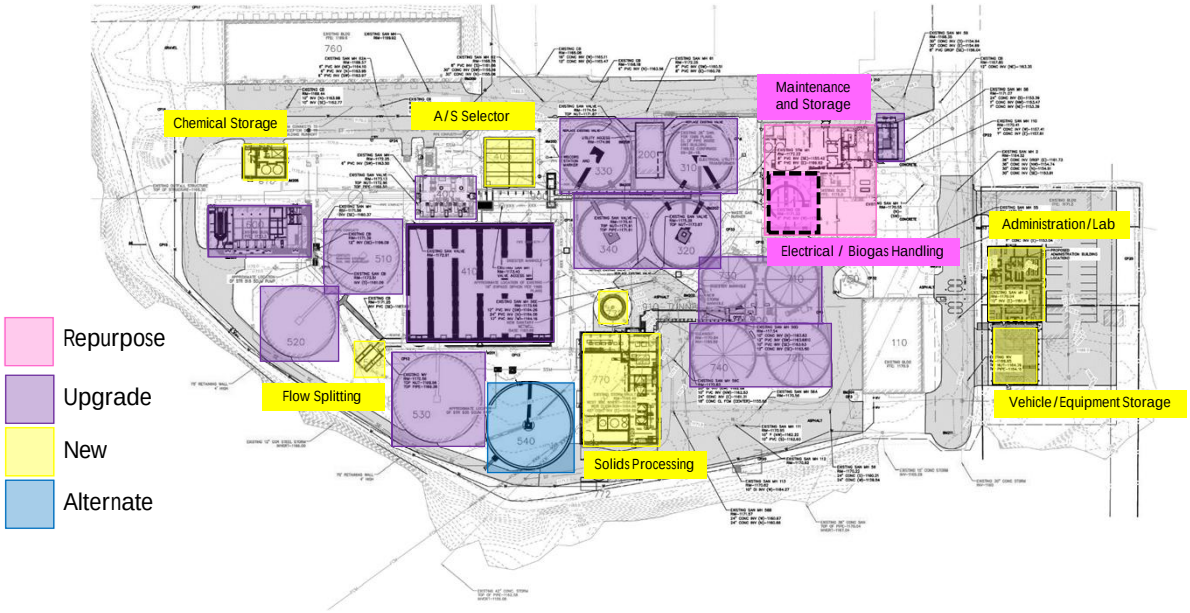
Process Design and Flowsheet Drawings



Preliminary Design Drawings



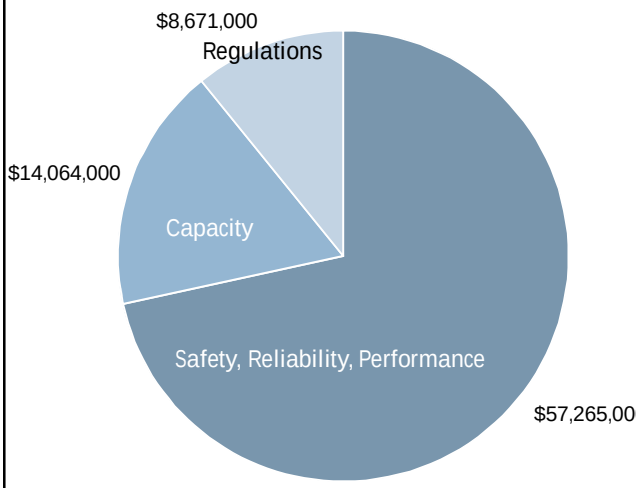
Preliminary Design Site Plan

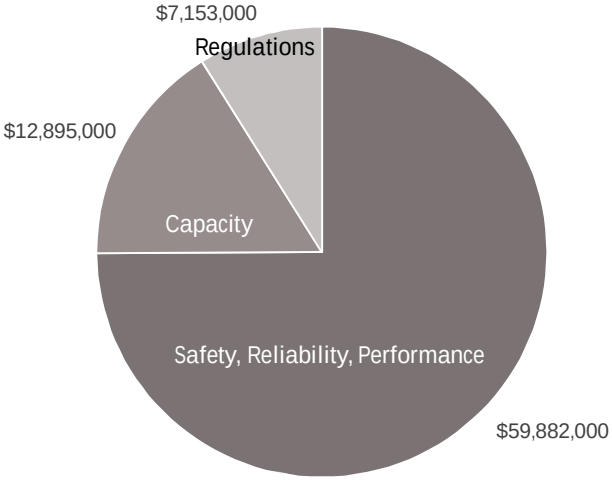


Preliminary Design Site Plan | New Structures

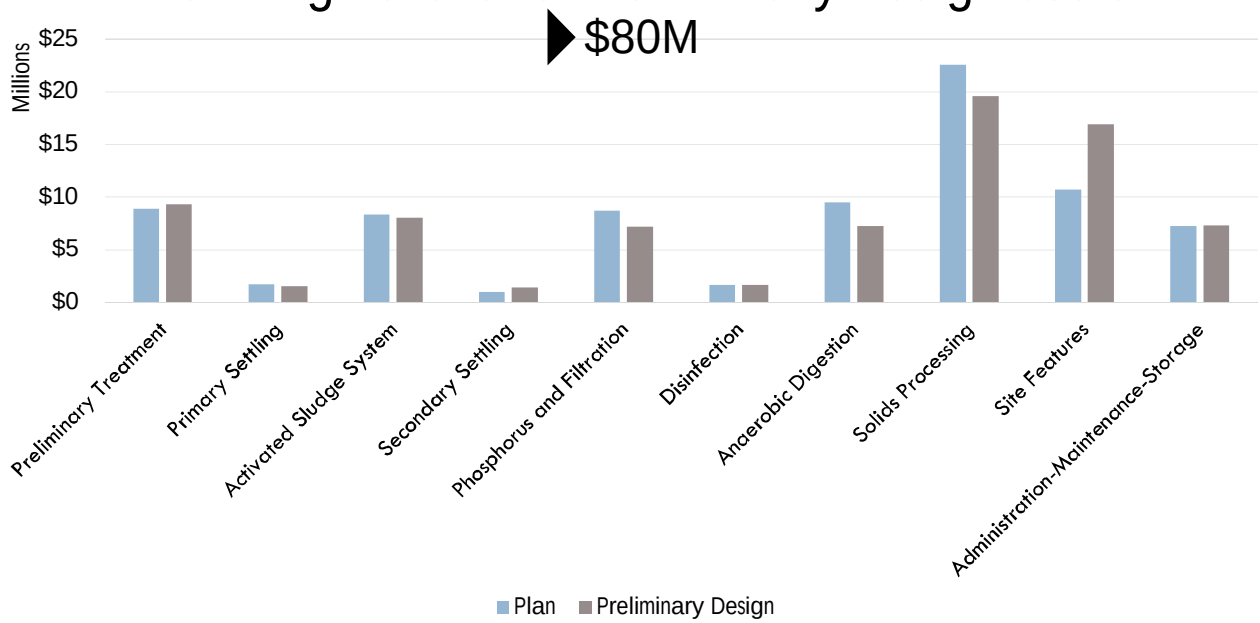
Planning-Level and Preliminary Design Costs

