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.

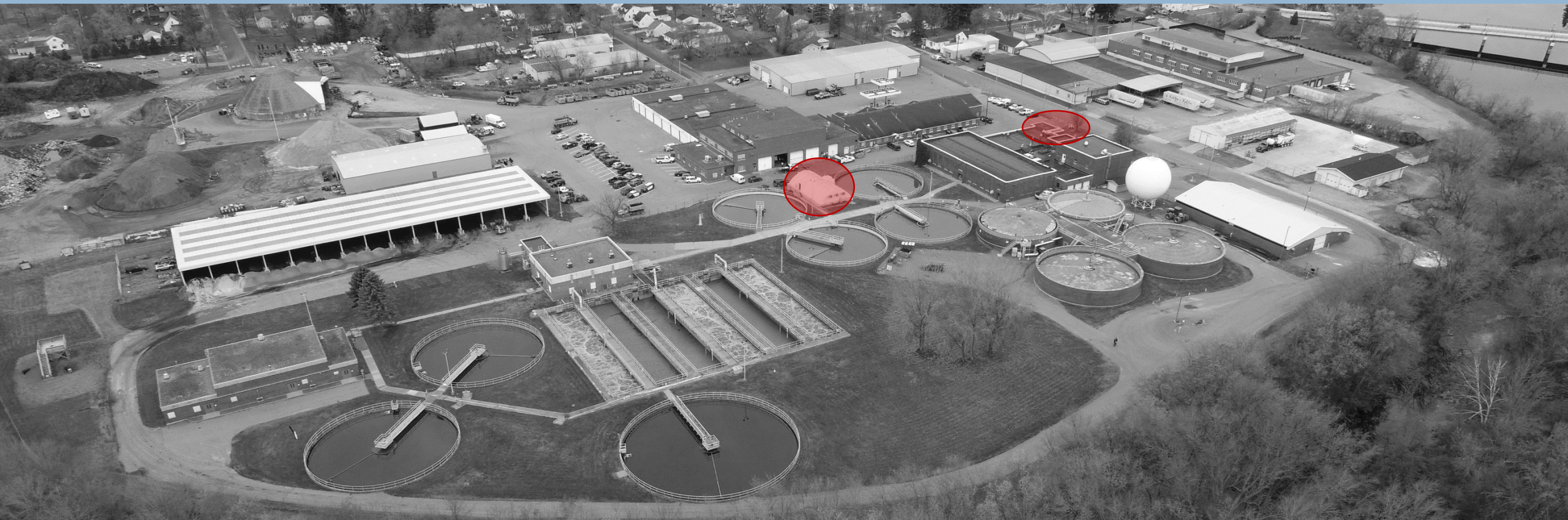
Issues

- 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



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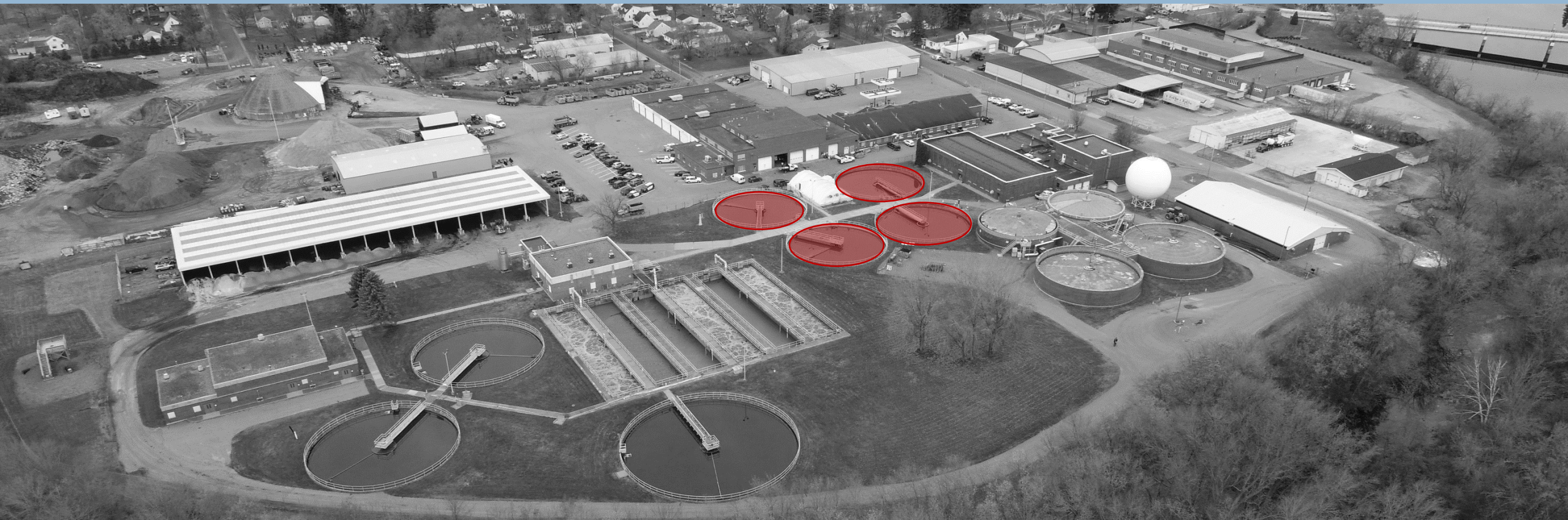
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Primary Settling



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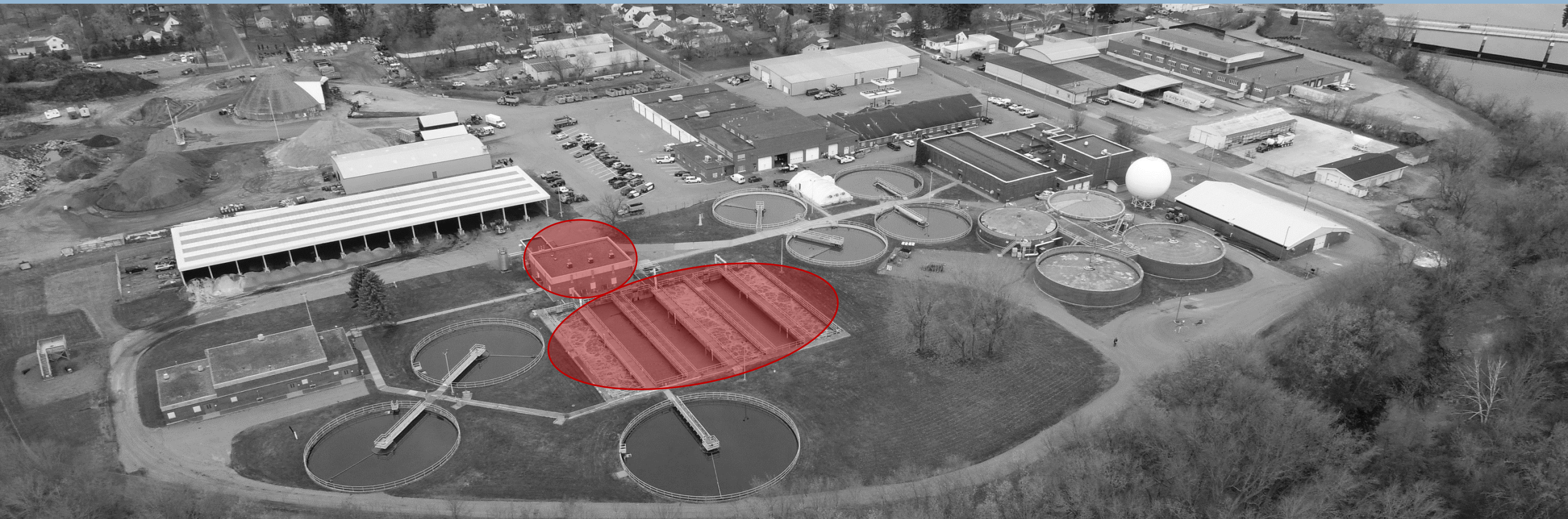
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Activated Sludge System



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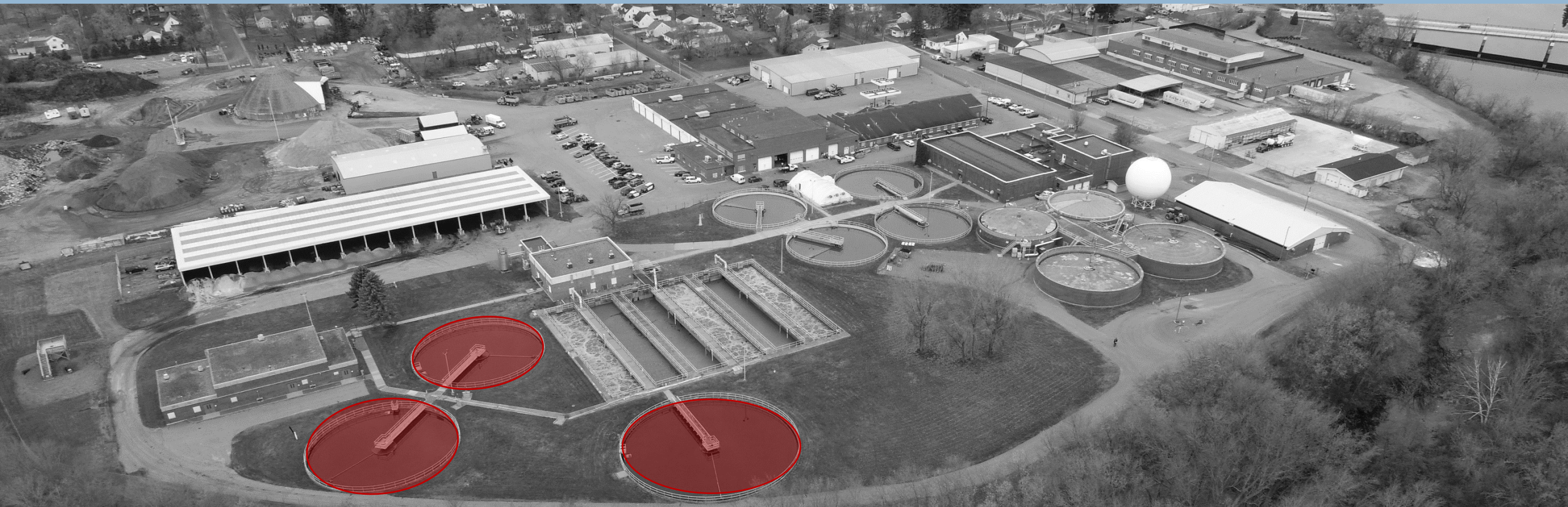
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Secondary Settling



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Disinfection	■	■	
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Phosphorus and Filtration

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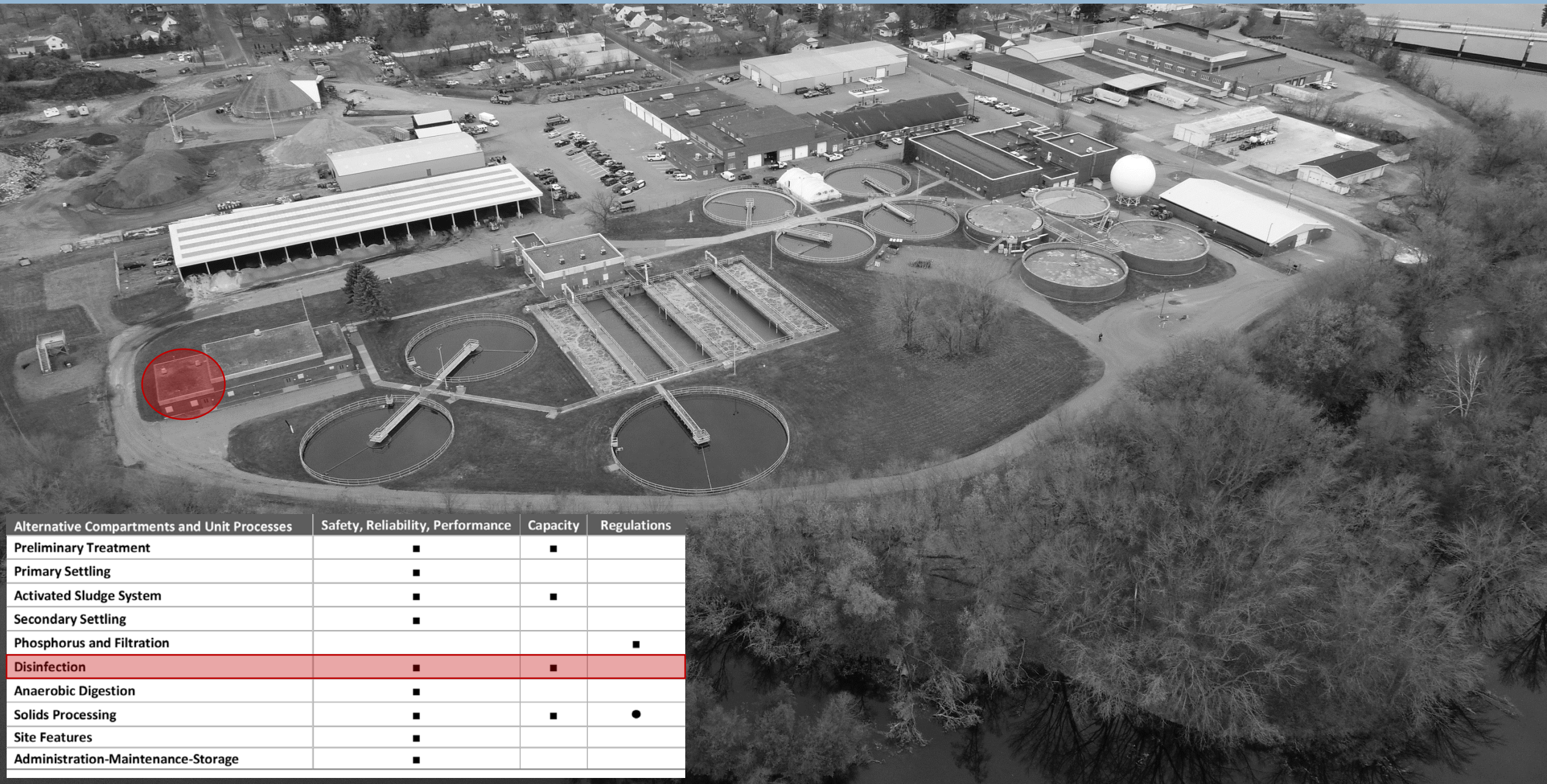
Primary Settling	■		
Activated Sludge System	■	■	
Secondary Settling	■		
Phosphorus and Filtration			■
Disinfection	■	■	
Anaerobic Digestion	■		
Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Disinfection



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Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Anaerobic Digestion

Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
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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
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Solids Processing	■	■	●
Site Features	■		
Administration-Maintenance-Storage	■		

Site Features

Alternative Compartments and Unit Processes	Safety, Reliability, Performance	Capacity	Regulations
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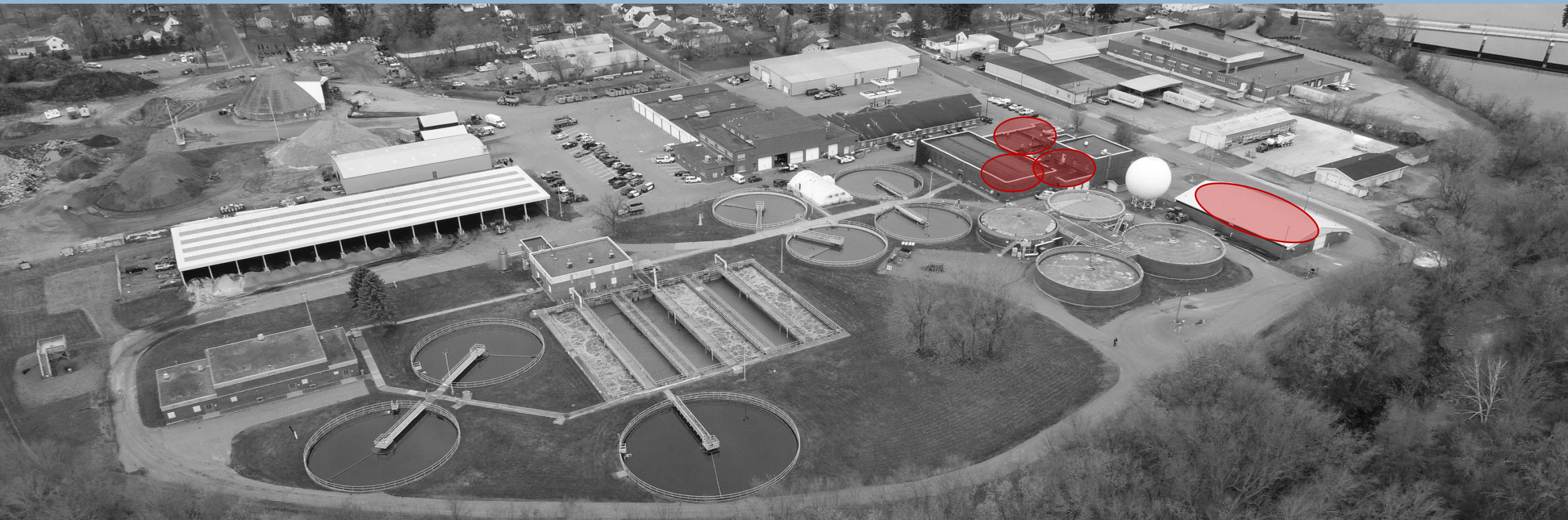
Administration-Maintenance-Storage	■		

Administration-Maintenance-Storage



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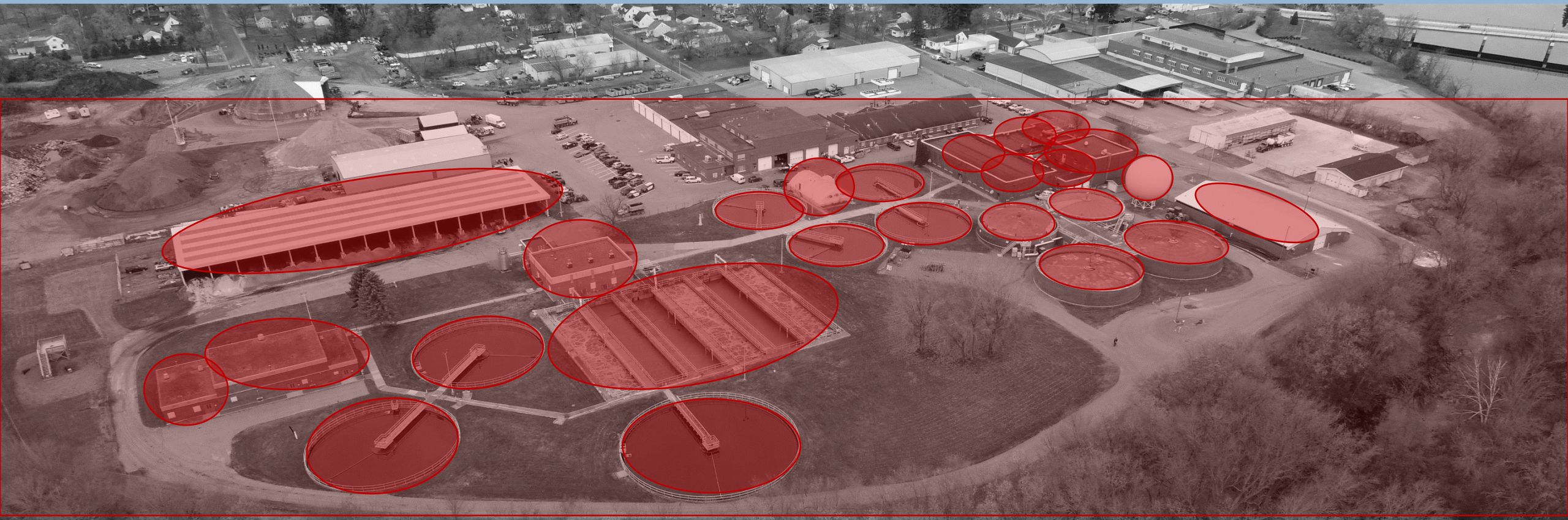
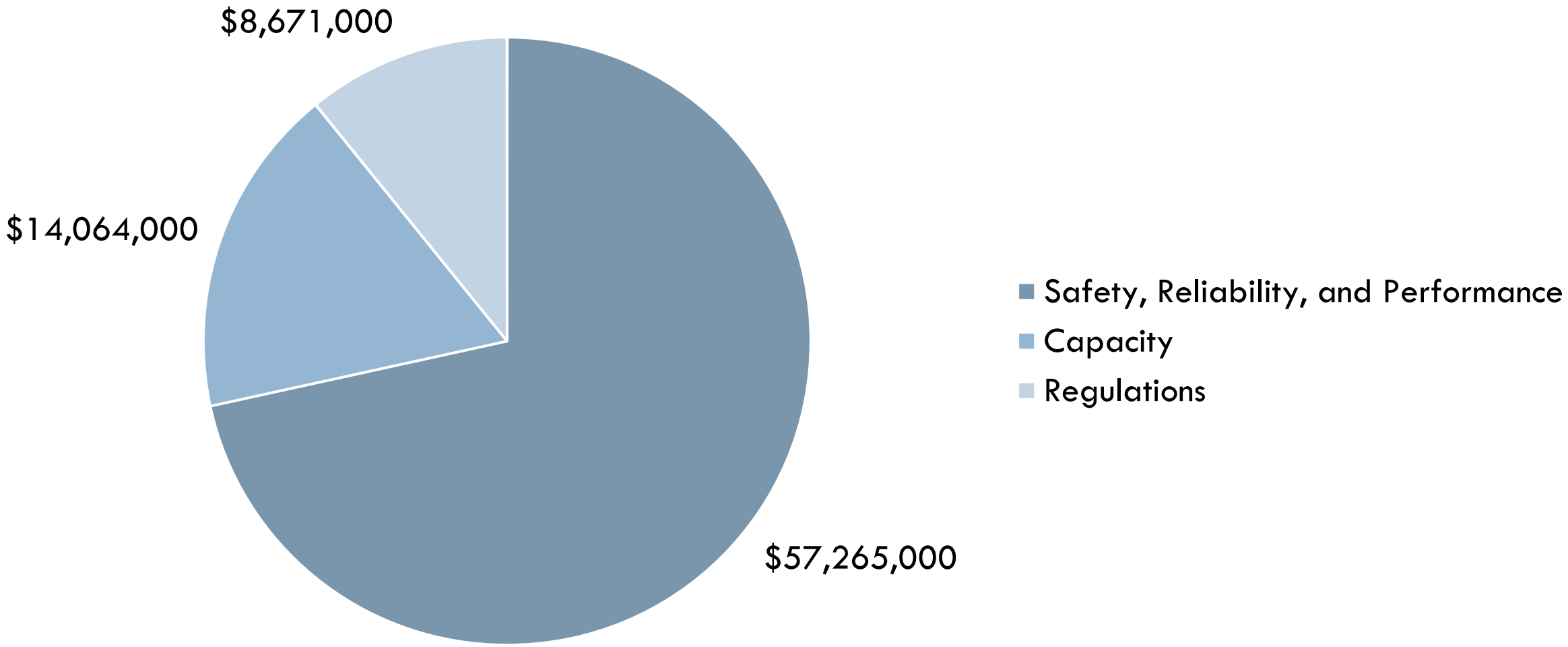
Site Features	■		
Administration-Maintenance-Storage	■		

The Issues are Pervasive



Planning-Level Costs

▶ $80M



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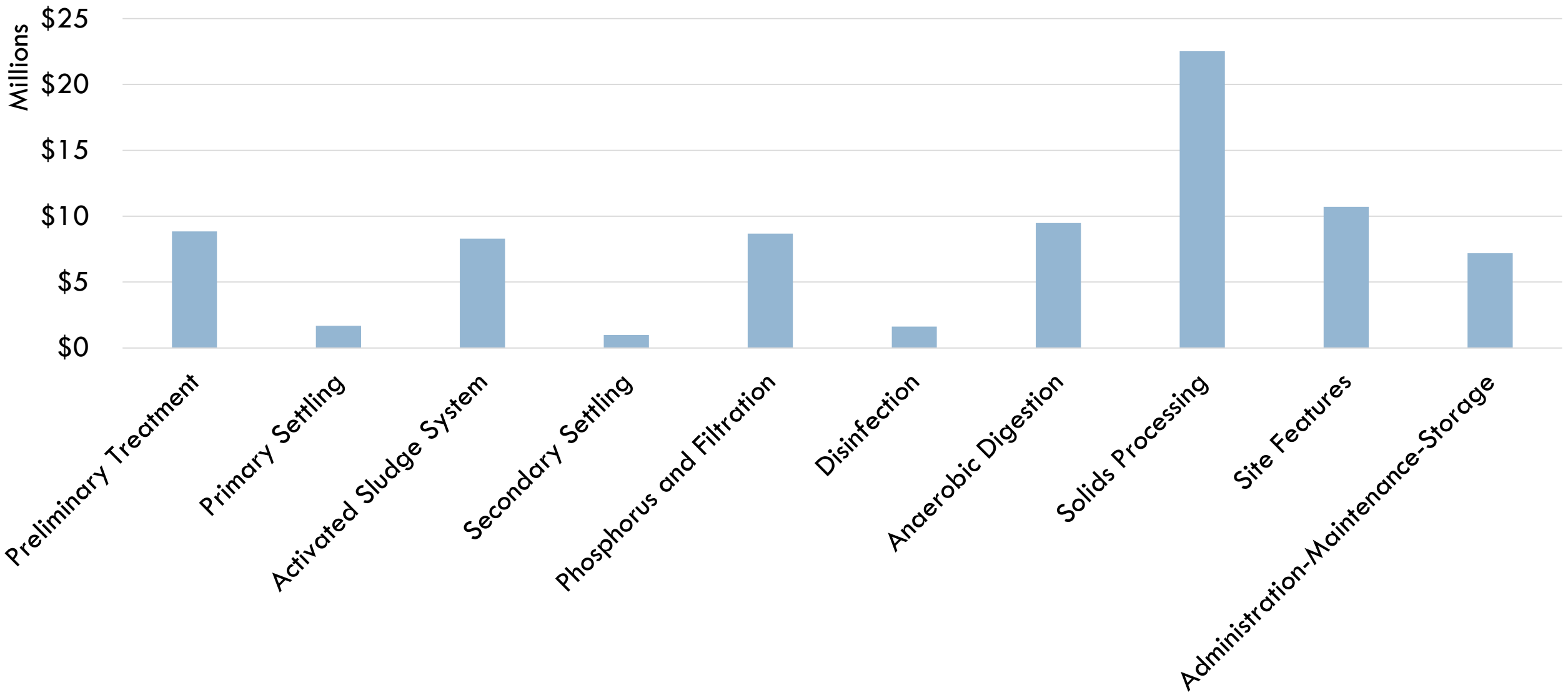
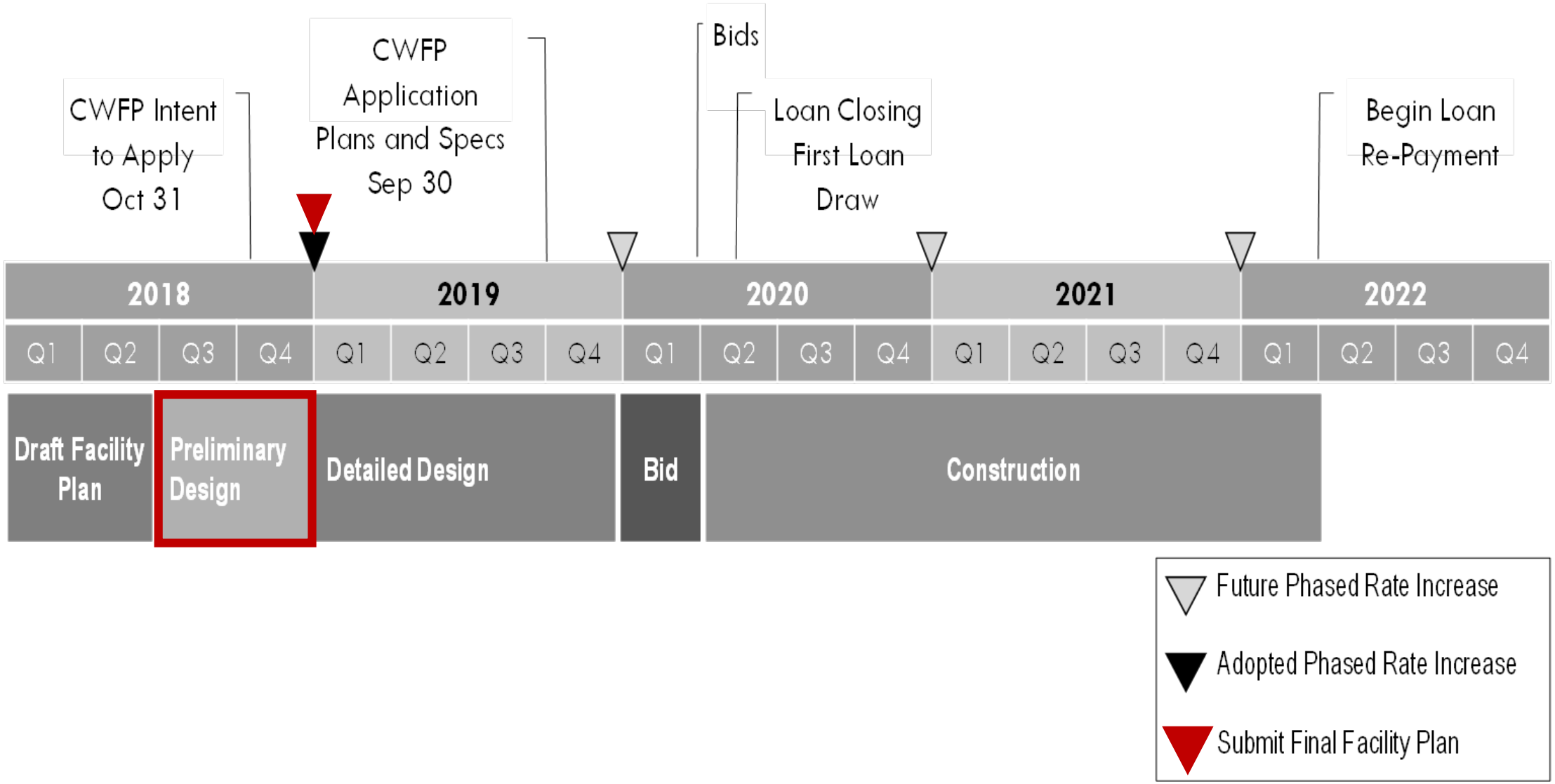


Schedule


CWFP Intent to Apply Oct 31
CWFP Application Plans and Specs Sep 30
Bids
Loan Closing First Loan Draw
Begin Loan Re-Payment
2018
2019
2020
2021
2022
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
Draft Facility Plan
Preliminary Design
Detailed Design
Bid
Construction
Future Phased Rate Increase
Adopted Phased Rate Increase
Submit Final Facility Plan

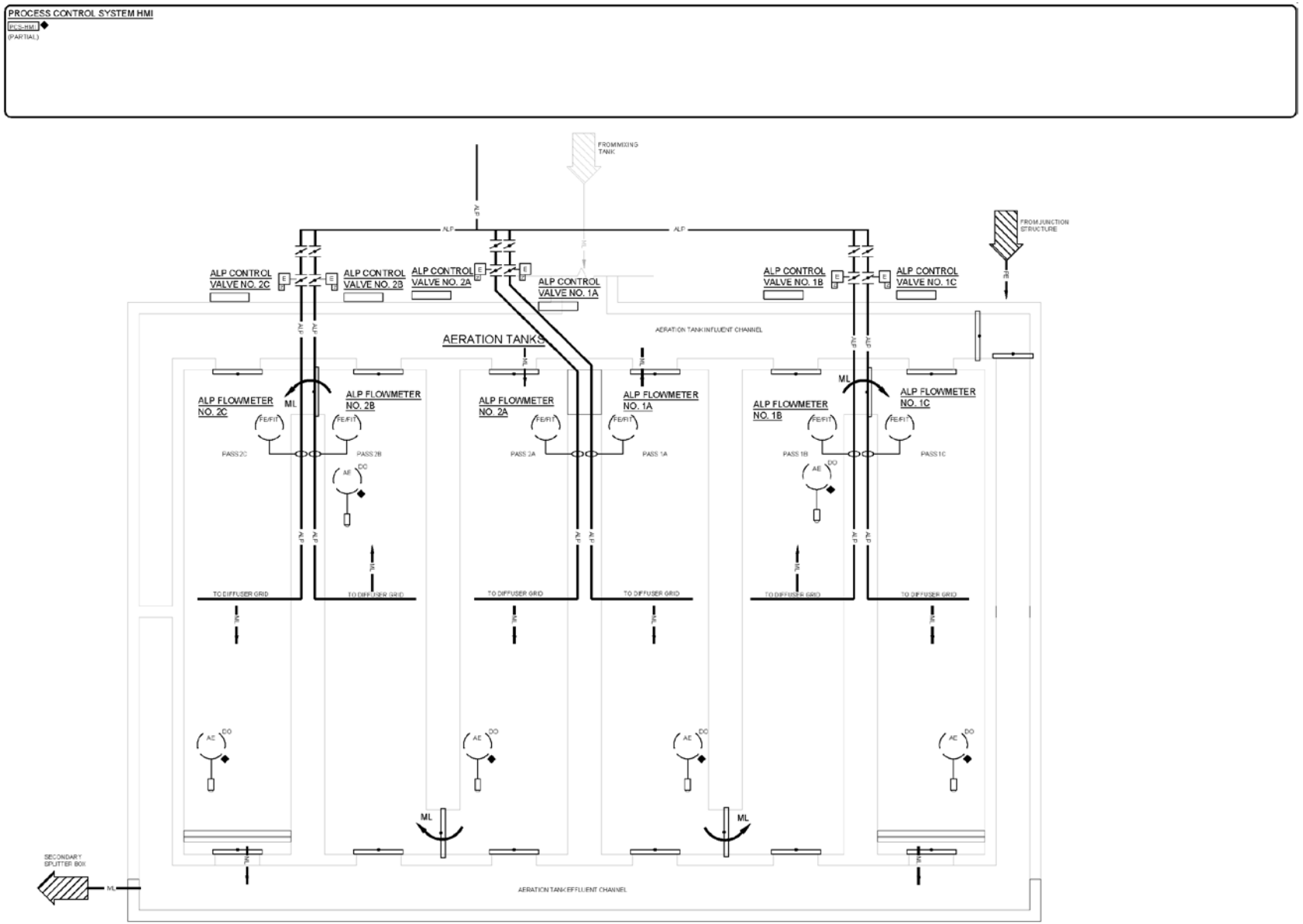
Preliminary Design Drawings

GENERAL			
			COVER
	1	001-G-1	INDEX TO DRAWINGS
	2	001-G-2	CIVIL LEGEND AND GENERAL NOTES
	3	001-G-3	GENERAL LEGEND, SYMBOLS AND ABBREVIATIONS
	4	001-G-4	PLUMBING LEGEND/HVAC LEGEND/ELECTRICAL LEGEND
	5	001-G-5	INSTRUMENTATION AND CONTROL STANDARD LEGEND
	6	001-G-6	INSTRUMENTATION AND CONTROL STANDARD SYMBOLOGY
SITE DEVELOPMENT			
	7	002-C-1	SITE PLAN
PROCESS SUMMARY			
	8	004-M-1	LIQUID TREATMENT FLOW DIAGRAM
	9	004-M-2	SOLIDS TREATMENT FLOW DIAGRAM
	10	004-M-3	HYDRAULIC PROFILE
	11	004-M-4	HYDRAULIC PROFILE
INSTRUMENTATION AND CONTROL			
	12	008-I-1	FIBER NETWORK OVERVIEW
FLOWSHEETS			
	13	009-N-1	INFLUENT SCREENING
	14	009-N-2	SCREENINGS HANDLING
	15	009-N-3	RWW PUMPING
	16	009-N-4	GRIT REMOVAL
	17	009-N-5	GRIT HANDLING
	18	009-N-6	PRIMARY INFLUENT SPLITTING
	19	009-N-7	PRIMARY CLARIFICATION
	20	009-N-8	RAS/WAS PUMPING
	21	009-N-9	RAS/WAS PUMPING
	22	009-N-10	AERATION BLOWERS
	23	009-N-11	JUNCTION STRUCTURE AND ANOXIC SELECTOR TANK
	24	009-N-12	ACTIVATED SLUDGE BASINS
	25	009-N-13	SECONDARY INFLUENT SPLITTING
	26	009-N-14	SECONDARY CLARIFICATION 1&2
	27	009-N-15	SECONDARY CLARIFICATION 3&4
	28	009-N-16	SECONDARY SCUM HANDLING
	29	009-N-17	SECONDARY EFFLUENT PUMPING
	30	009-N-18	FILTRATION
	31	009-N-19	FILTRATION CLEANING
	32	009-N-20	FILTRATION CHEMICAL FEED
	33	009-N-21	FILTRATION POLYMER FEED
	34	009-N-22	UV DISINFECTION
	35	009-N-23	W3 EFFLUENT PUMPING
	36	009-N-25	DIGESTER HEATING-RECIRC AND SLUDGE TRANSFER
	37	009-N-27	DIGESTER FEED-OVERFLOW MIXING
	38	009-N-28	DIGESTER GAS COLLECTION AND WASTE GAS BURNER
	39	009-N-29	DIGESTER GAS COMPRESSION-STORAGE DISTRIBUTION
	40	009-N-30	DIGESTER GAS AND NATURAL GAS BOILERS
	41	009-N-31	HOT WATER DISTRIBUTION
	42	009-N-33	PRIMARY SCUM PUMPING
	43	009-N-34	PRIMARY SLUDGE PUMPING
	44	009-N-35	PRIMARY SLUDGE SCREENING
	45	009-N-36	PSD THICKENING & PUMPING
	46	009-N-37	WAS THICKENING
	47	009-N-38	TWAS PUMPING
	48	009-N-39	GBT POLYMER FEED
	49	009-N-40	SLUDGE DEWATERING
	50	009-N-41	BFP POLYMER FEED
	51	009-N-42	SLUDGE CAKE PUMPING
	52	009-N-43	DRYER DOSING PUMPS
	53	009-N-44	DRYER DEPOSITOR
	54	009-N-45	SLUDGE DRYING
	55	009-N-46	DRYING AIR TREATMENT
	56	009-N-47	DRIED BIOSOLIDS STORAGE AND HANDLING
	57	009-N-48	THERMAL FLUID SYSTEM
	58	009-N-49	RECYCLE PUMPING
	59	009-N-50	COMPRESSED AIR SYSTEM
	60	009-N-51	FERRIC FEED SYSTEM