▶ $80M

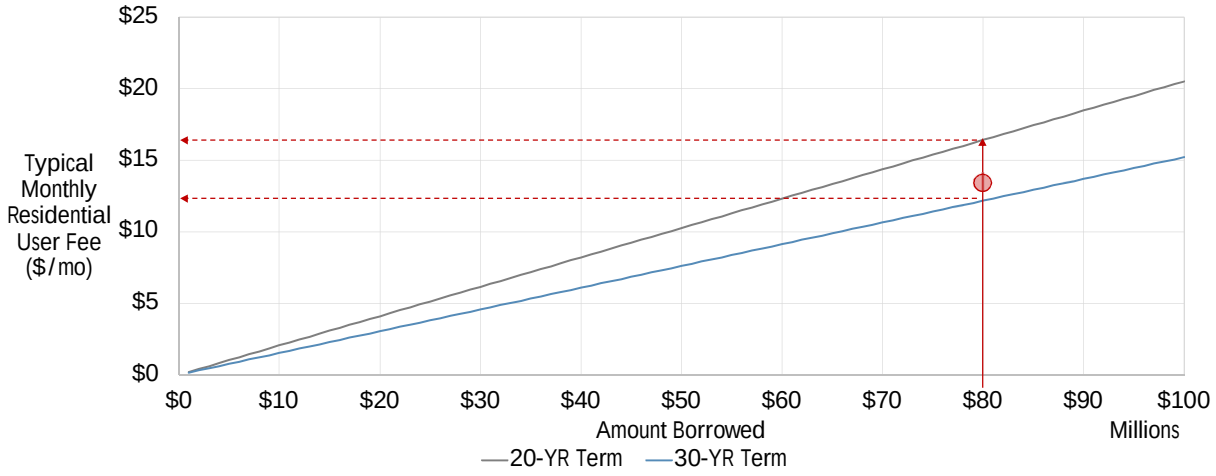




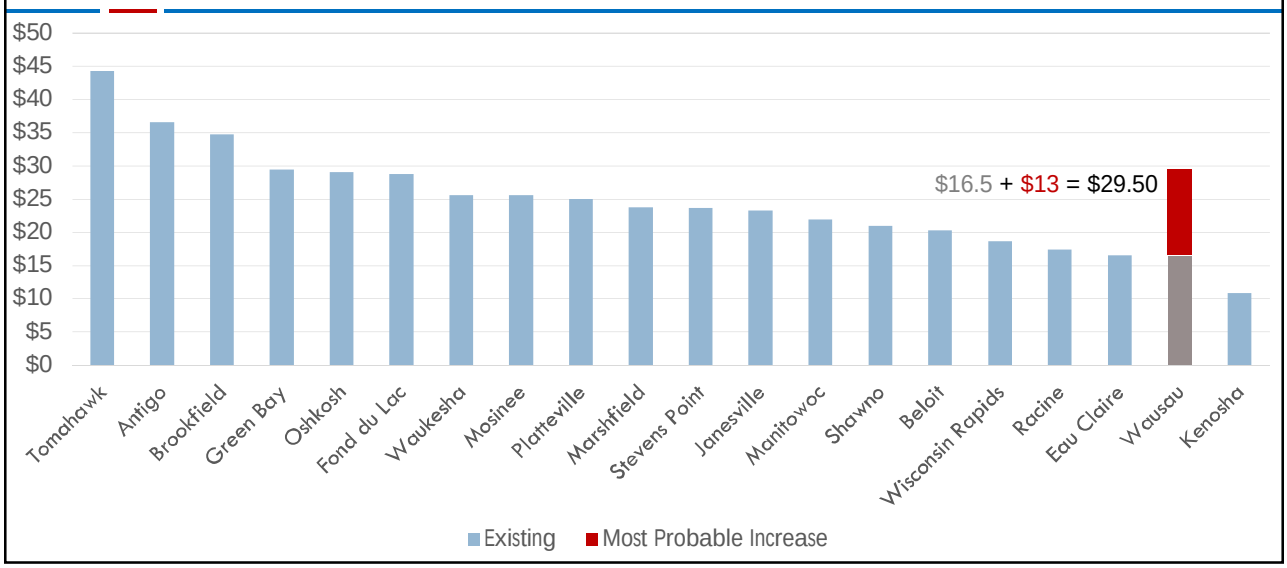
Planning-Level and Preliminary Design Costs



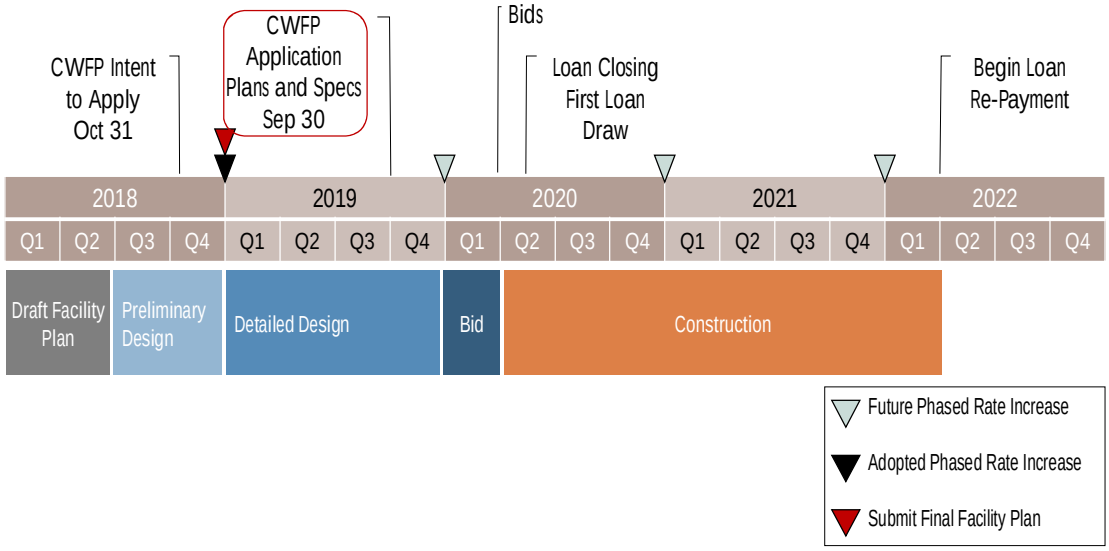
Typical Monthly Residential User Rates



Comparison of Future Monthly Residential Wastewater Bills [37 kgpy]



Project Schedule



Action Items

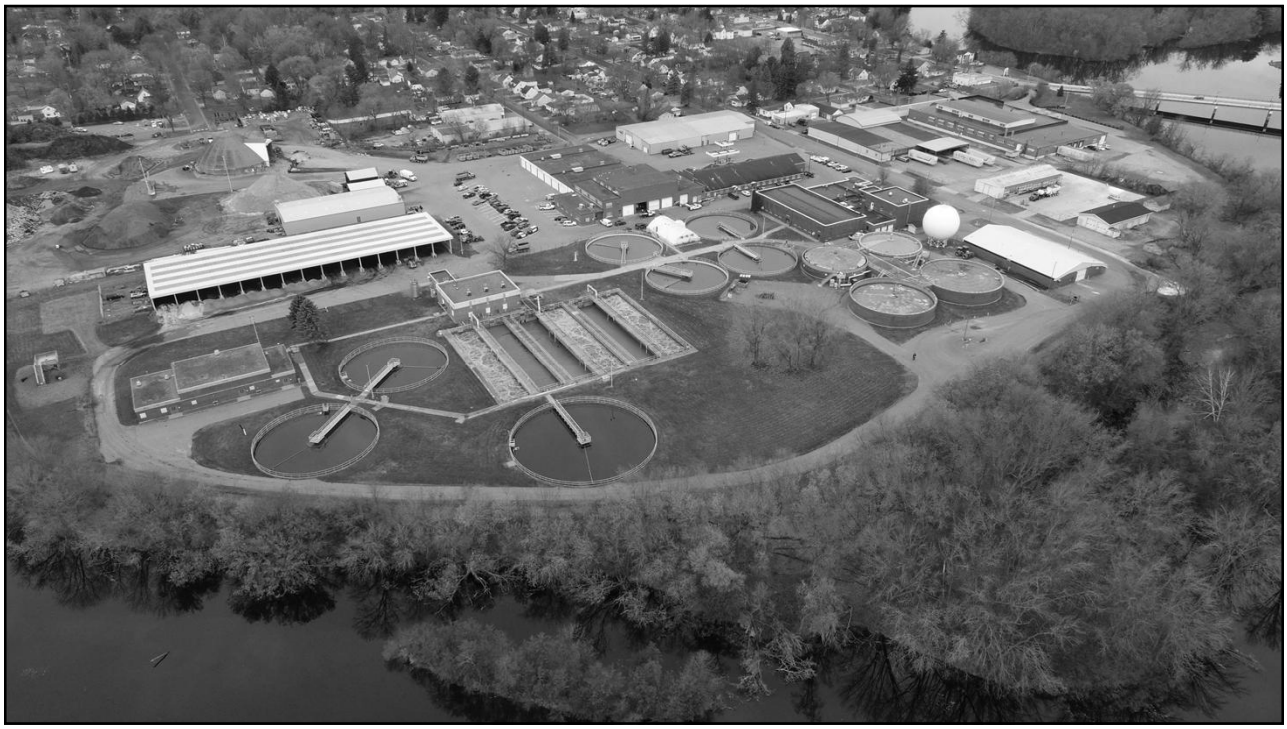
- City Approve and Submit Facility Plan | January/February 2019
- Proceed with Final Design/Bidding Documents| January/February 2019
- Submit Reviewable Plans and Specifications to WDNR | September 30, 2019