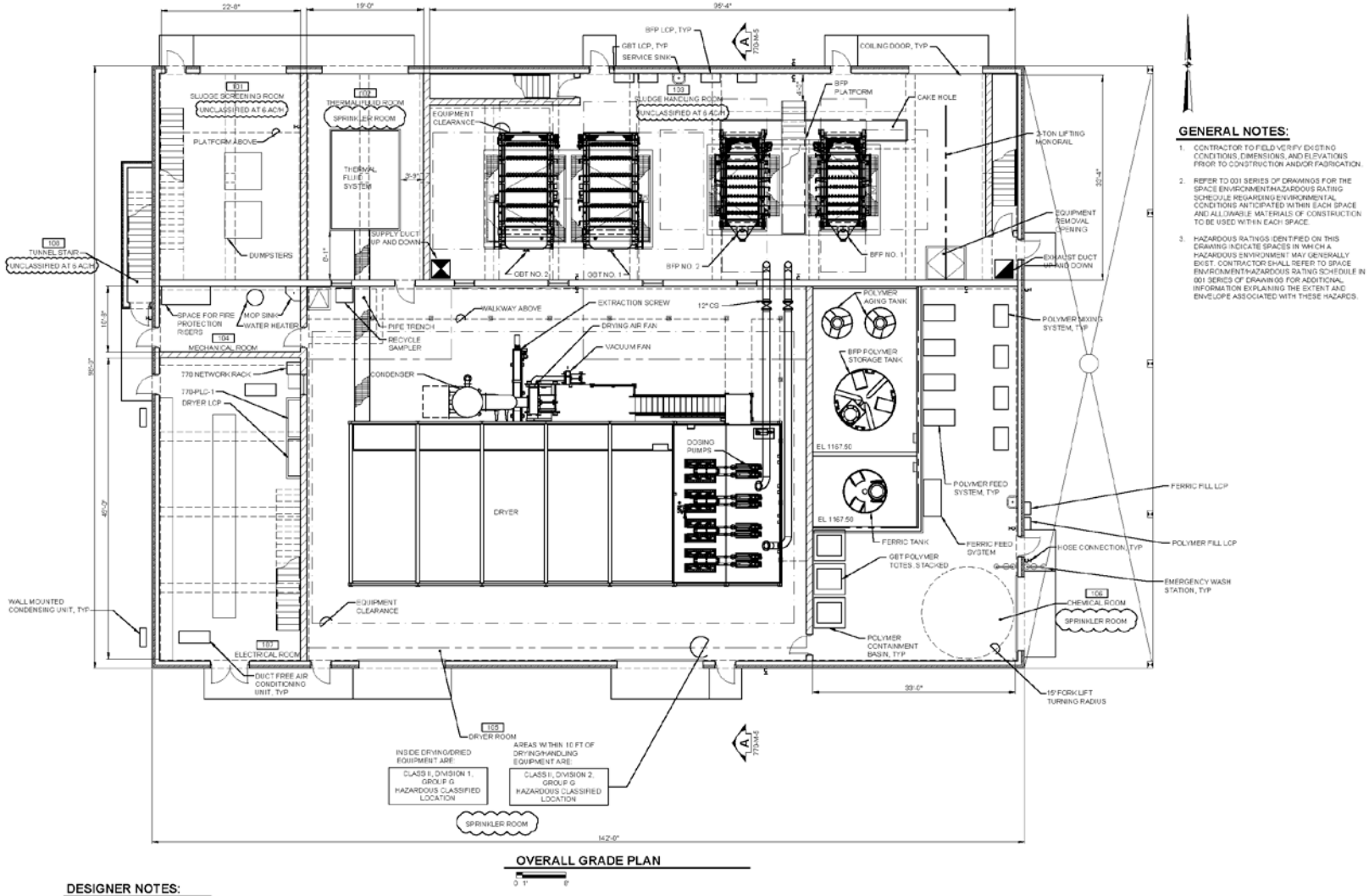
MAIN BUILDING			
	61	100-R-1	REMOVAL PLAN
	62	100-R-2	REMOVAL PLAN
	63	100-R-3	REMOVAL PLAN
	64	100-R-4	REMOVAL PLAN
	65	100-R-12	REMOVAL PLAN
	66	100-R-13	REMOVAL PLAN
	67	100-R-14	REMOVAL PLAN
	68	100-R-15	REMOVAL PLAN
	69	100-R-18	REMOVAL PLAN
	70	100-R-19	REMOVAL PLAN
	71	100-R-20	REMOVAL PLAN
	72	100-R-22	REMOVAL PLAN
	73	100-R-28	REMOVAL SECTION
	74	100-M-1	PLAN
	75	100-M-2	PLAN
	76	100-M-3	PLAN
	77	100-M-4	PLAN
	78	100-M-10	PLAN
	79	100-M-11	PLAN
	80	100-M-12	PLAN
	81	100-M-13	PLAN
	82	100-M-18	PLAN
	83	100-M-19	PLAN
	84	100-M-28	SECTION
	85	100-M-29	SECTION
ADMINISTRATIVE BUILDING			
	86	120-A-1	PLAN
GRIT BUILDING			
	87	200-R-1	REMOVAL PLAN
	88	200-R-2	REMOVAL PLAN
	89	200-M-1	PLAN
	90	200-M-2	PLAN
	91	200-M-3	PLAN
	92	200-M-4	SECTION
	93	200-M-5	SECTION
PRIMARY CLARIFIERS 1-4			
	94	310-R-1	REMOVAL PLAN
	95	310-M-1	PLAN
	96	310-M-2	PLAN
	97	310-M-3	PLAN
	98	310-M-4	SECTION
	99	310-M-5	SECTION
ACTIVATED SLUDGE BUILDING			
	100	400-R-1	REMOVAL PLAN
	101	400-R-2	REMOVAL PLAN
	102	400-M-1	PLAN
	103	400-M-2	PLAN
	104	400-M-3	SECTION
JUNCTION STRUCTURE			
	105	404-M-1	PLAN
	106	404-M-2	SECTION
ANOXIC SELECTOR TANK			
	107	405-M-1	PLAN
	108	405-M-2	PLAN
	109	405-M-3	SECTION
MIXING TANK			
	110	406-R-1	REMOVAL PLAN
	111	406-M-1	PLAN
	112	406-M-2	SECTION
ACTIVATED SLUDGE BASINS			
	113	410-R-1	REMOVAL PLAN
	114	410-M-1	PLAN
	115	410-M-2	PLAN
	116	410-M-3	SECTION
SECONDARY SPLITTER			
	117	500-M-1	PLANS AND SECTION

SECONDARY CLARIFIER 1-2			
	118	510-R-1	REMOVAL PLAN
	119	510-M-1	PLAN
SECONDARY SCUM MANHOLE 1			
	120	515-M-1	PLAN AND SECTION
SECONDARY CLARIFIER 3			
	121	530-R-1	REMOVAL PLAN
	122	530-M-1	PLAN
SECONDARY SCUM MANHOLE 2			
	123	535-M-1	PLAN AND SECTION
SECONDARY CLARIFIER 4			
	124	540-M-1	PLAN
	125	540-M-2	PLAN
	126	540-M-3	SECTION
EFFLUENT BUILDING			
	127	600-R-1	REMOVAL PLAN
	128	600-R-2	REMOVAL PLAN
	129	600-R-3	REMOVAL PLAN
	130	600-M-1	PLAN
	131	600-M-2	PLAN
	132	600-M-3	PLAN
	133	600-M-4	SECTIONS
P-CHEM STORAGE BUILDING			
	134	610-M-1	PLAN
	135	610-M-2	PLAN
	136	610-M-3	SECTIONS
DIGESTION BUILDING			
	137	700-R-1	REMOVAL PLAN
	138	700-R-2	REMOVAL PLAN
	139	700-R-3	REMOVAL PLAN
	140	700-R-4	REMOVAL PLAN
	141	700-R-5	REMOVAL PLAN
	142	700-R-6	REMOVAL PLAN
	143	700-R-7	REMOVAL PLAN
	144	700-M-1	PLAN
	145	700-M-2	PLAN
	146	700-M-3	PLAN
	147	700-M-4	PLAN
	148	700-M-5	PLAN
	149	700-M-6	PLAN
	150	700-M-7	PLAN
	151	700-M-8	PLAN
	152	700-M-9	PLAN
	153	700-M-10	SECTION
	154	700-M-11	SECTION
SOLIDS BUILDING			
	155	770-M-1	PLAN
	156	770-M-2	PLAN
	157	770-M-3	PLAN
	158	770-M-4	PLAN
	159	770-M-5	SECTION
SILO			
	160	771-M-1	PLAN AND SECTION
PSD THICKENER			
	161	775-M-1	PLANS AND SECTION
TUNNELS			
	162	900-R-1	REMOVAL PLANS
	163	900-M-1	PLANS
TUNNEL SYSTEM NO. 2			
	164	910-M-1	PLAN