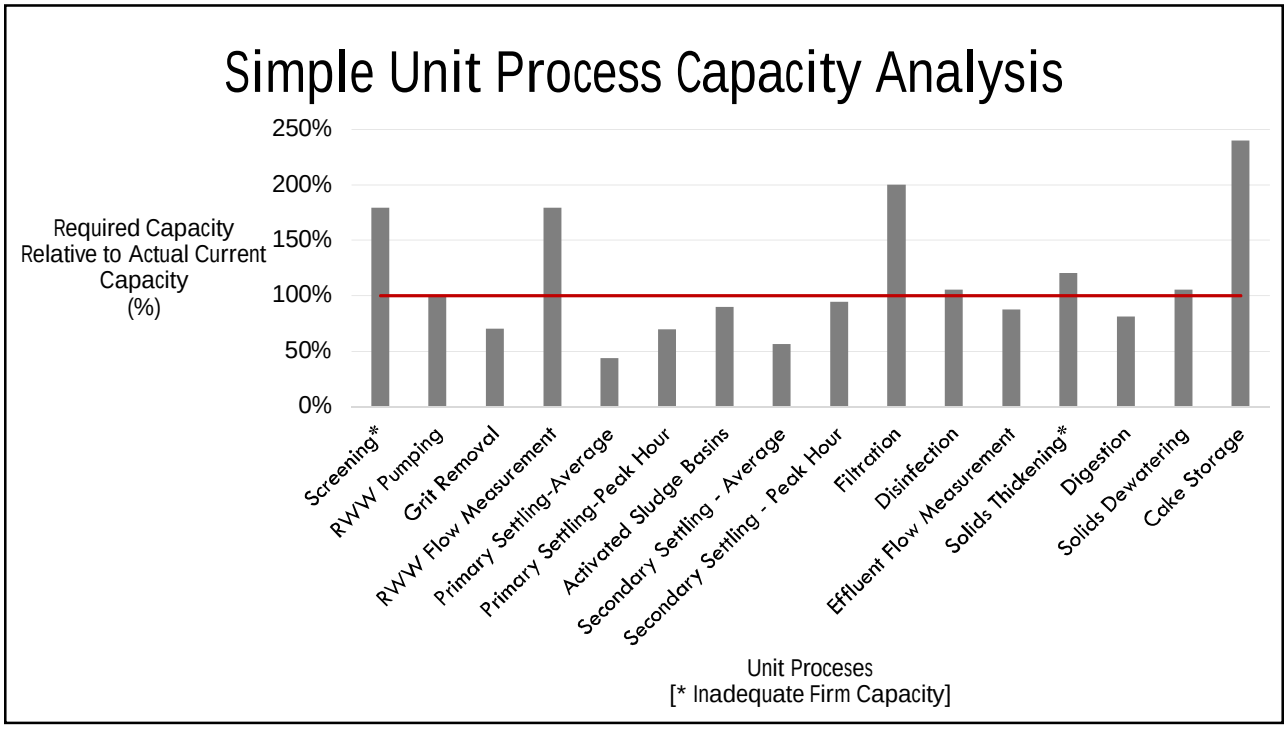
Questions and Discussion

?

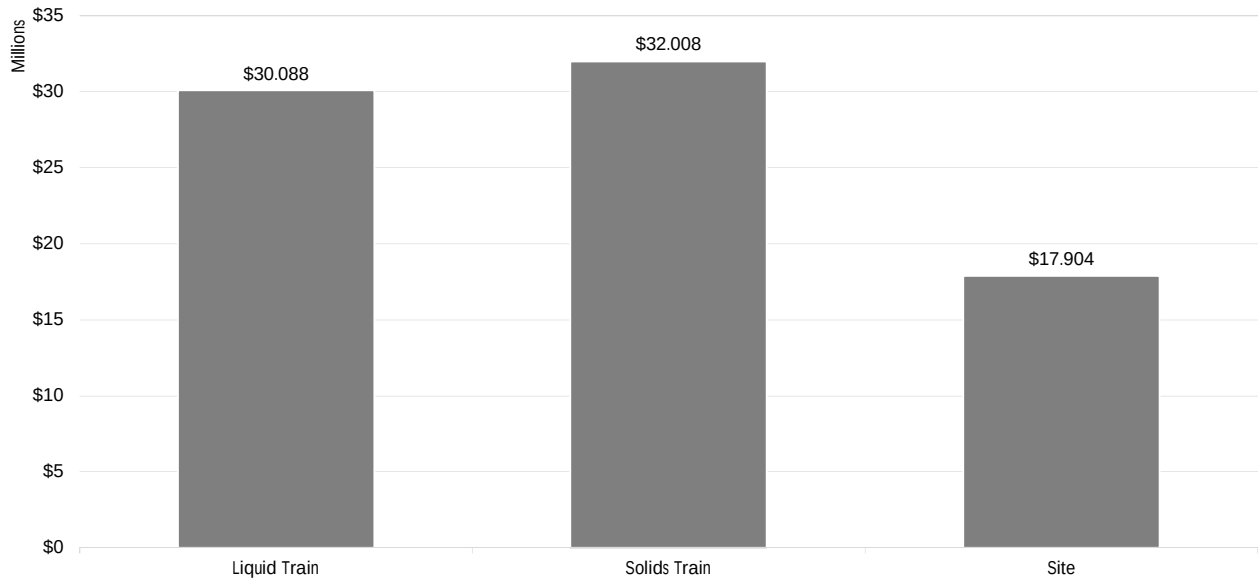
Thank You

Backup Materials




Simple Unit Process Capacity Analysis
Required Capacity Relative to Actual Current Capacity (%)
250%
200%
150%
100%
50%
0%
Screening*
RWW Pumping
Grit Removal
RWW Flow Measurement
Primary Settling-Average
Primary Settling-Peak Hour
Activated Sludge Basins
Secondary Settling - Average
Secondary Settling - Peak Hour
Filtration
Disinfection
Effluent Flow Measurement
Solids Thickening*
Digestion
Solids Dewatering
Cake Storage
Unit Proceses
[* Inadequate Firm Capacity]