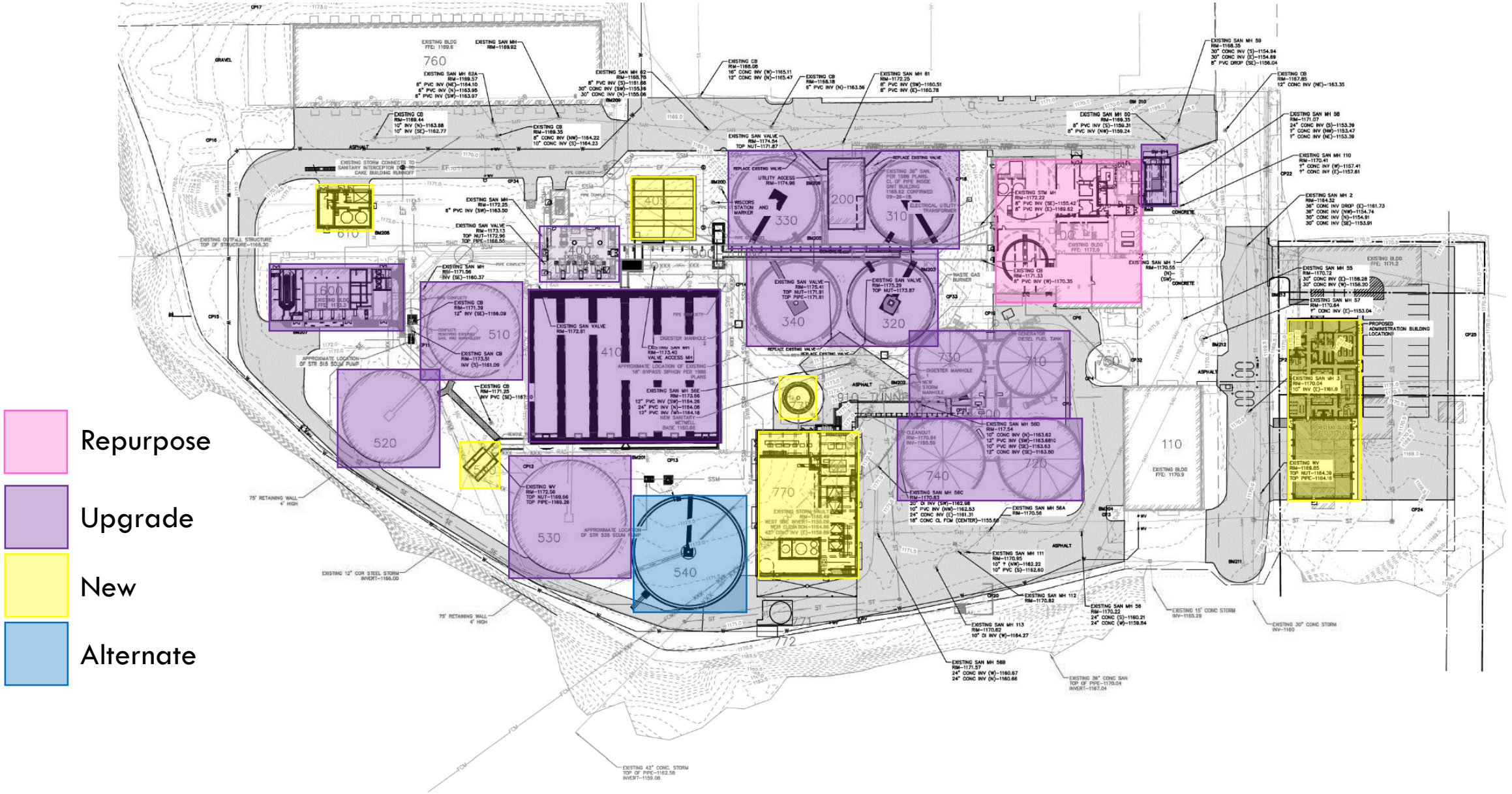
Process Design and Flowsheet Drawings



Preliminary Design Drawings



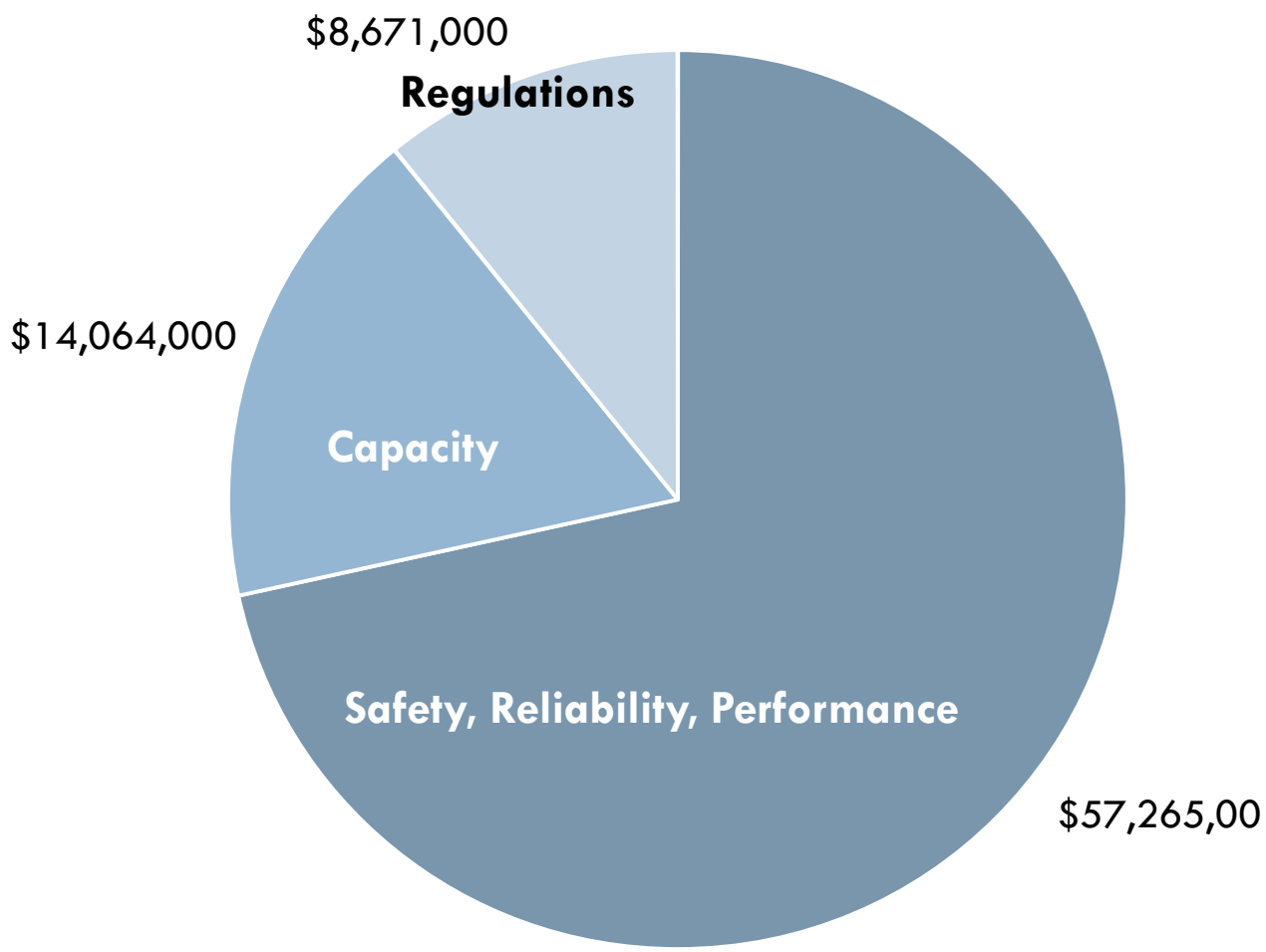
Preliminary Design Site Plan

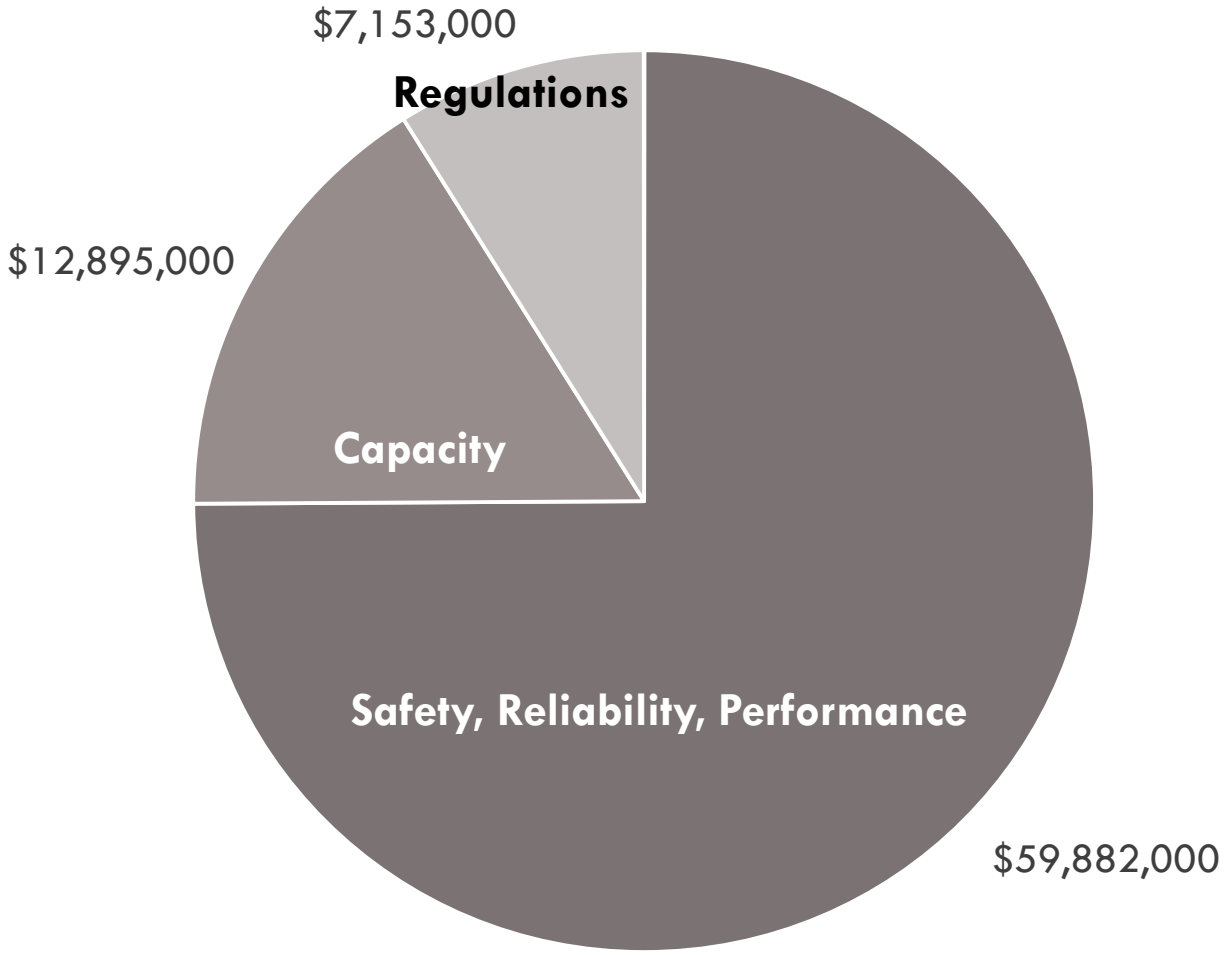


Preliminary Design Site Plan | New Structures

Planning-Level and Preliminary Design Costs

▶ $80M





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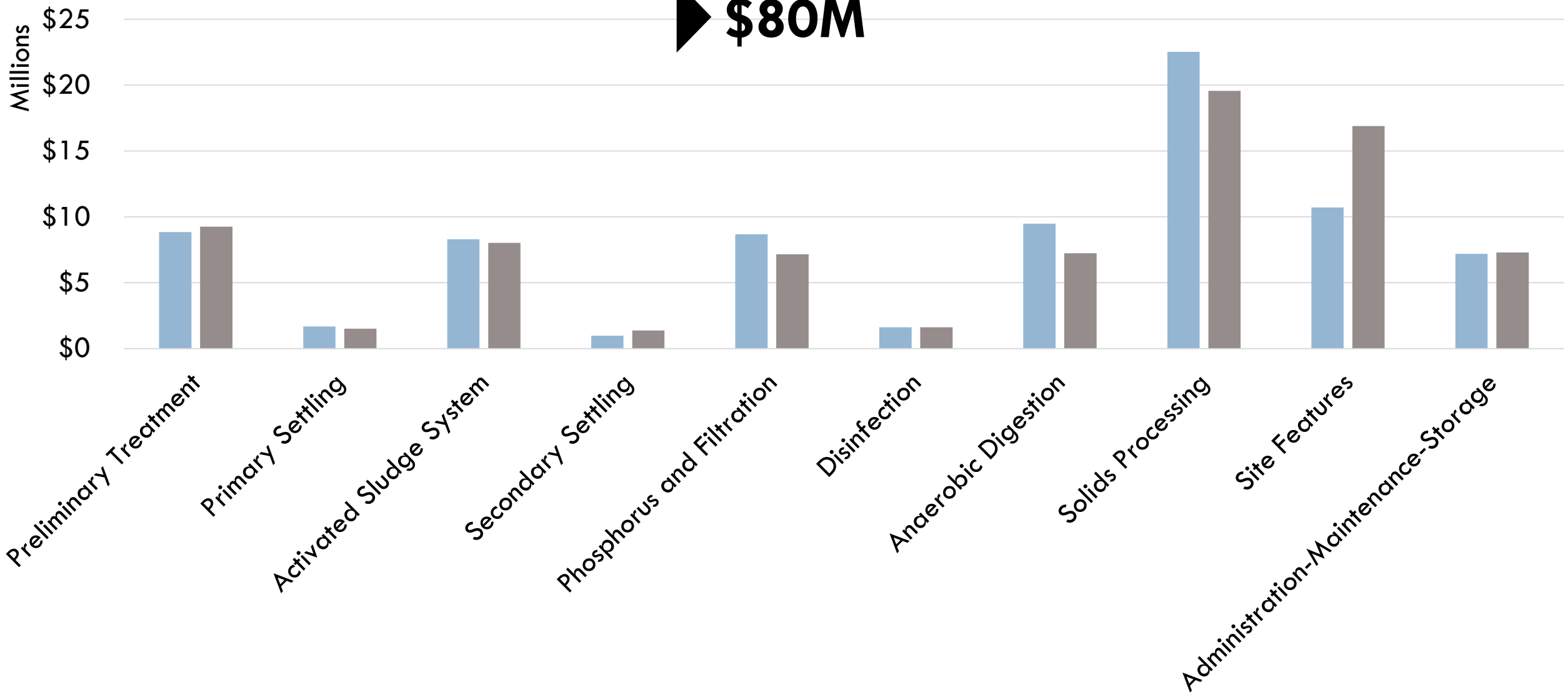
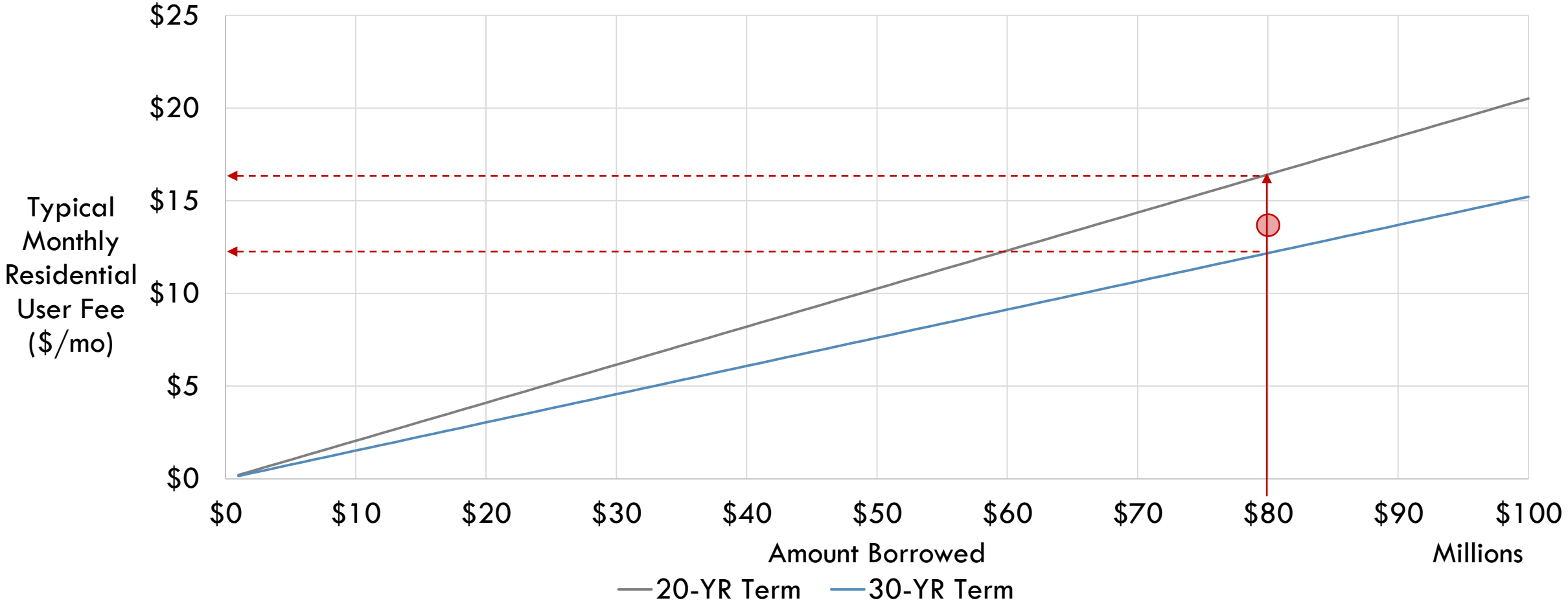
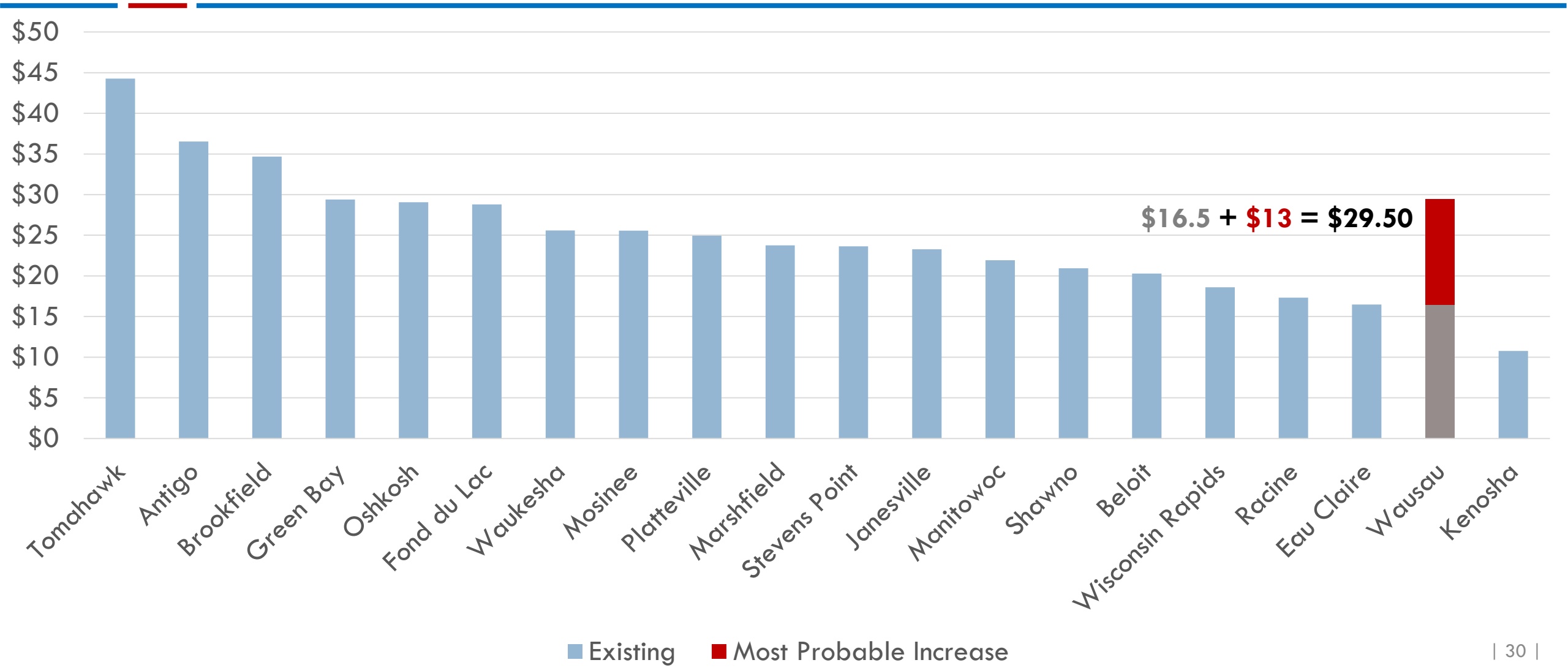


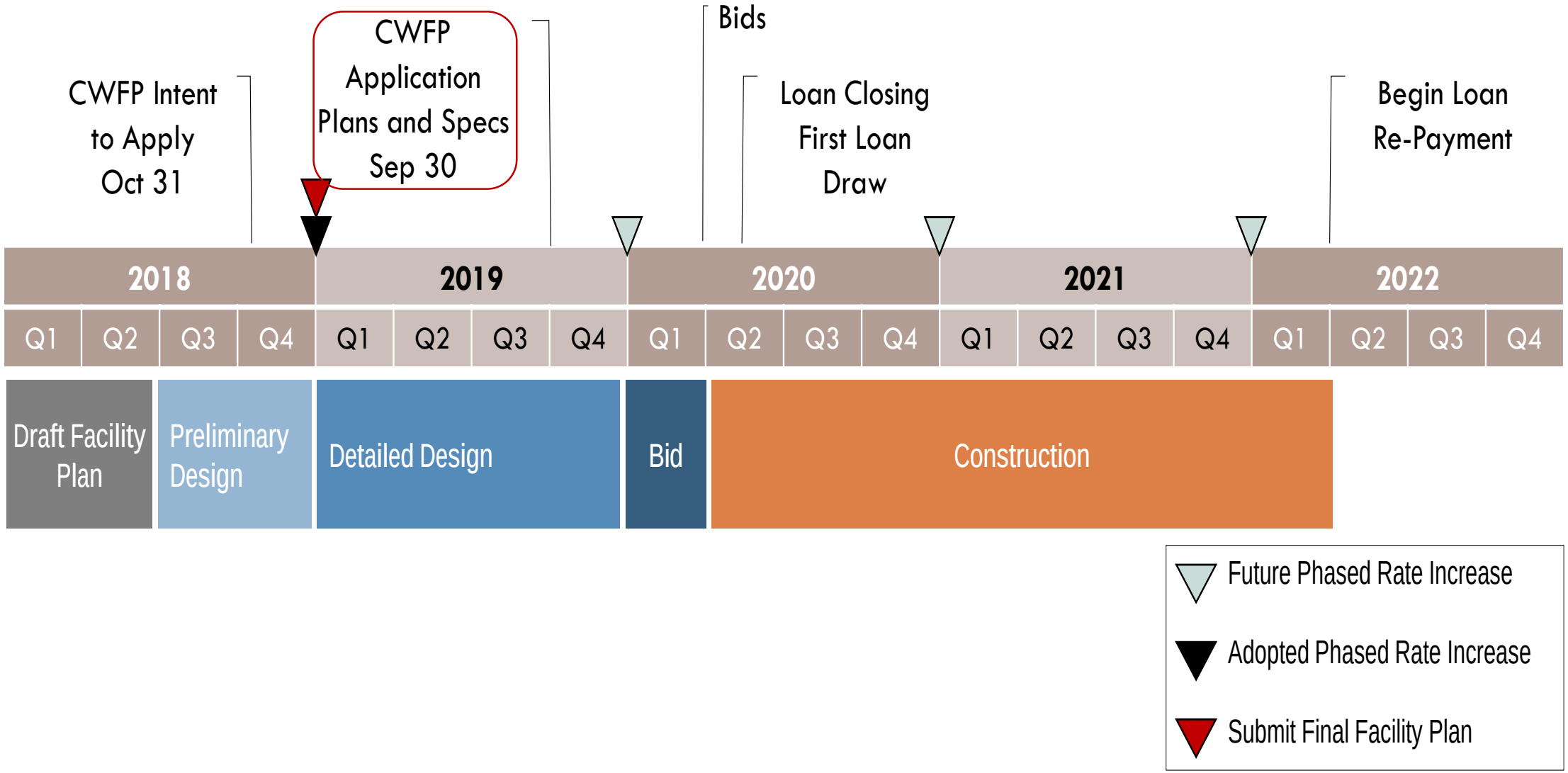
Typical Monthly Residential User Rates



Comparison of Future Monthly Residential Wastewater Bills [37 kgpy]



Project Schedule



Action Items

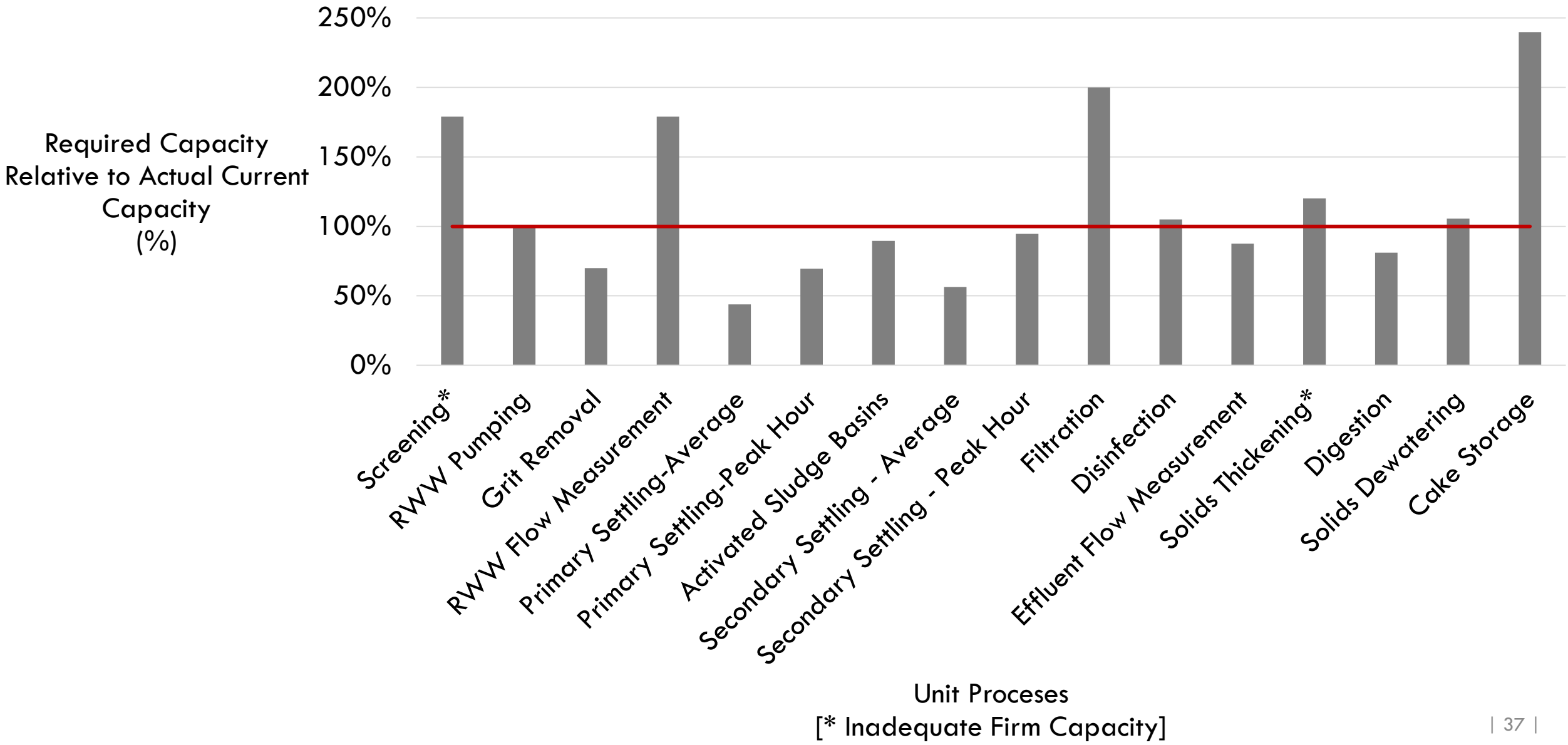
- City Approve Facility Plan in January 2018
- Submit Facility Plan to WDNR in January 2019
- Proceed with Final Design in January/February 2019
- Submit Reviewable Plans and Specifications to WDNR by Sep 30, 2019