Costs by High-Level WWTF Function

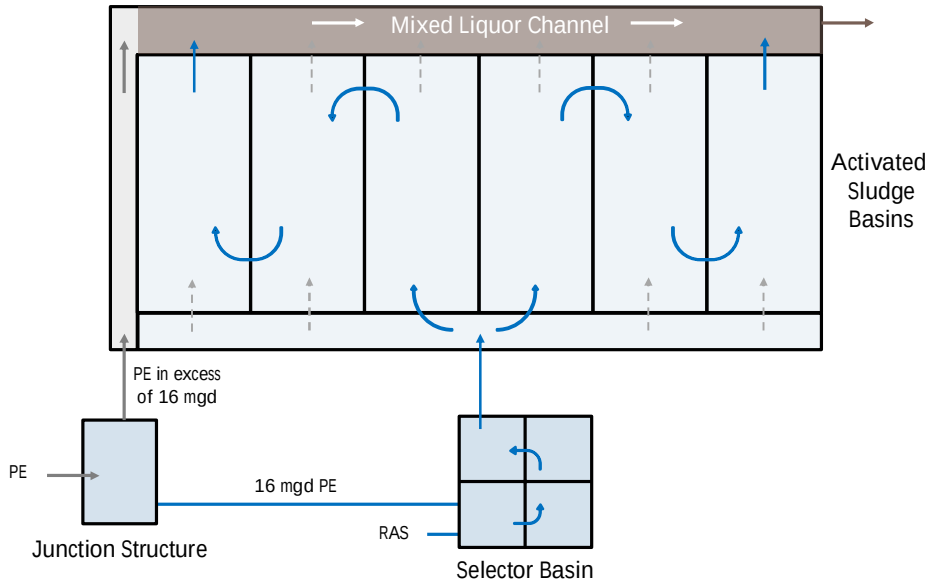


Future Design Values

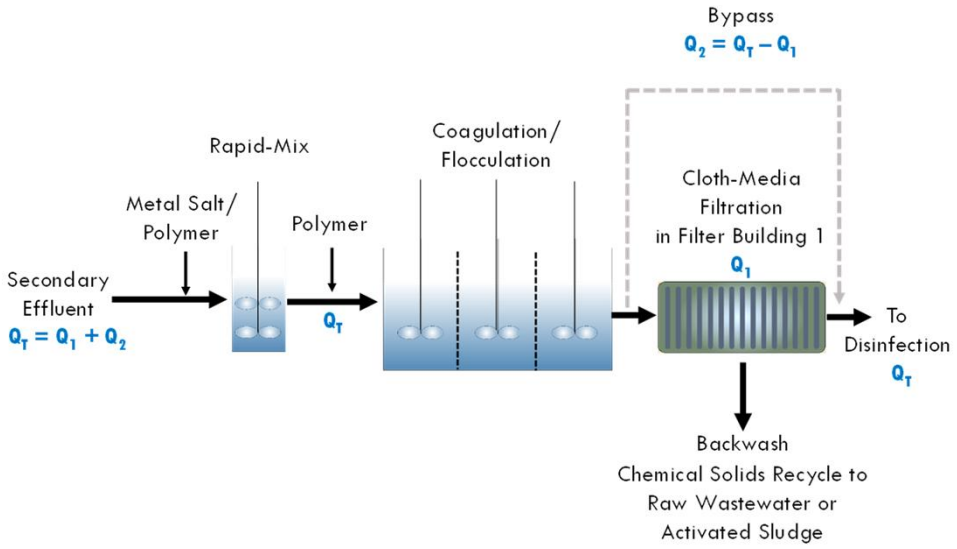
Flow	Flow (mgd)	Peaking Factor
Average	5.4	
Maximum Month	9.2	1.69
Maximum Week	11.6	2.14
Maximum Day	16.8	3.10
Peak Hour	22.0	4.06
Peak Instantaneous	35.8	

Parameter	AA (ppd)	MM (ppd)	MW (ppd)	MD (ppd)
BOD	11,190	14,438	17,458	24,108
TSS	11,763	16,361	19,005	31,445
TKN	2,004	2,586	3,130	4,193
TP	545	703	850	1,258

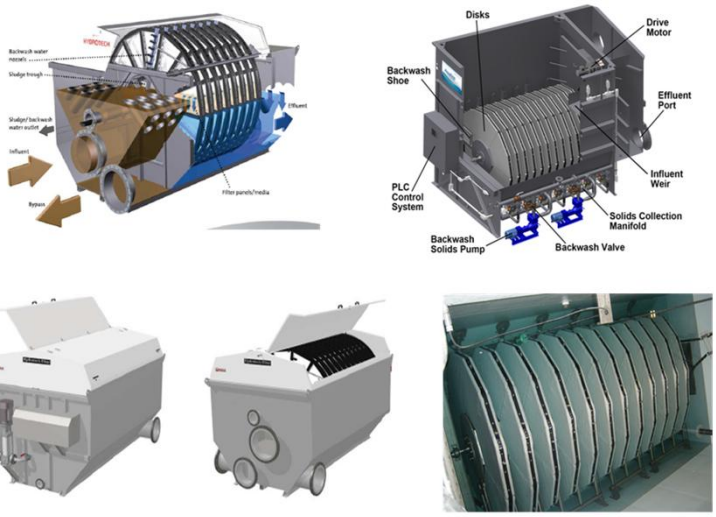
Activated Sludge System Configuration



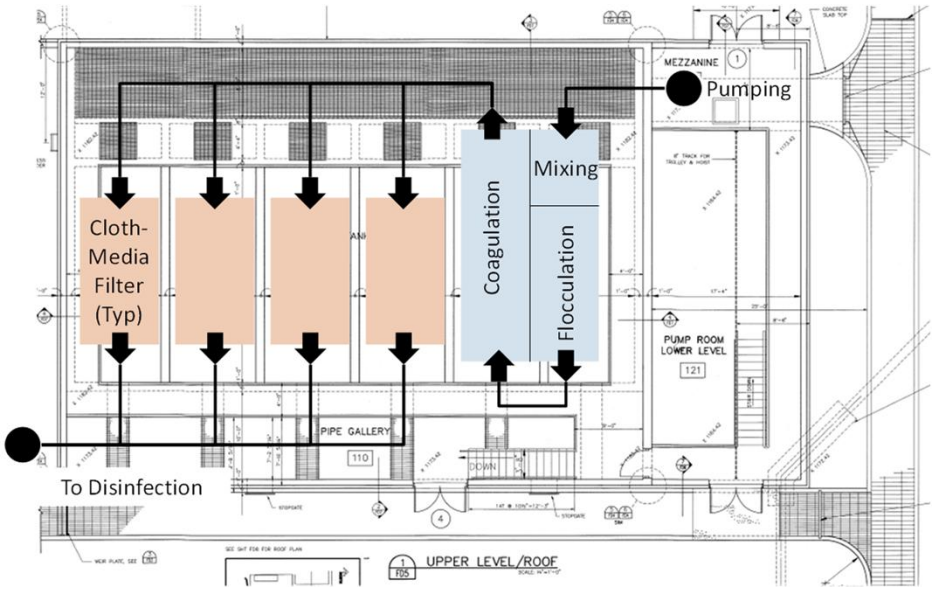
Low-Level Phosphorus and WLA BOD Compliance



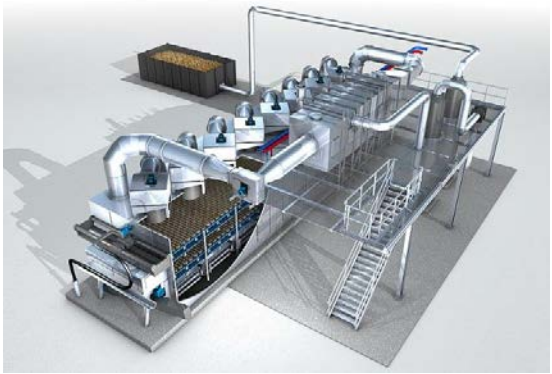
Cloth-Media Filters



Low-Level Phosphorus and WLA BOD Compliance



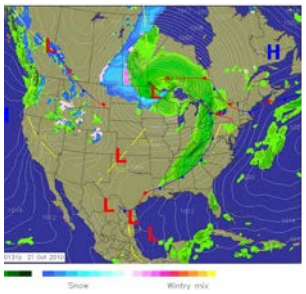
Medium-Temperature Belt Dryer



Class A EQ
Biosolids Product

Motivations to Consider Biosolids Drying
Logistics

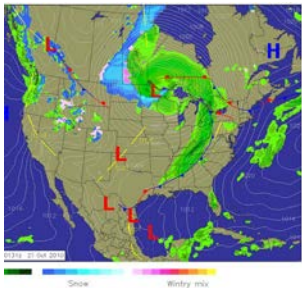
- Spring/fall weather and farming practices dictate application/reuse



Motivations to Consider Biosolids Drying
Logistics

- Spring/fall weather and farming practices dictate application/reuse

Weather patterns and farming practices are likely to make these challenges progressively worse over time



Motivations to Consider Biosolids Drying
Logistics

- Class B Restricted to Permitted Sites. Highly Regulated.