Questions and Discussion

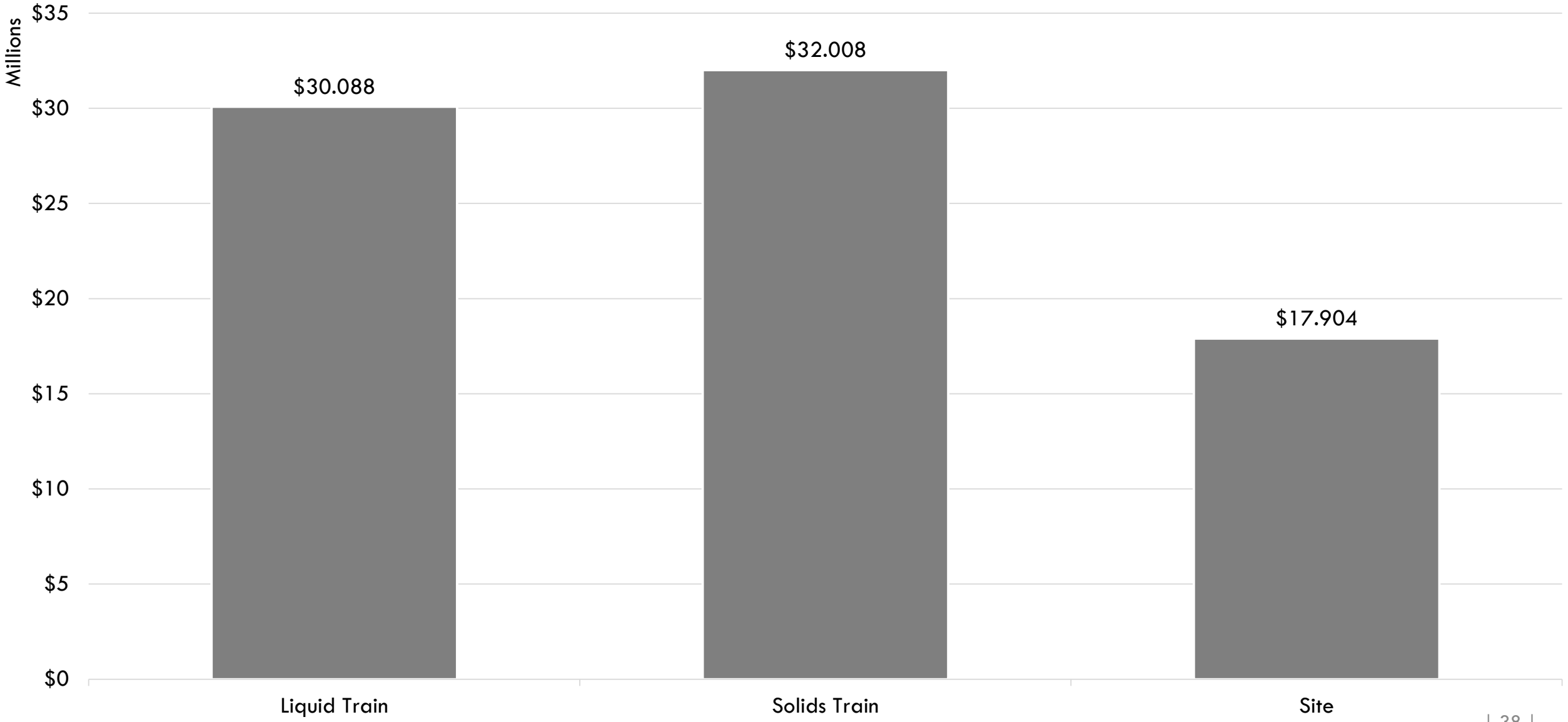
Thank You

Backup Materials

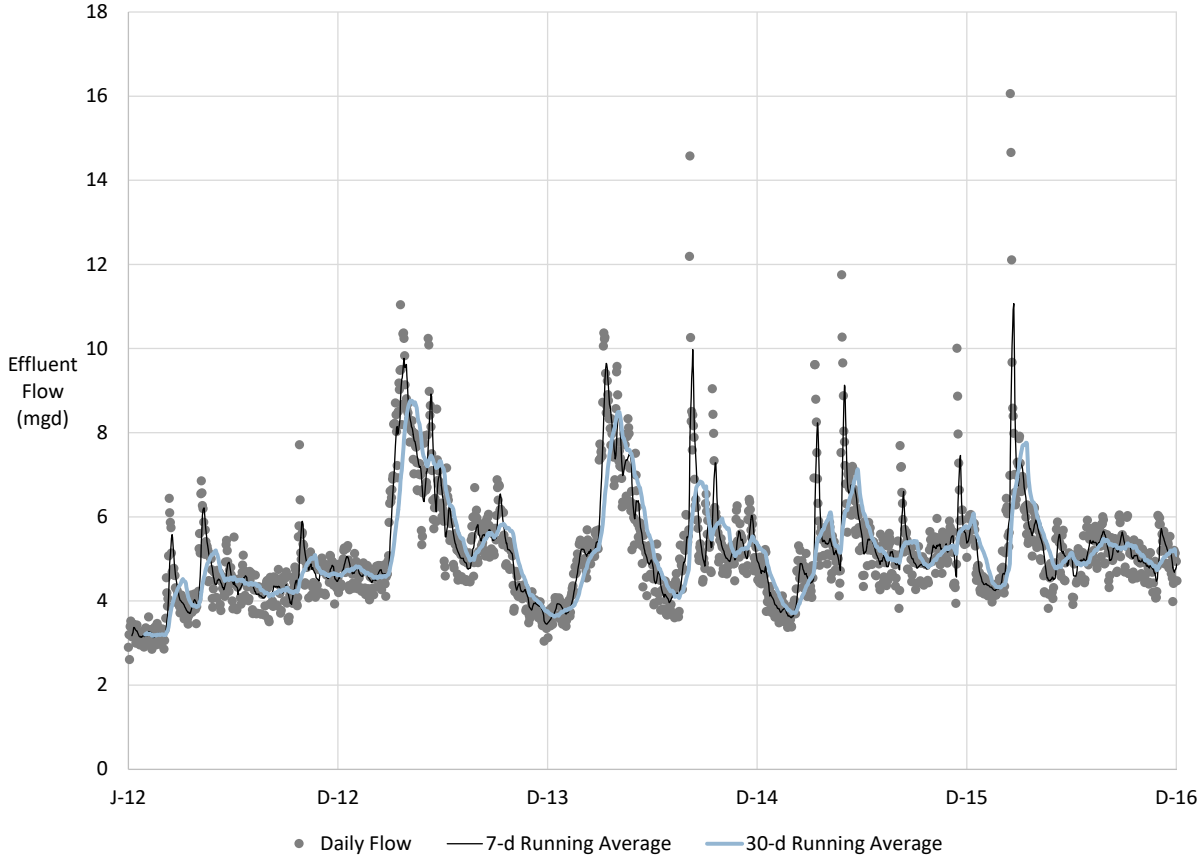
Simple Unit Process Capacity Analysis

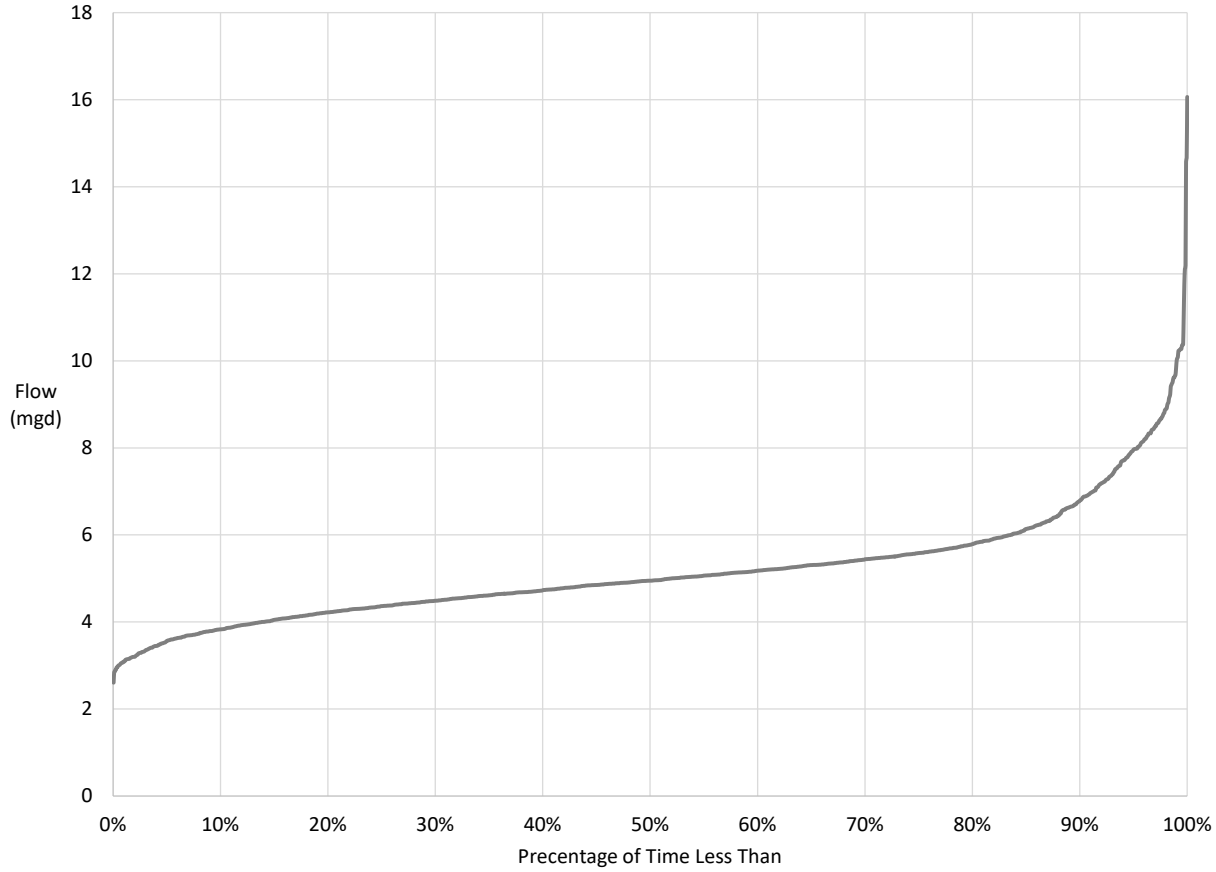


Costs by High-Level WWTF Function

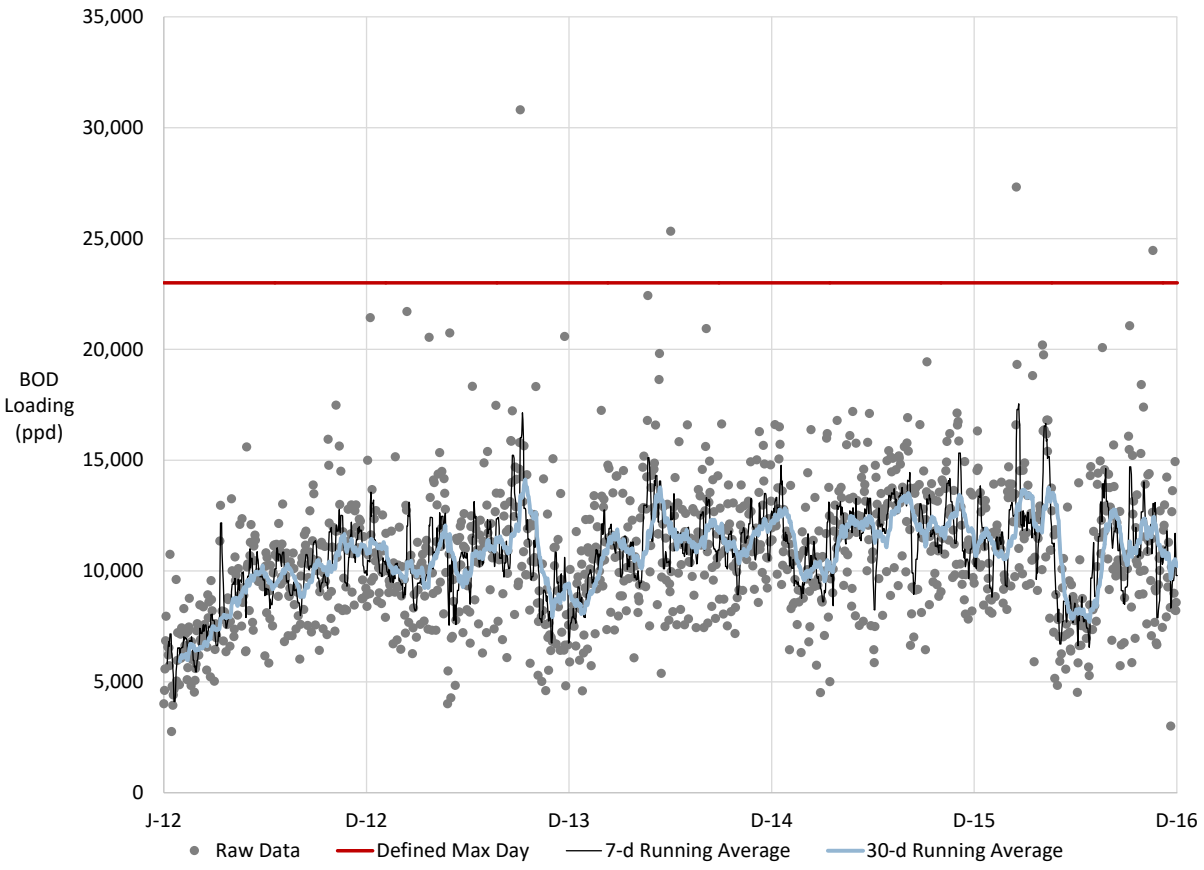


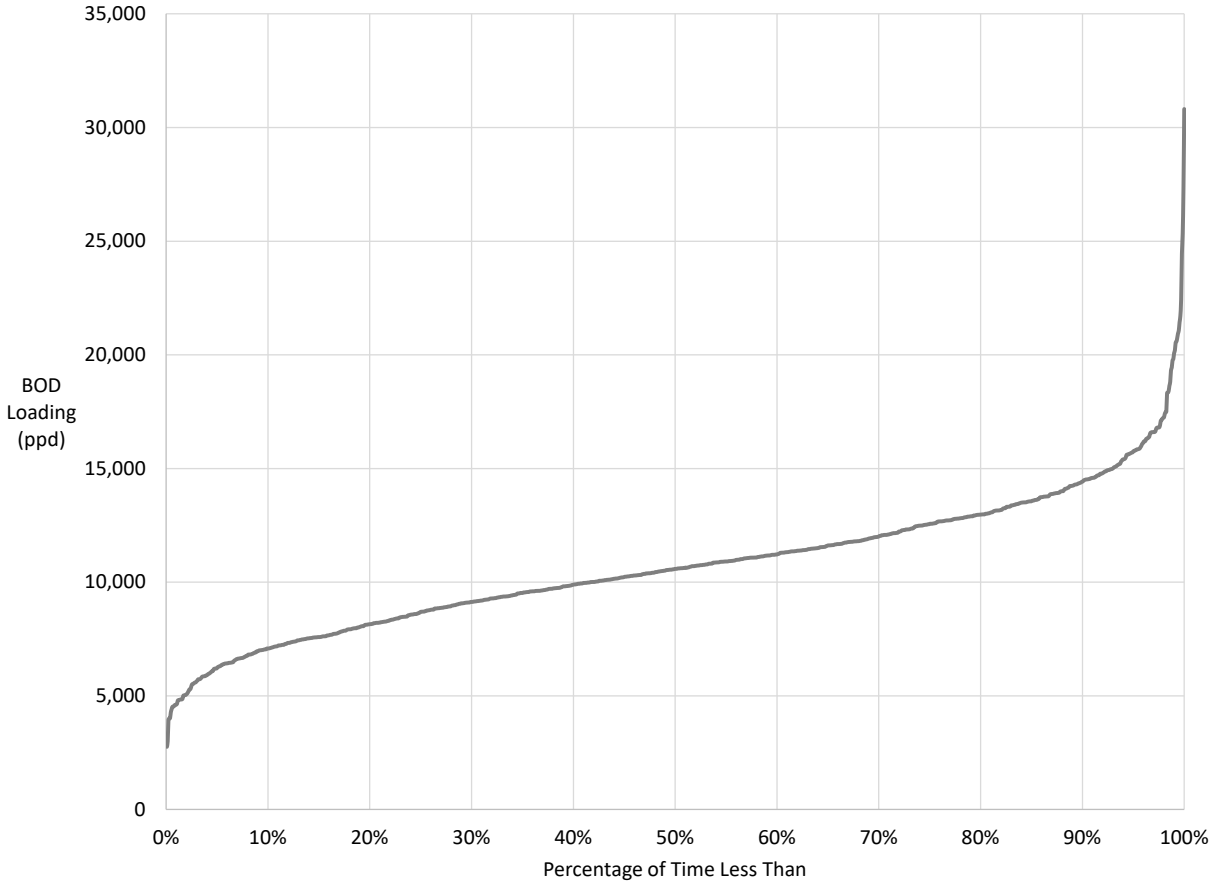