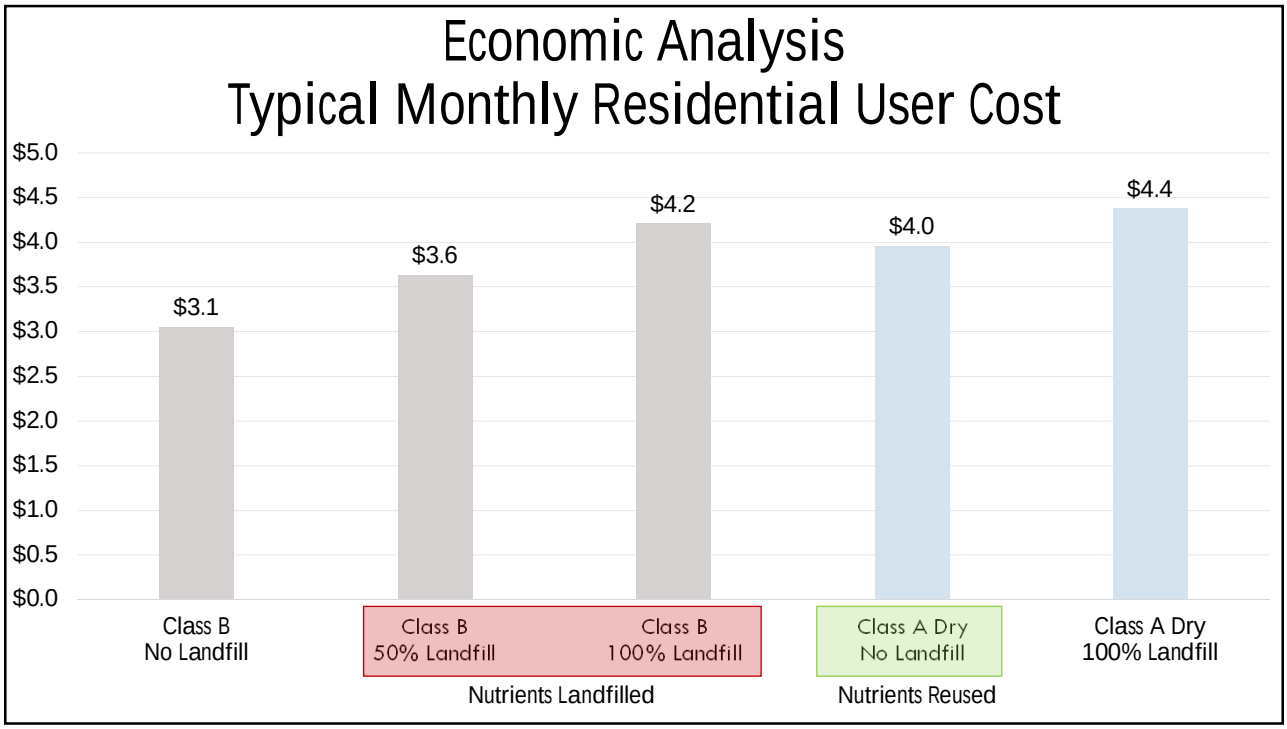
Class B

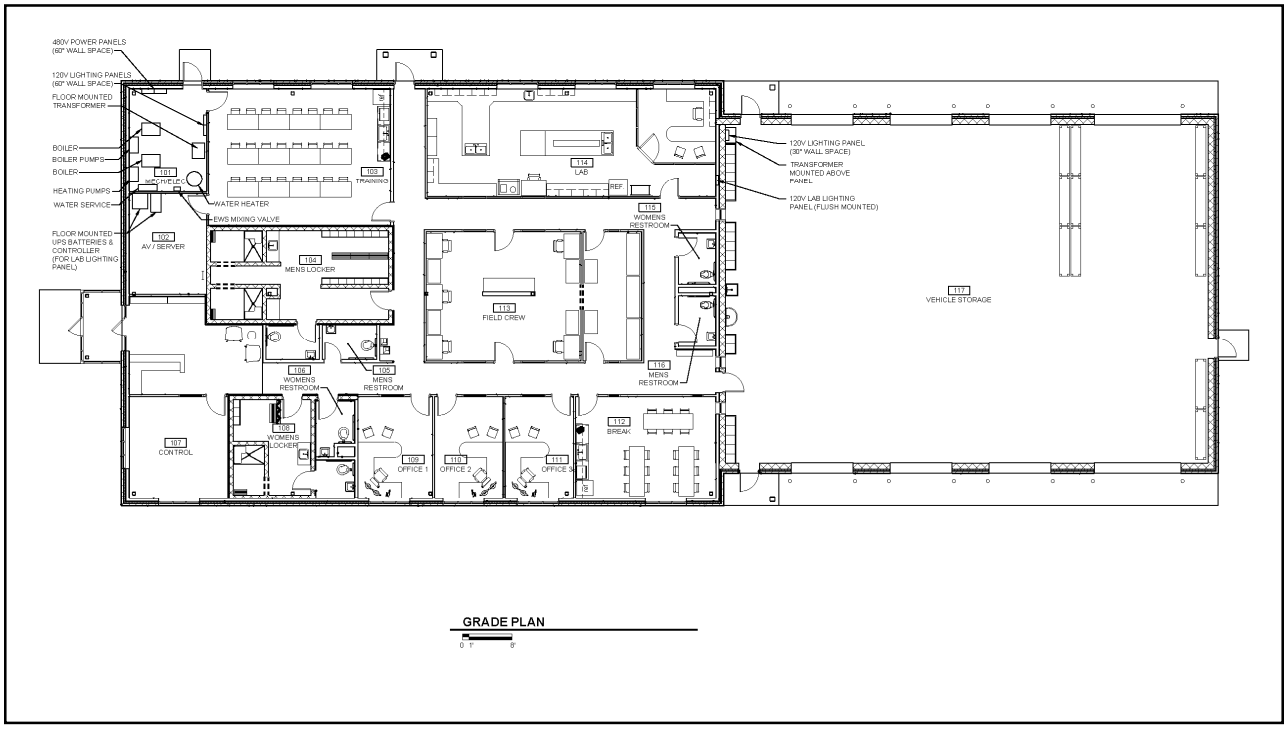
Class A

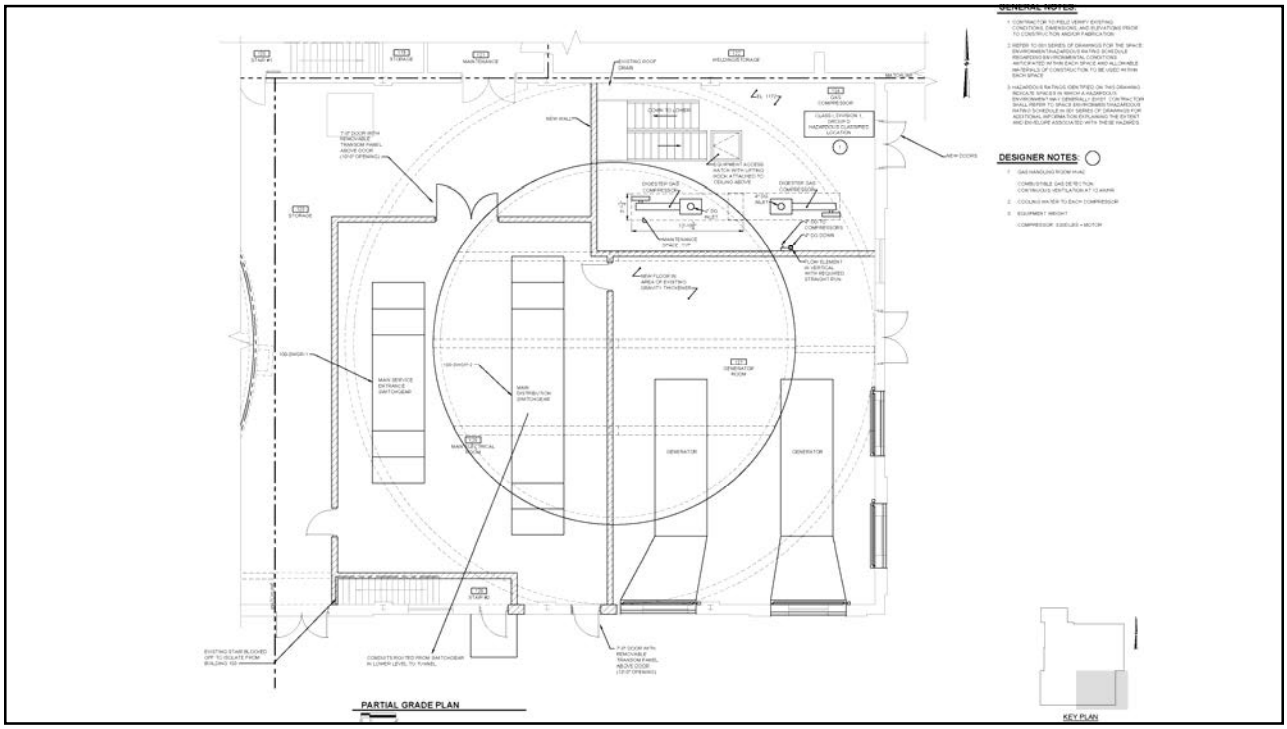
Motivations to Consider Biosolids Drying
Longevity

- Class B Investment
  - Does Not Address Logistics
  - Future Uncertain
- Class A Investment
  - Addresses Logistics
  - Future More Certain

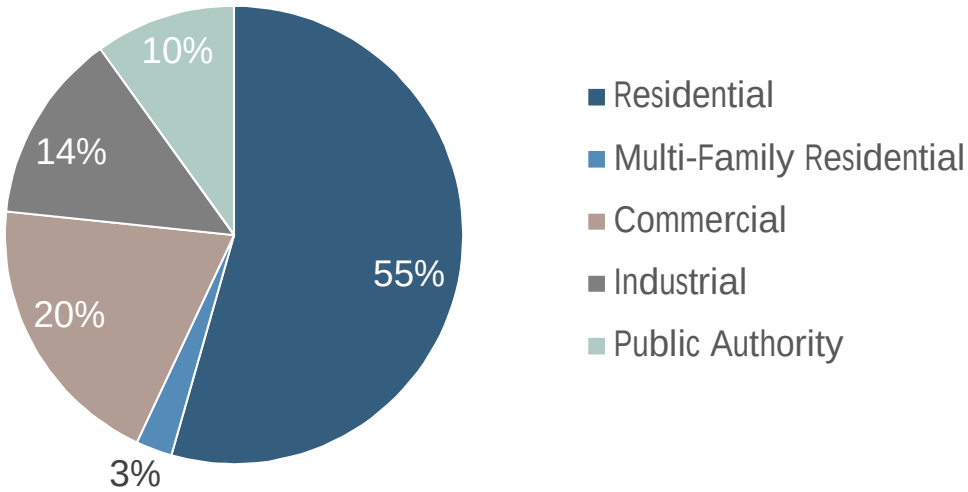
Economic Analysis
Typical Monthly Residential User Cost


Economic Analysis
Typical Monthly Residential User Cost
$5.0
$4.5
$4.0
$3.5
$3.0
$2.5
$2.0
$1.5
$1.0
$0.5
$0.0
$3.1
$3.6
$4.2
$4.0
$4.4
Class B No Landfill
Class B 50% Landfill
Class B 100% Landfill
Class A Dry No Landfill
Class A Dry 100% Landfill
Nutrients Landfilled
Nutrients Reused

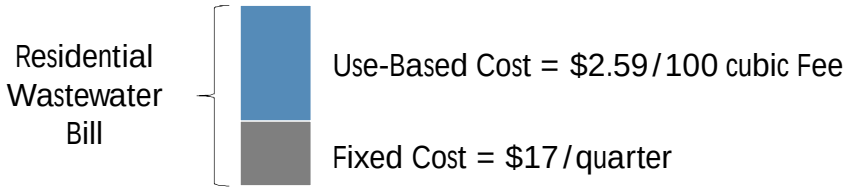

480V POWER PANELS (60" WALL SPACE)
120V LIGHTING PANELS (60" WALL SPACE)
FLOOR MOUNTED TRANSFORMER
BOILER
BOILER PUMPS
BOILER
HEATING PUMPS
WATER SERVICE
FLOOR MOUNTED UPS BATTERIES & CONTROLLER (FOR LAB LIGHTING PANEL)
101 MPC FIVE LC
WATER HEATER
EWS MIXING VALVE
102 AV / SERVER
103 TRAINING
104 MEN'S LOCKER
105 MENS RESTROOM
106 WOMENS RESTROOM
107 CONTROL
108 WOMENS LOCKER
109 OFFICE 1
110 OFFICE 2
111 OFFICE 3
112 BREAK
113 FIELD CREW
114 LAB
REF.
115 WOMENS RESTROOM
116 MENS RESTROOM
117 VEHICLE STORAGE
120V LIGHTING PANEL (30" WALL SPACE)
TRANSFORMER MOUNTED ABOVE PANEL
120V LAB LIGHTING PANEL (FLUSH MOUNTED)
GRADE PLAN
0 1' 8'



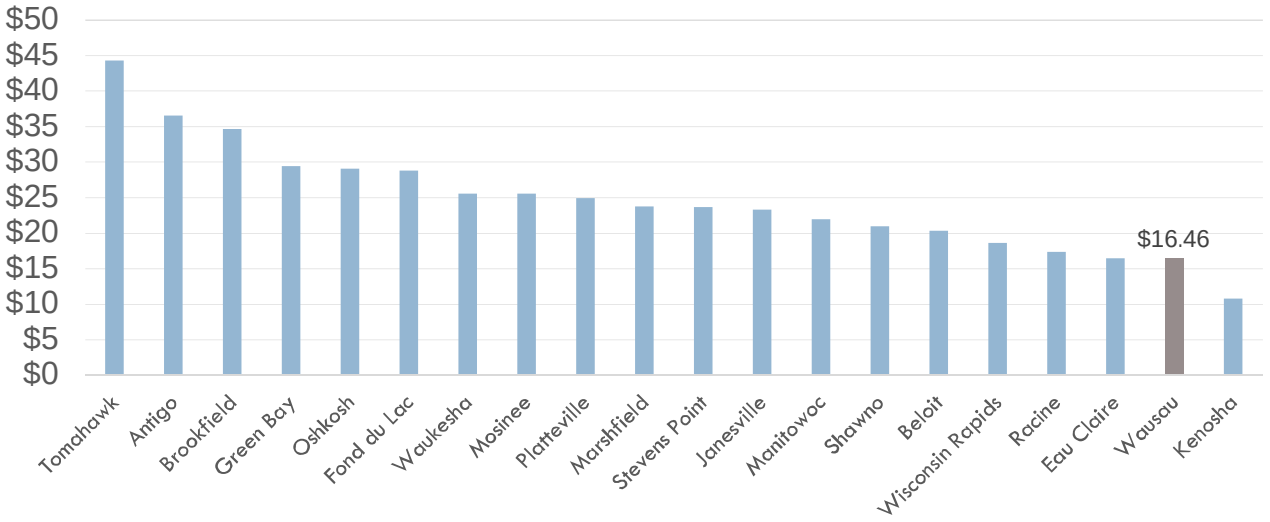
Primary Revenue Sources for Wausau Wastewater Utility



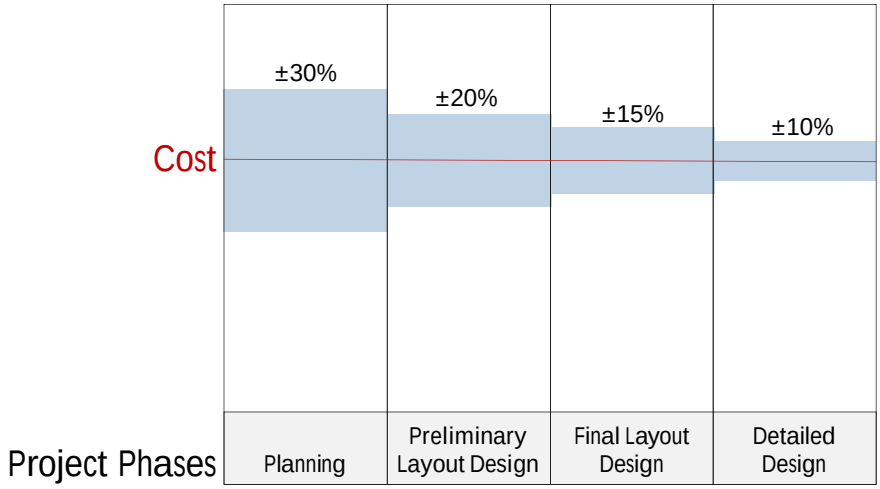
The Structure of a Residential Wastewater Bill



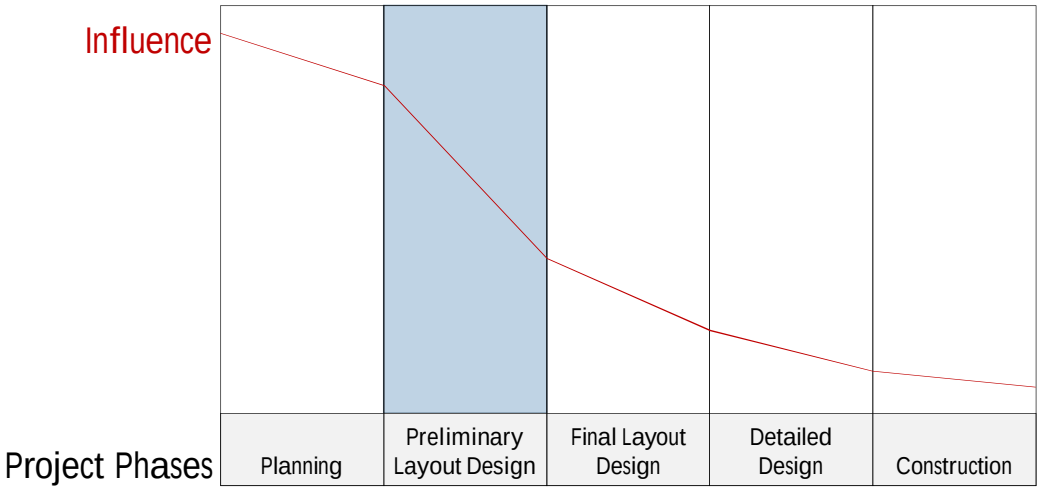
Comparison of Current Monthly Residential Wastewater Bills [37.4 kgpy]