Historical Flows



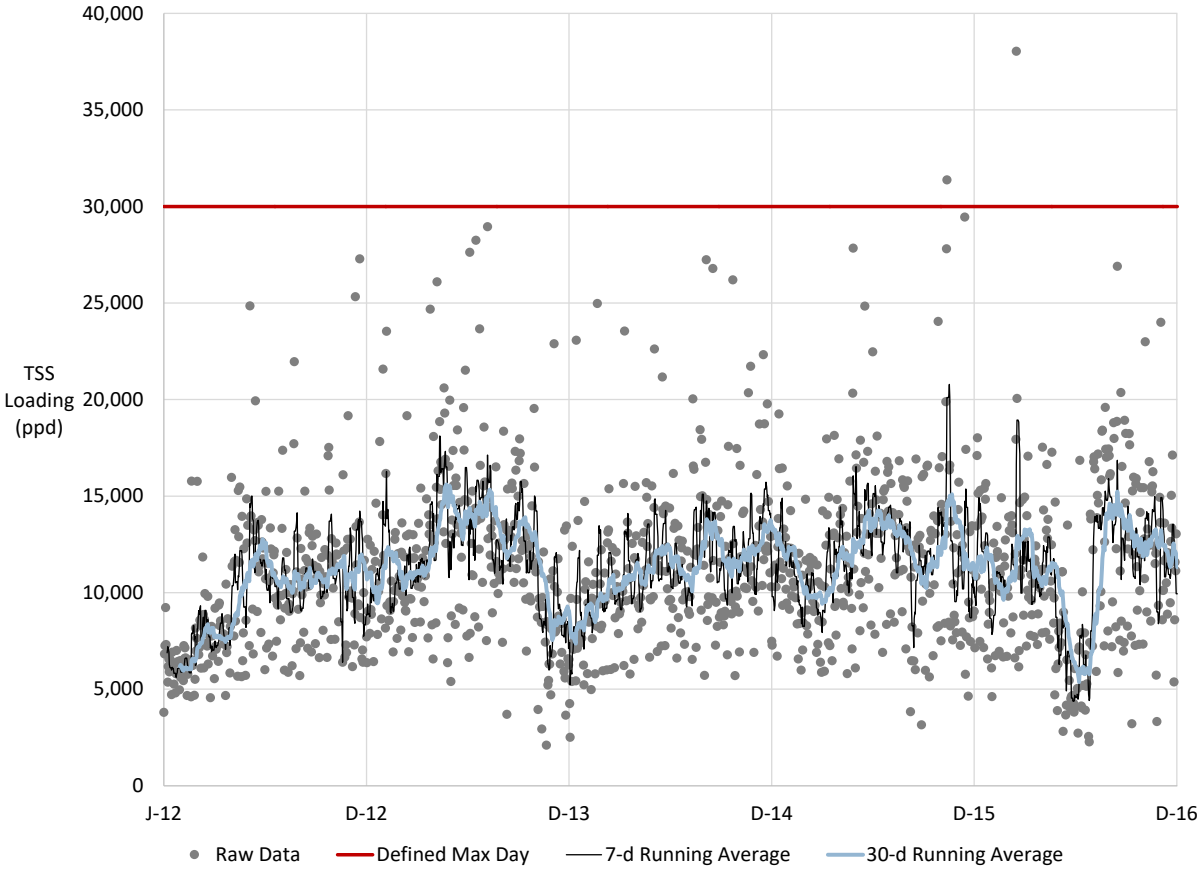


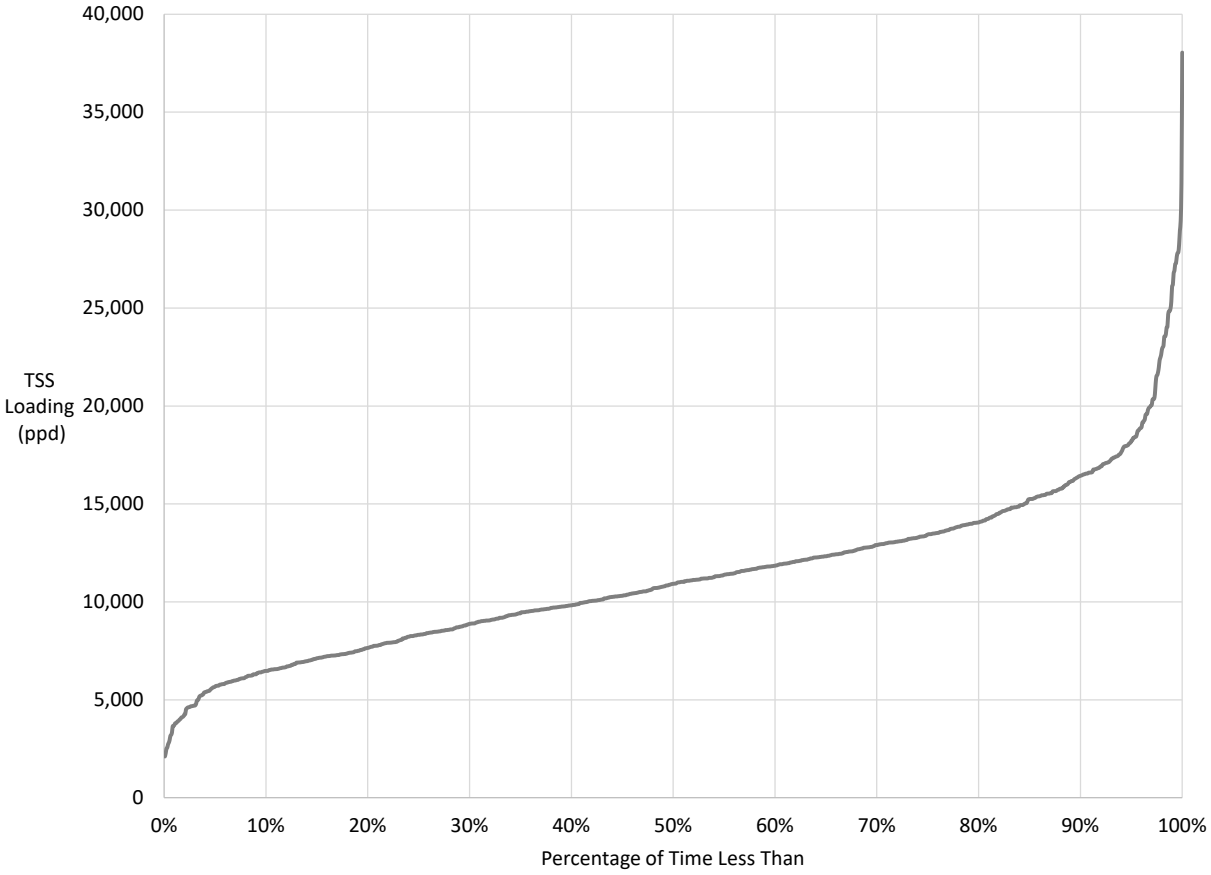
Historical BOD Loadings



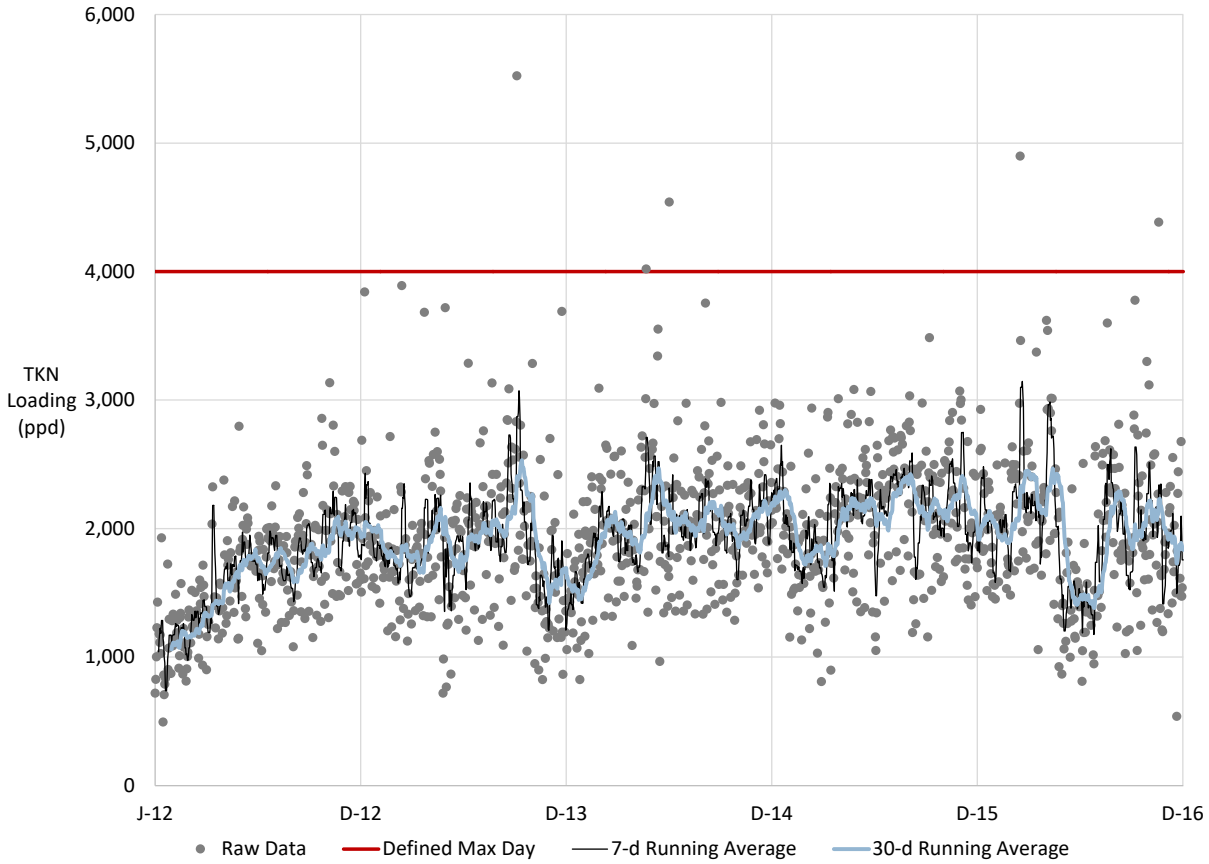


Historical TSS Loading

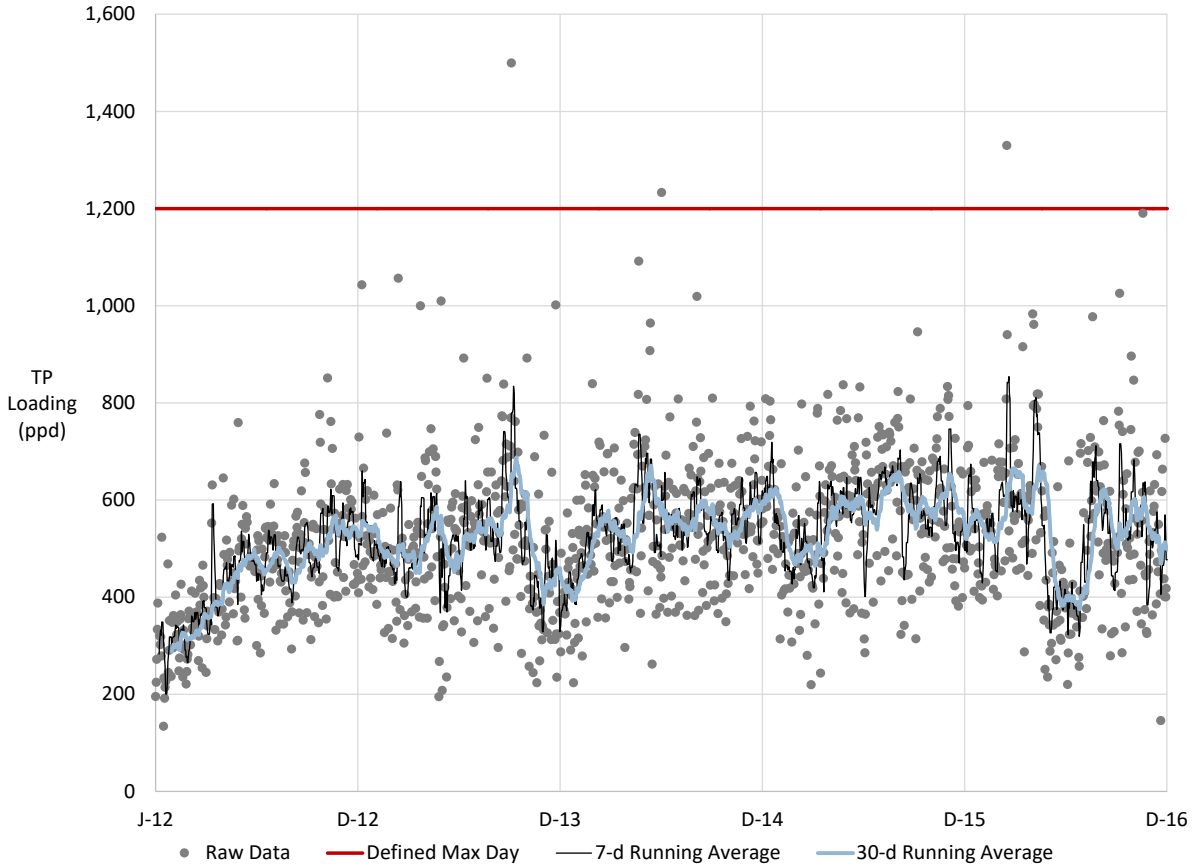




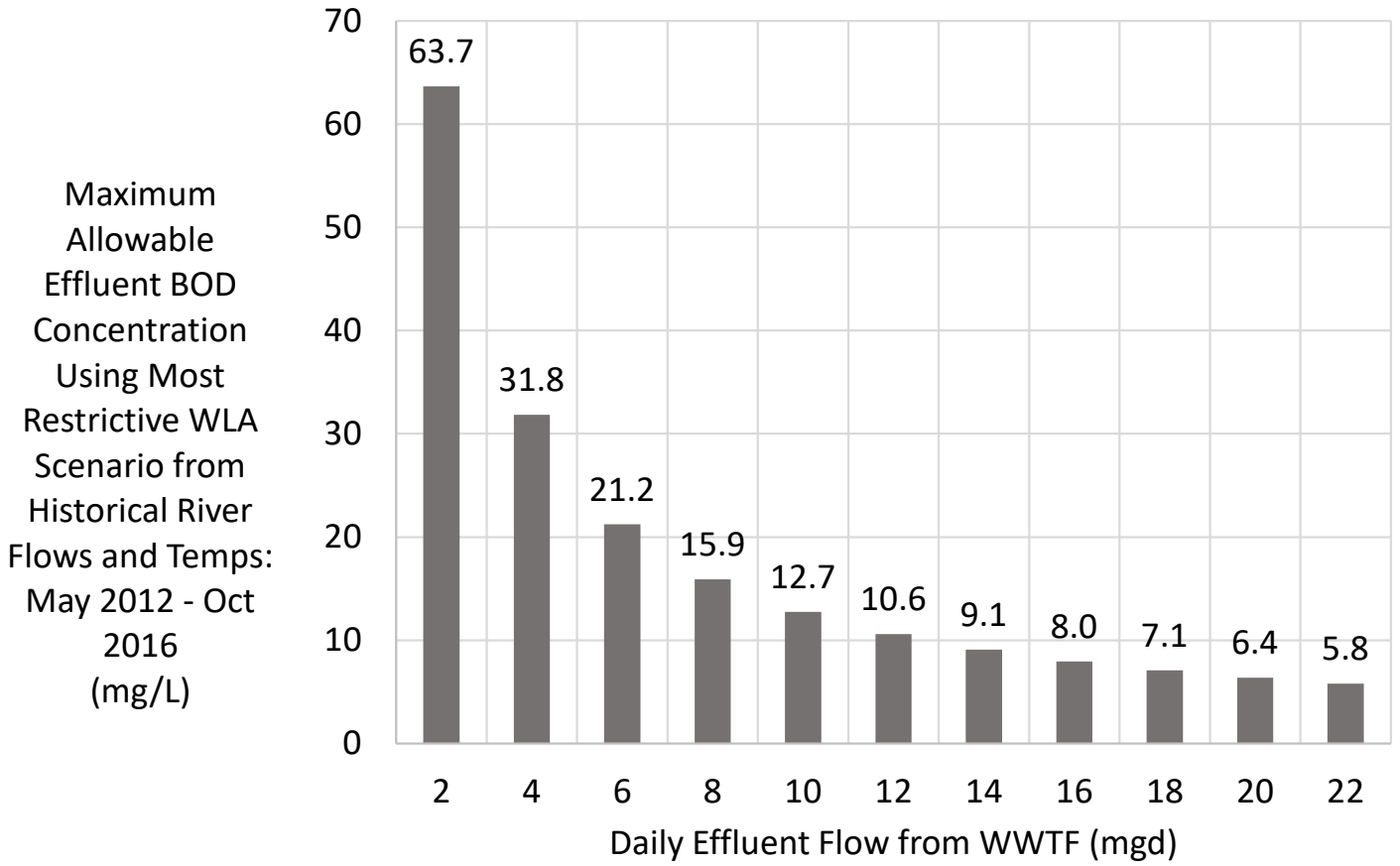
Historical TKN Loading



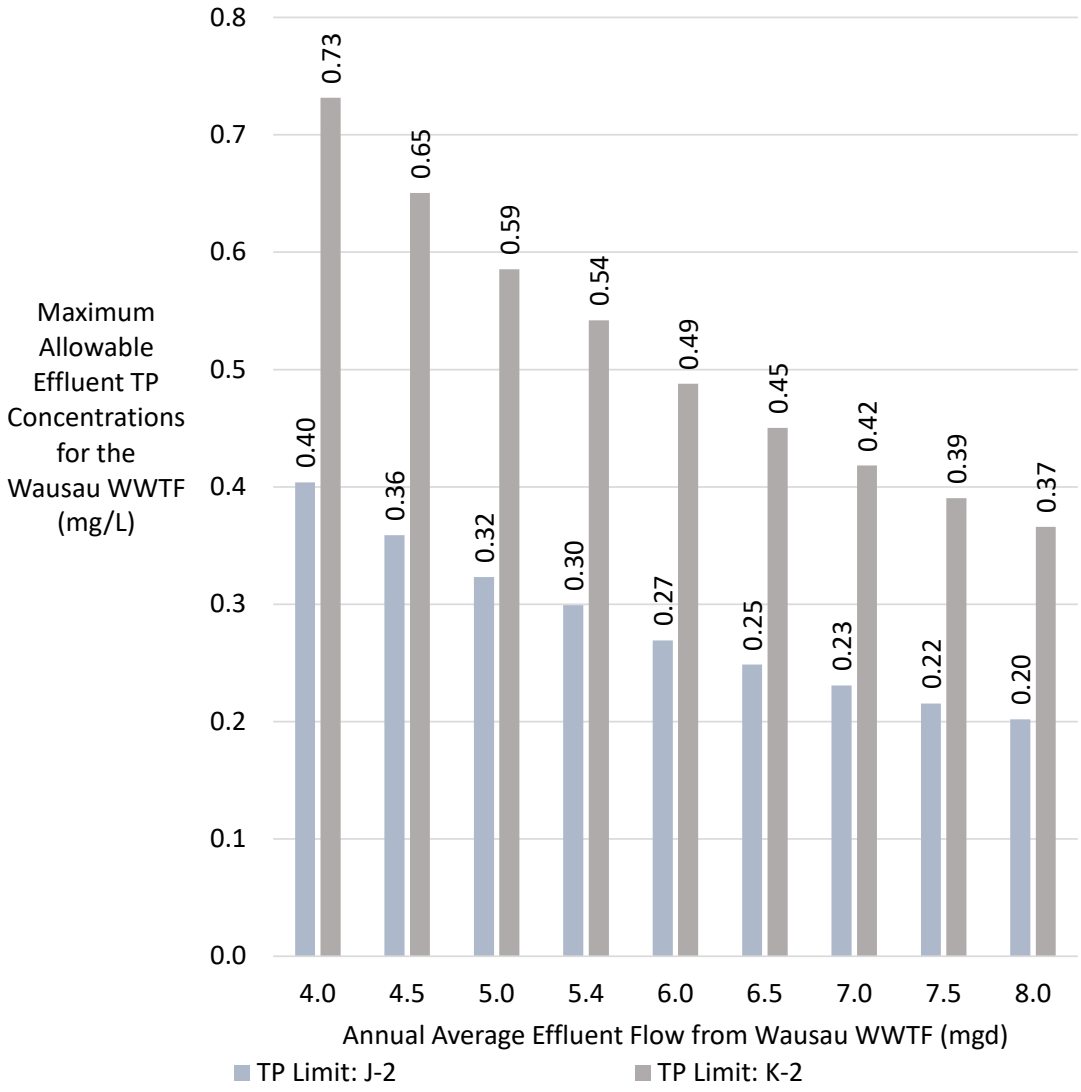
Historical TP Loading



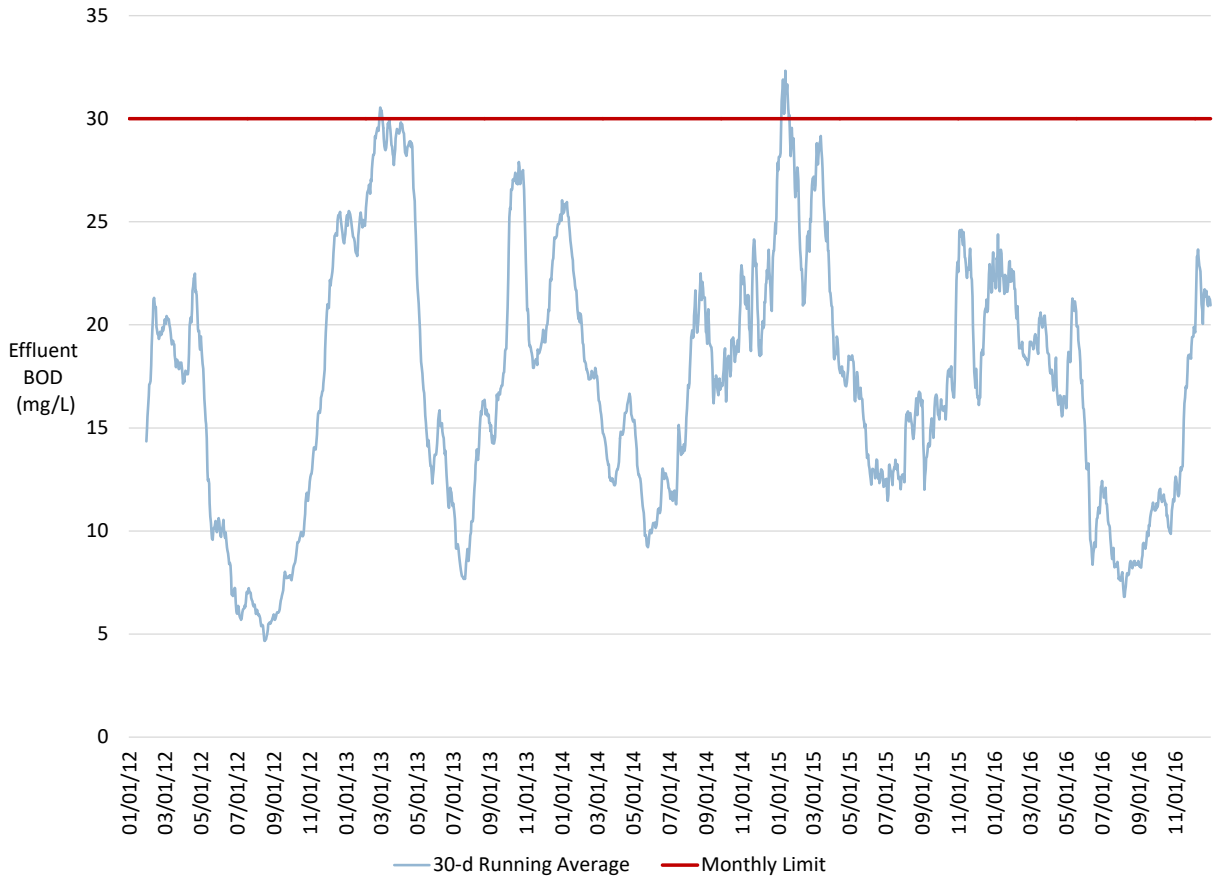
Effluent WLA BOD Limit



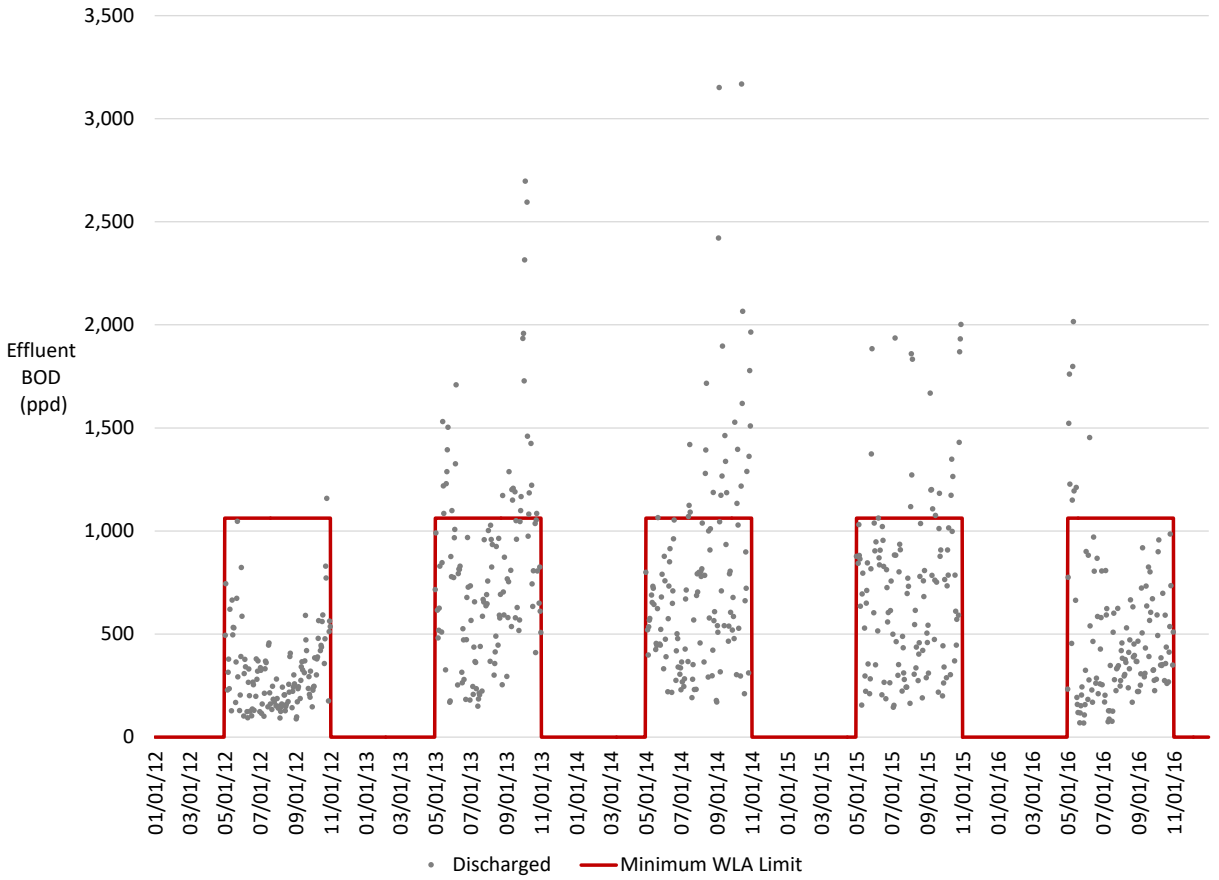
TMDL Phosphorus Limit



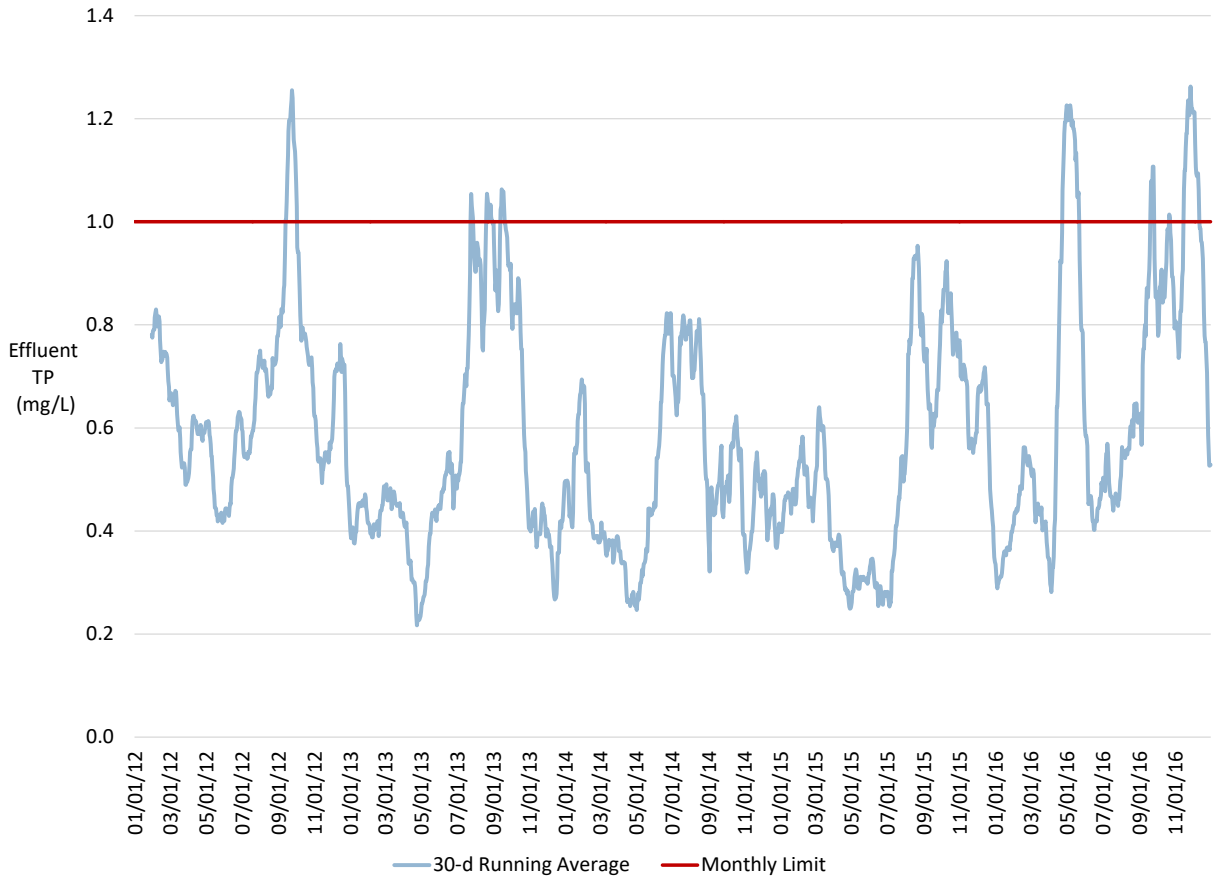
Historical Effluent BOD



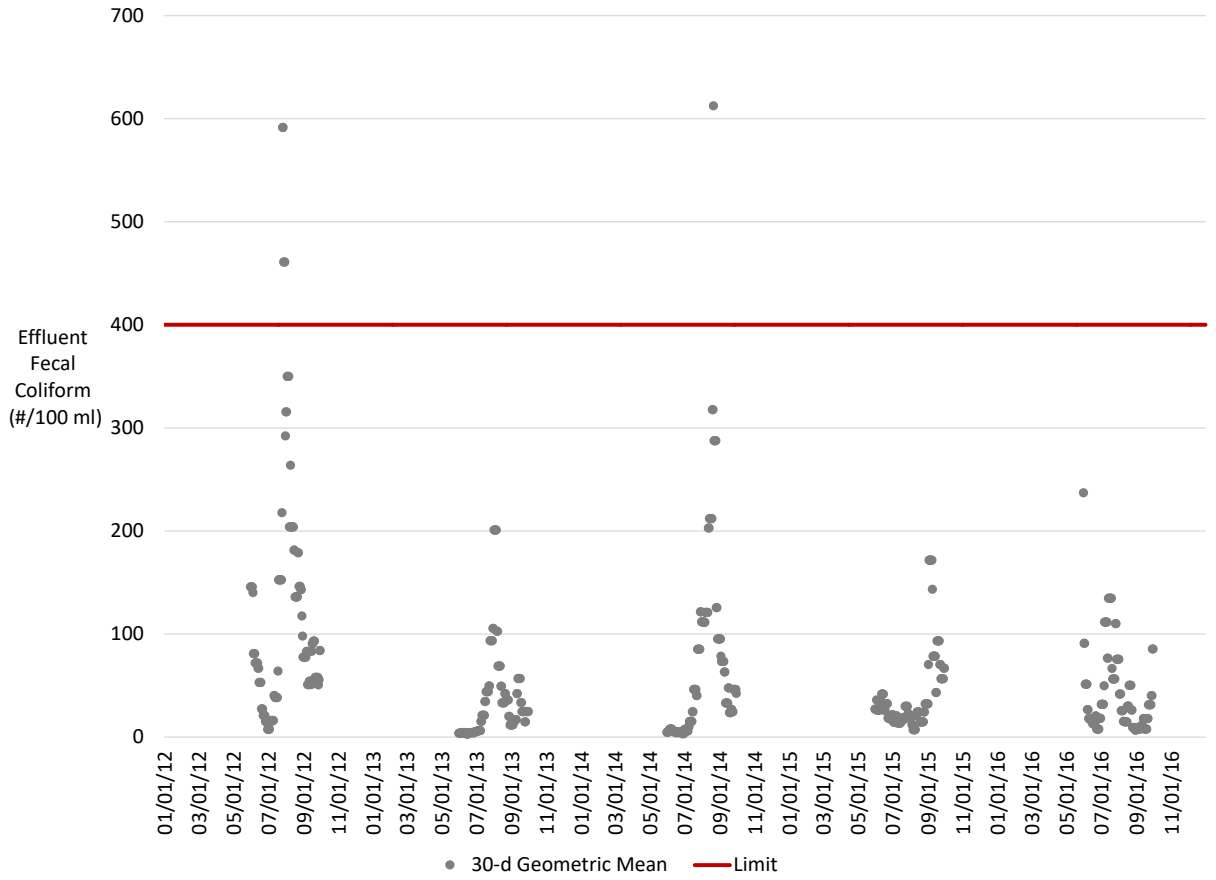
Historical Effluent BOD and Minimum WLA Limit