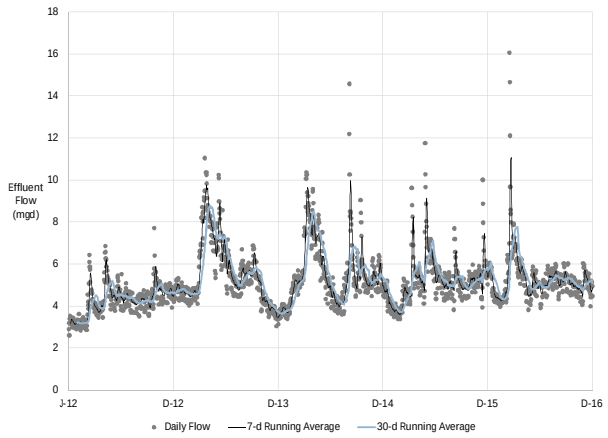
Cost Opinion Accuracy

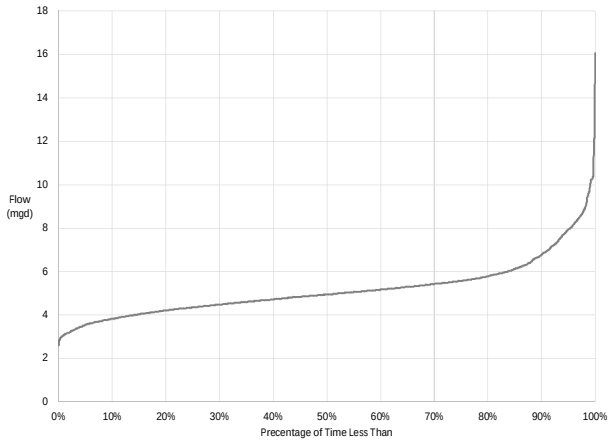


Opportunity to Influence Cost

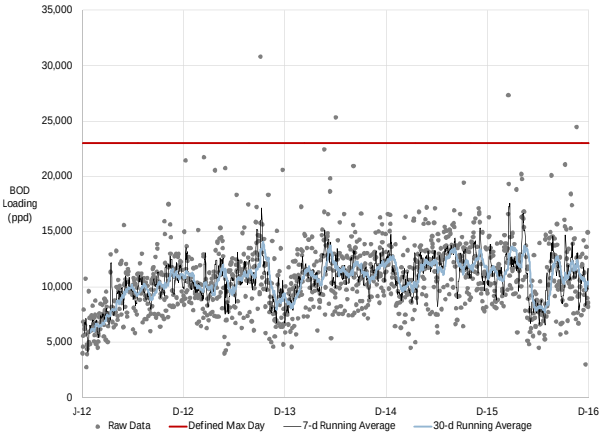


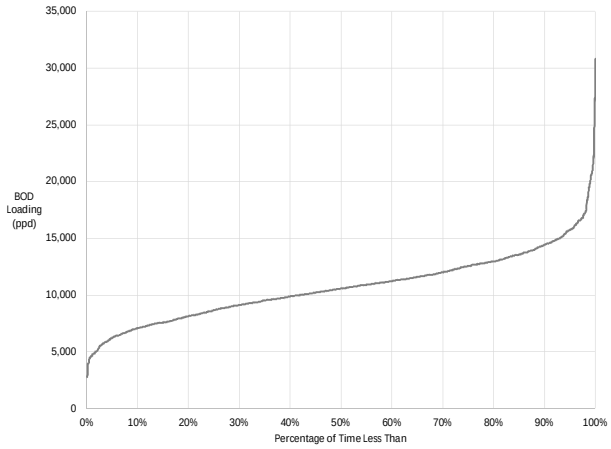
Historical Flows



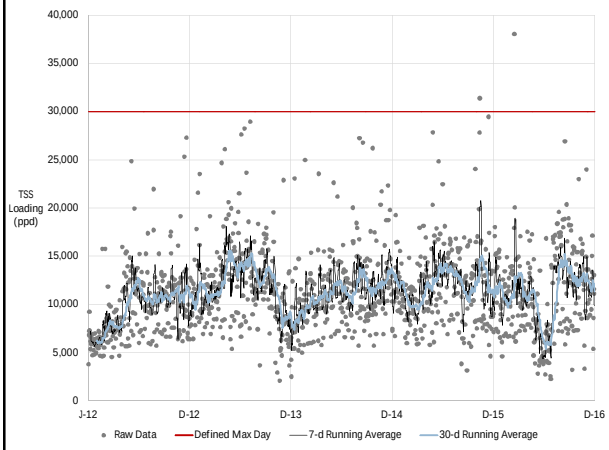


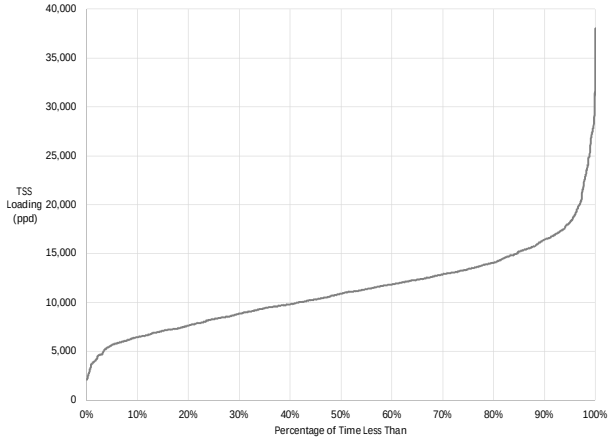
Historical BOD Loadings



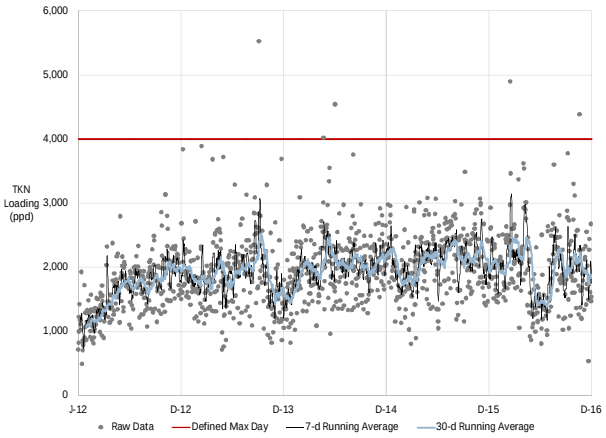


Historical TSS Loading

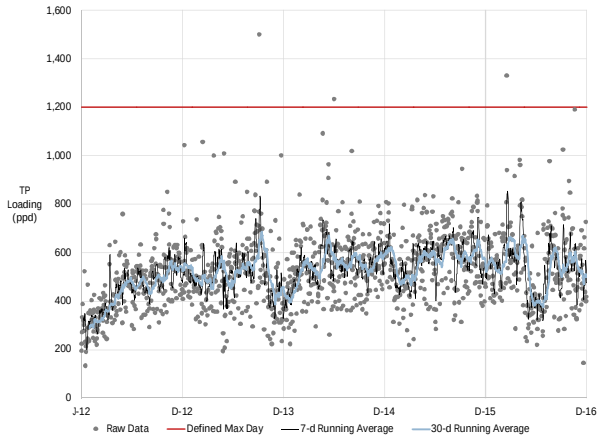




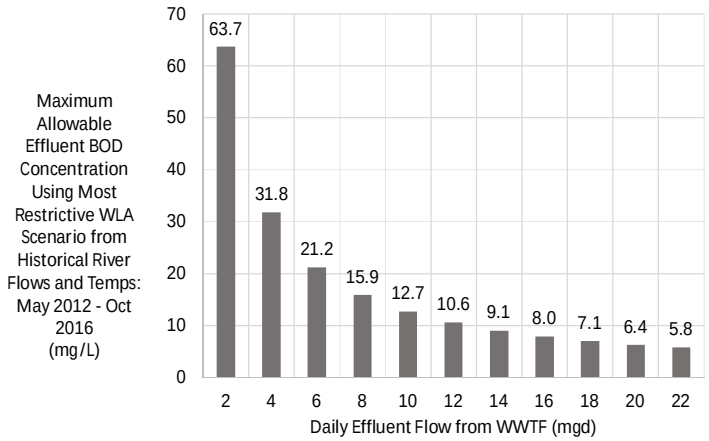
Historical TKN Loading



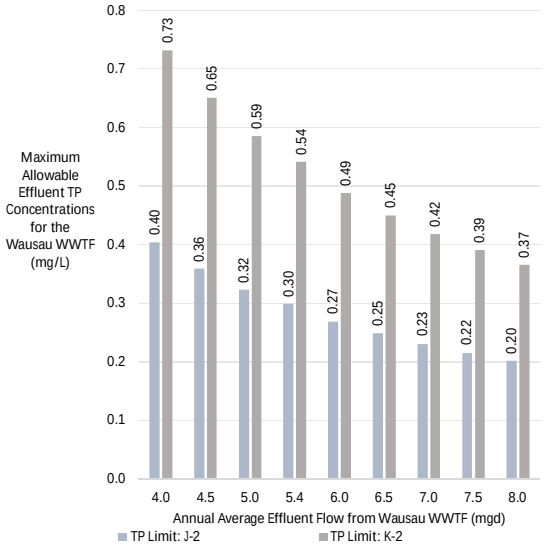
Historical TP Loading



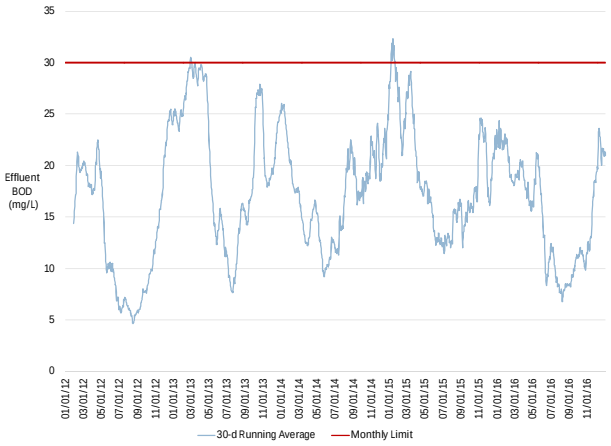
Effluent WLA BOD Limit



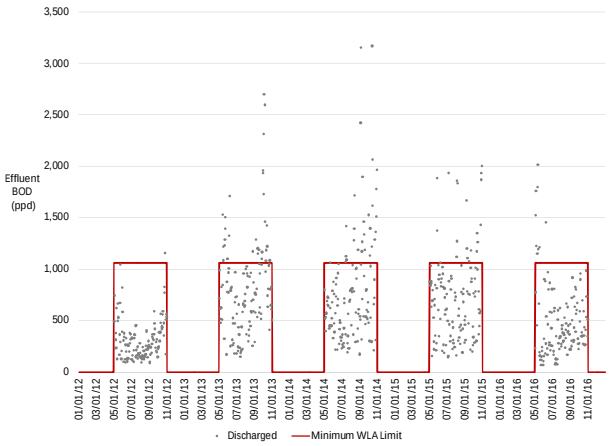
TMDL Phosphorus Limit



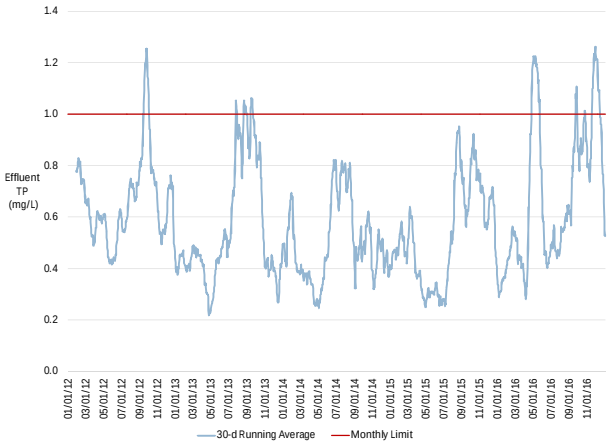
Historical Effluent BOD



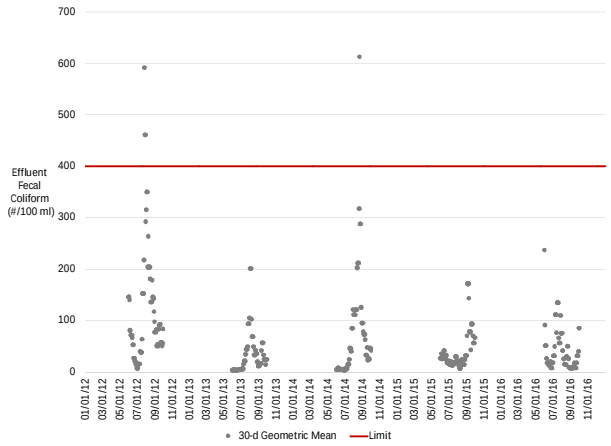
Historical Effluent BOD and Minimum WLA Limit



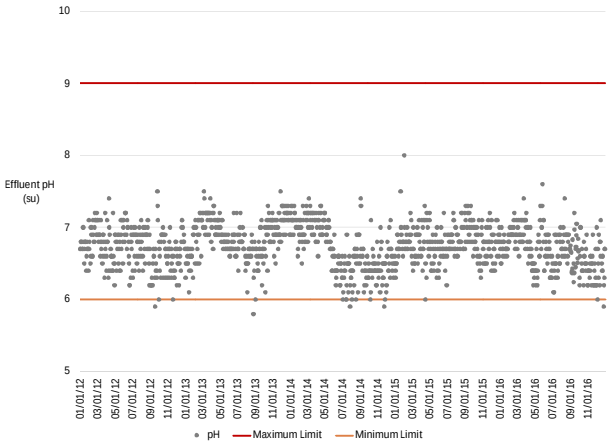
Historical Effluent TP



Historical Effluent Fecal Coliform



Historical Effluent pH



Appendix G

2040 Wastewater Facilities Plan Resolution

CITY OF WAUSAU, 407 Grant Street, Wausau, WI 54403

RESOLUTION OF WAUSAU WATER WORKS – WASTEWATER DIVISION

Approving the Submission of the Wastewater Facilities Plan to the WDNR

Committee Action: Approved 5-0

Fiscal Impact: None

File Number:	19-0206	**Date Introduced:**	February 26, 2019

FISCAL IMPACT SUMMARY				
COSTS	*Budget Neutral*	Yes ☒ No ☐		
	Included in Budget:	Yes ☐ No ☐	*Budget Source:*	
	One-time Costs:	Yes ☐ No ☐	*Amount:*	
	Recurring Costs:	Yes ☐ No ☐	*Amount:*	
SOURCE	*Fee Financed:*	Yes ☐ No ☐	*Amount:*	
	Grant Financed:	Yes ☐ No ☐	*Amount:*	
	Debt Financed:	Yes ☐ No ☐	*Amount*	*Annual Retirement*
	TID Financed:	Yes ☐ No ☐	*Amount:*	
	TID Source: Increment Revenue ☐ *Debt* ☐ *Funds on Hand* ☐ *Interfund Loan* ☐			

RESOLUTION

WHEREAS, Donohue and Associates has completed a facility plan for the Wastewater Treatment Facility; and

WHEREAS, the facility plan explains the major processes, outlines the costs proposed for each process upgrade, provides historical data of influent and effluent, and outlines current conditions at the plant; and

WHEREAS, the facility plan recommends the best course of action to move ahead and outlines the needs for process upgrades, recommends improvements and additions, and provides a schedule for implementation; and

WHEREAS, the WDNR will use the facility plan as the basis for their approval of the proposed upgrade; and

WHEREAS, your Wausau Water Works Commission met on January 8, 2019 to review the Wastewater Facility Plan and recommends submission to the Wisconsin Department of Natural Resources; now therefore

BE IT RESOLVED the Common Council of the City of Wausau does hereby approve the submission of the Wastewater Facilities Plan to the WDNR.

Approved:

Robert B. Mielke

Robert B. Mielke, Mayor