Historical Effluent TP



Historical Effluent Fecal Coliform



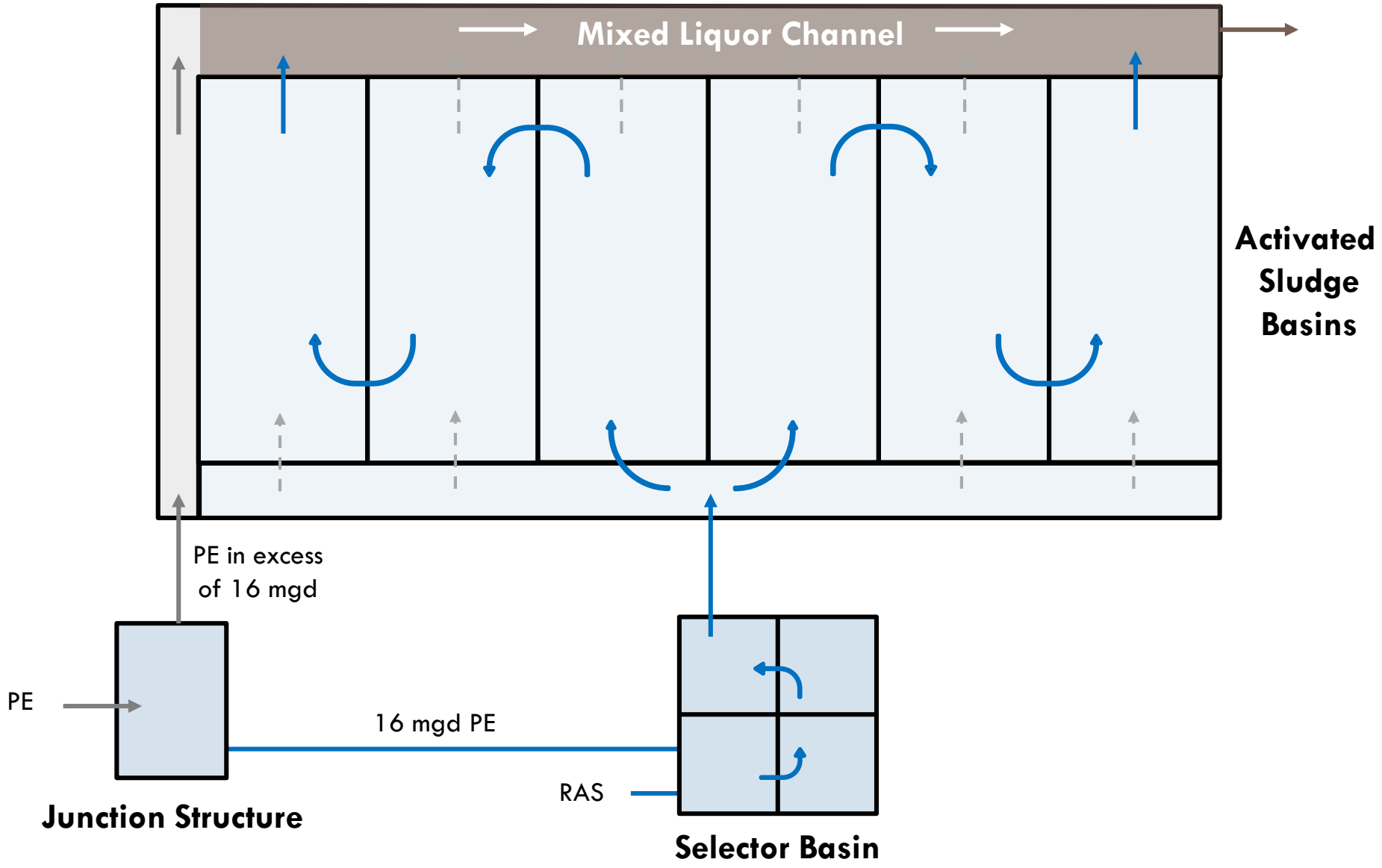
Historical Effluent pH

Future Design Values

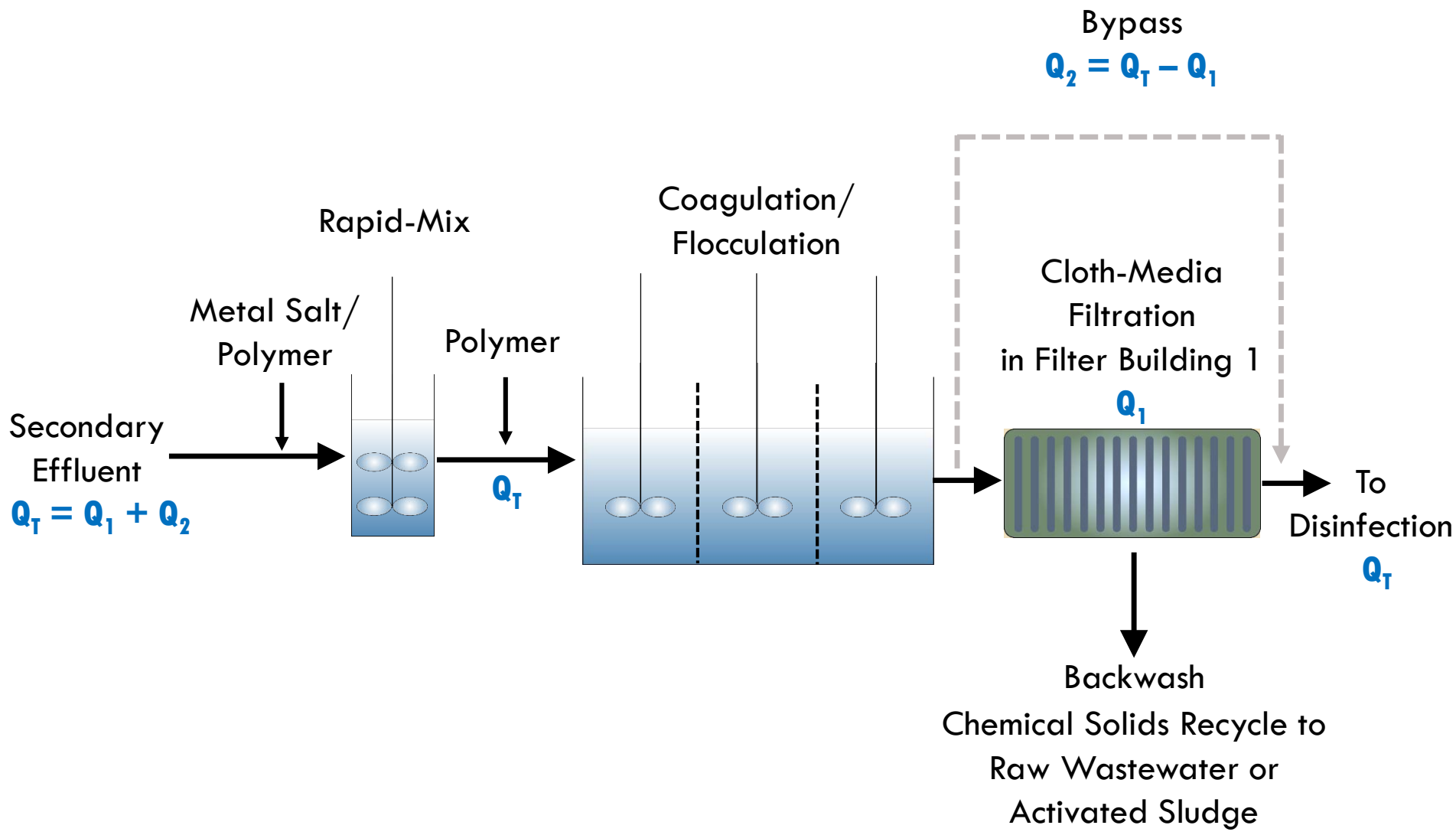
Flow	Flow (mgd)	Peaking Factor
Average	5.4	
Maximum Month	9.2	1.69
Maximum Week	11.6	2.14
Maximum Day	16.8	3.10
Peak Hour	22.0	4.06
Peak Instantaneous	35.8	

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

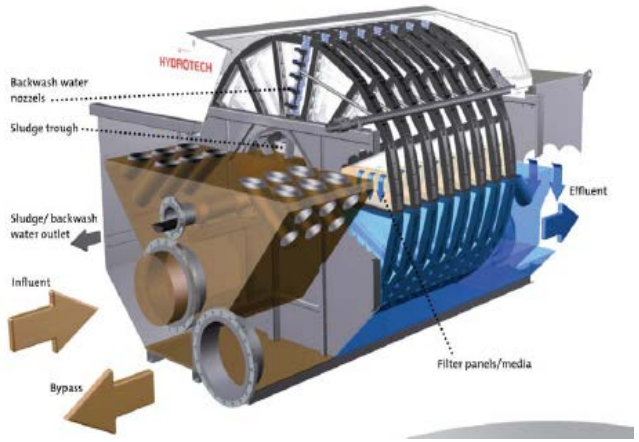
Activated Sludge System Configuration

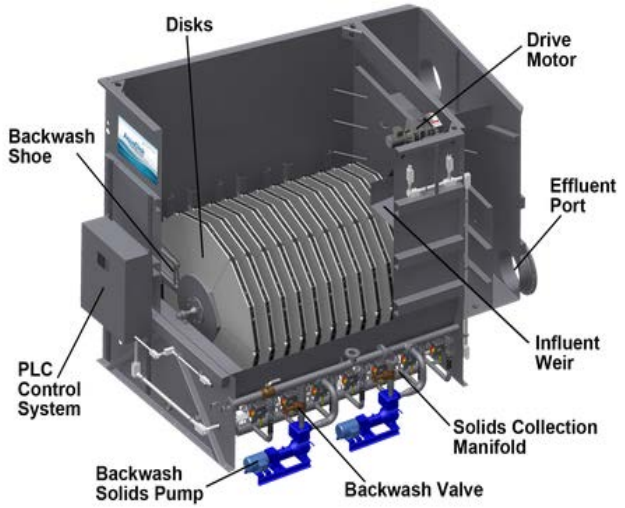


Low-Level Phosphorus and WLA BOD Compliance

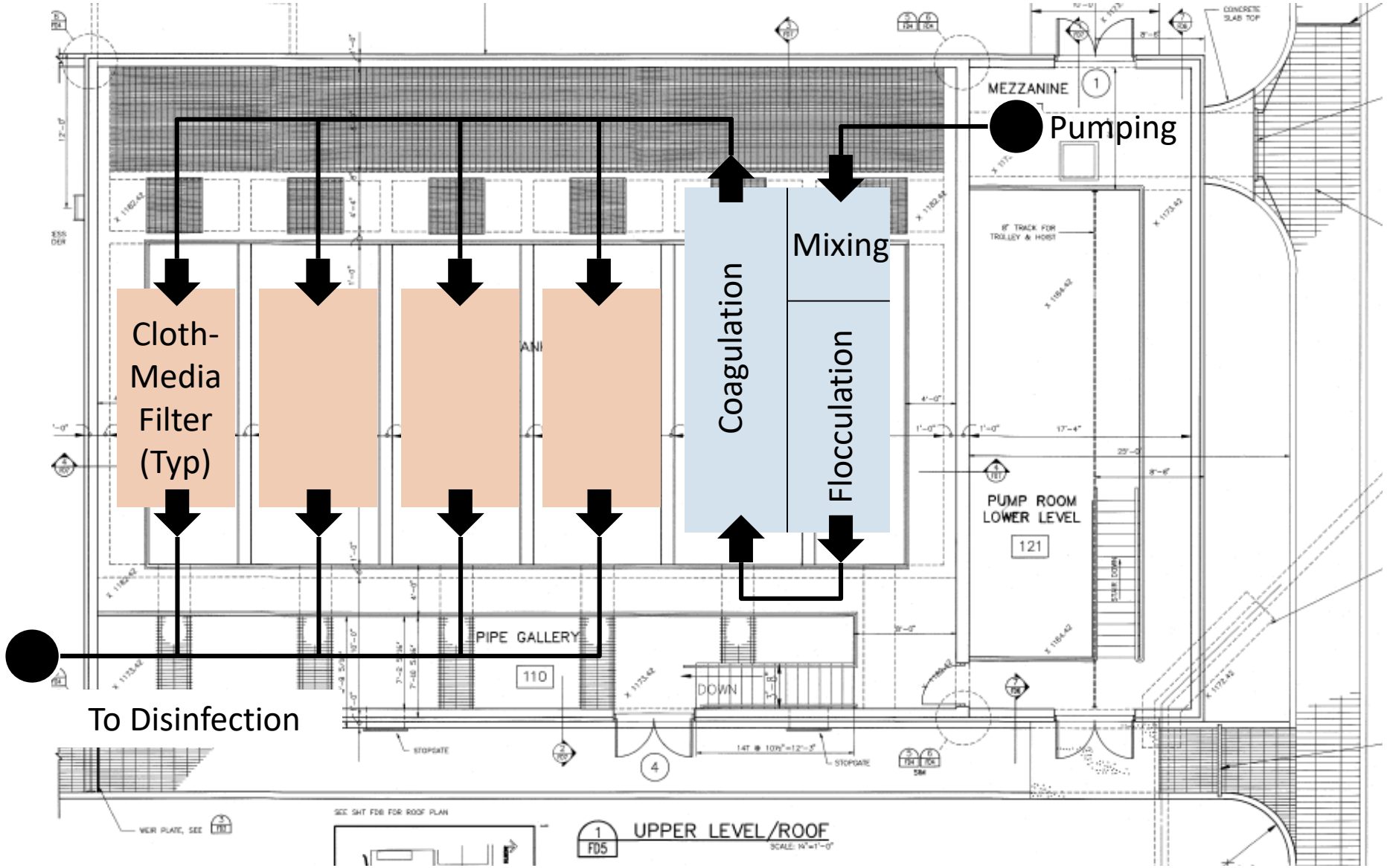


Cloth-Media Filters

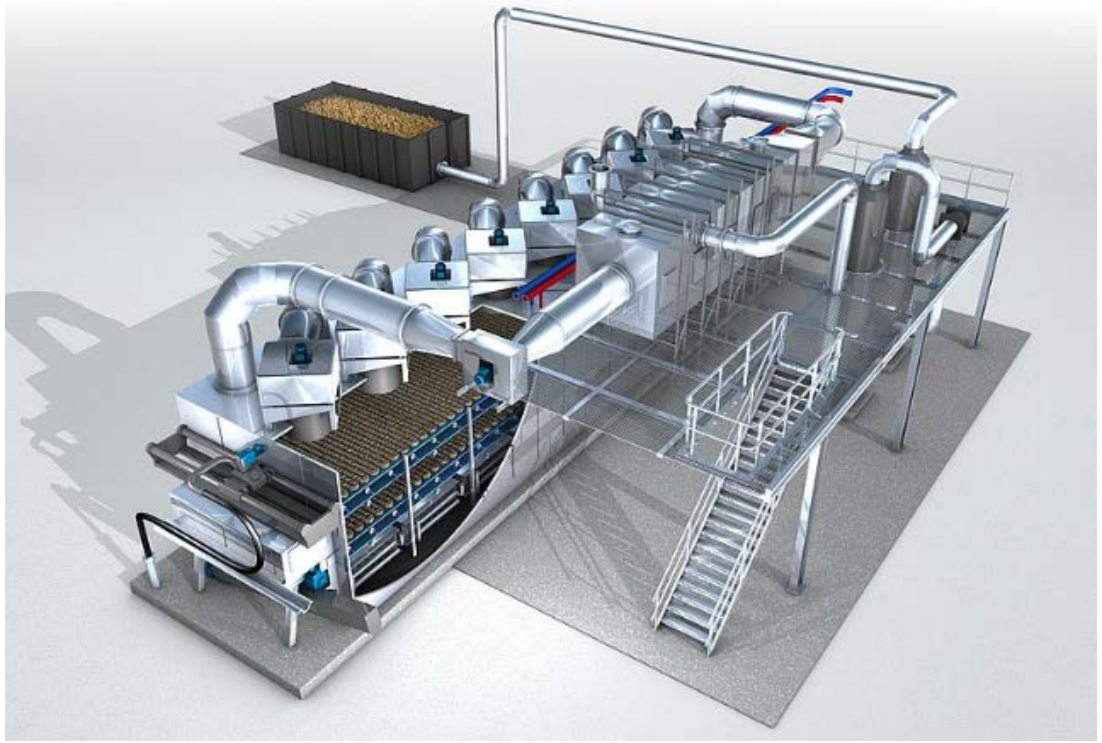




Low-Level Phosphorus and WLA BOD Compliance



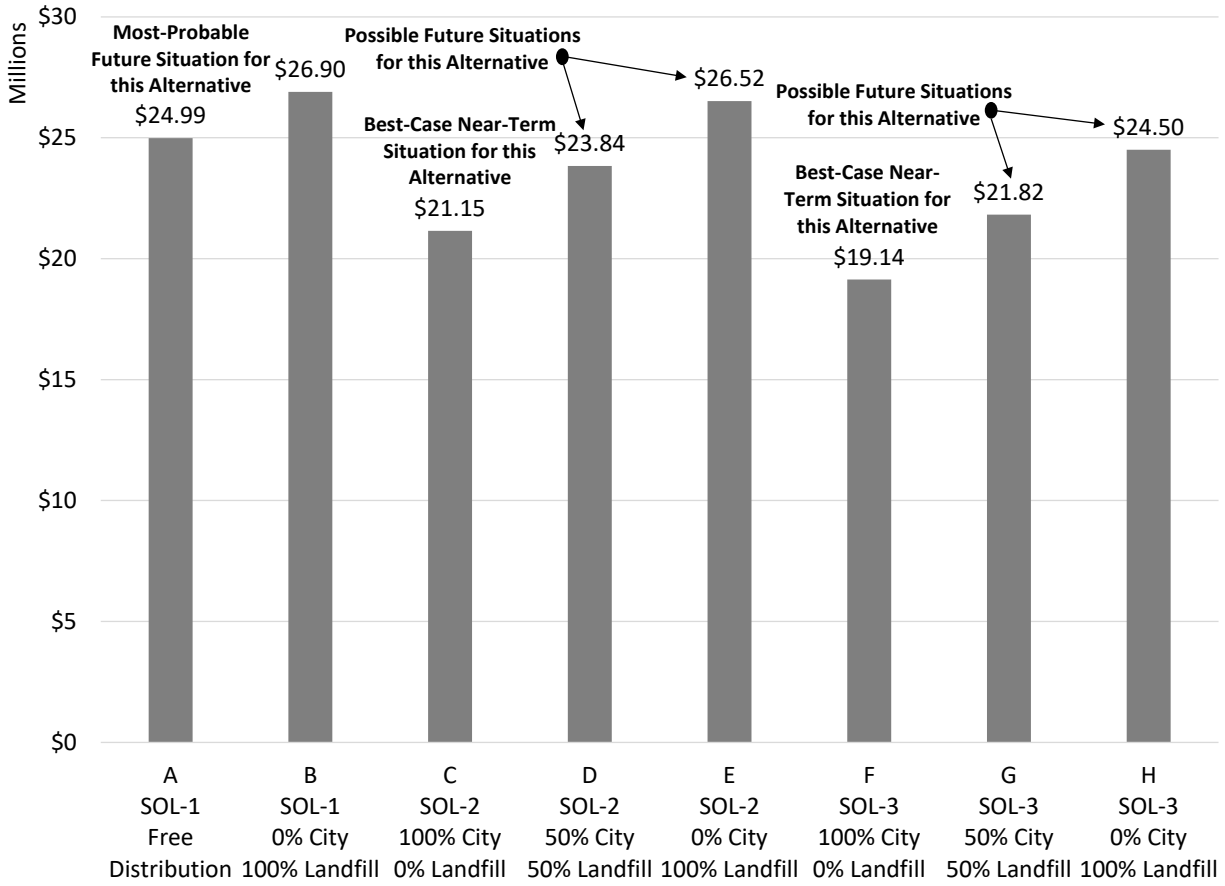
Medium-Temperature Belt Dryer



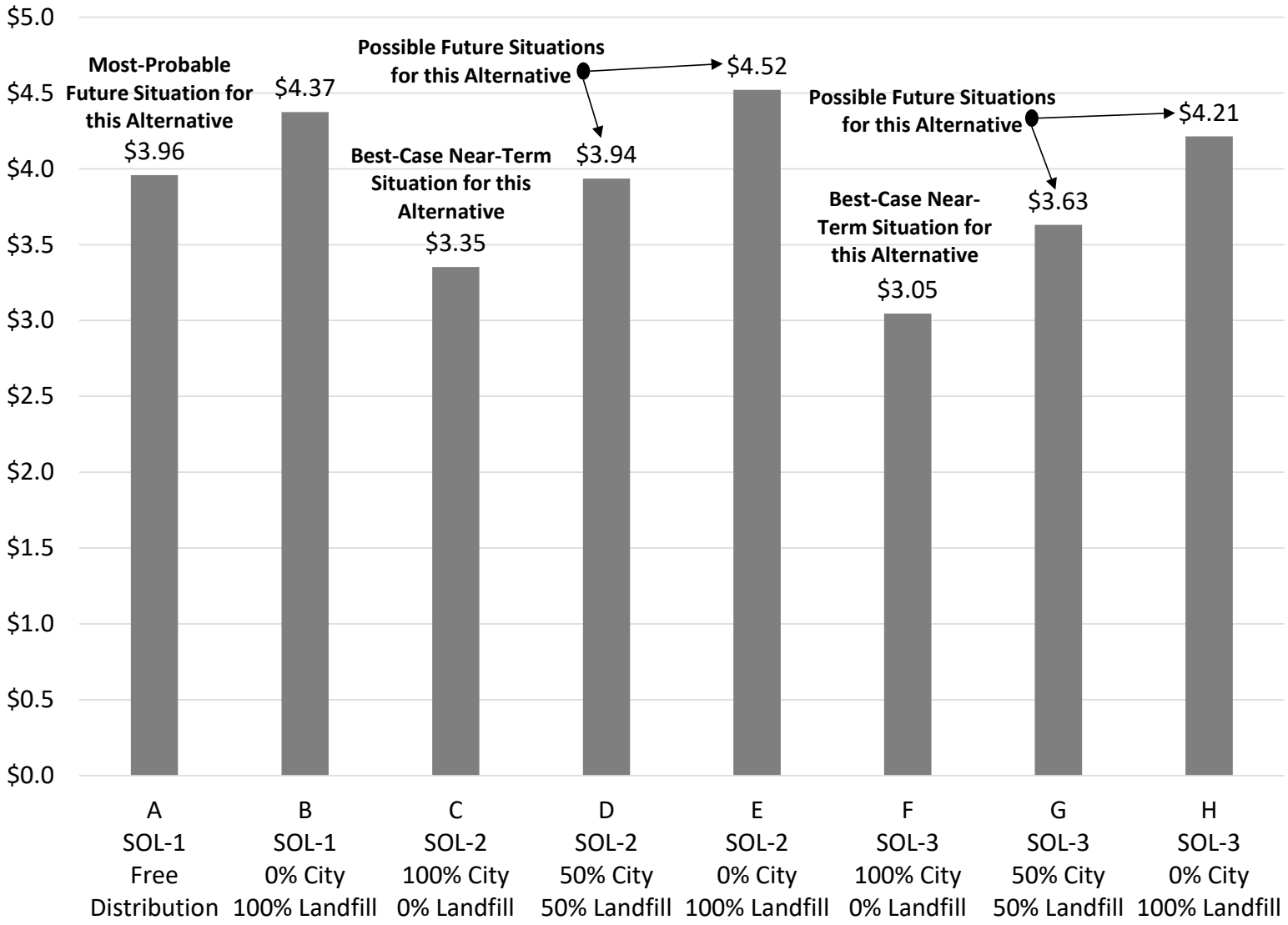
Class A EQ
Biosolids Product

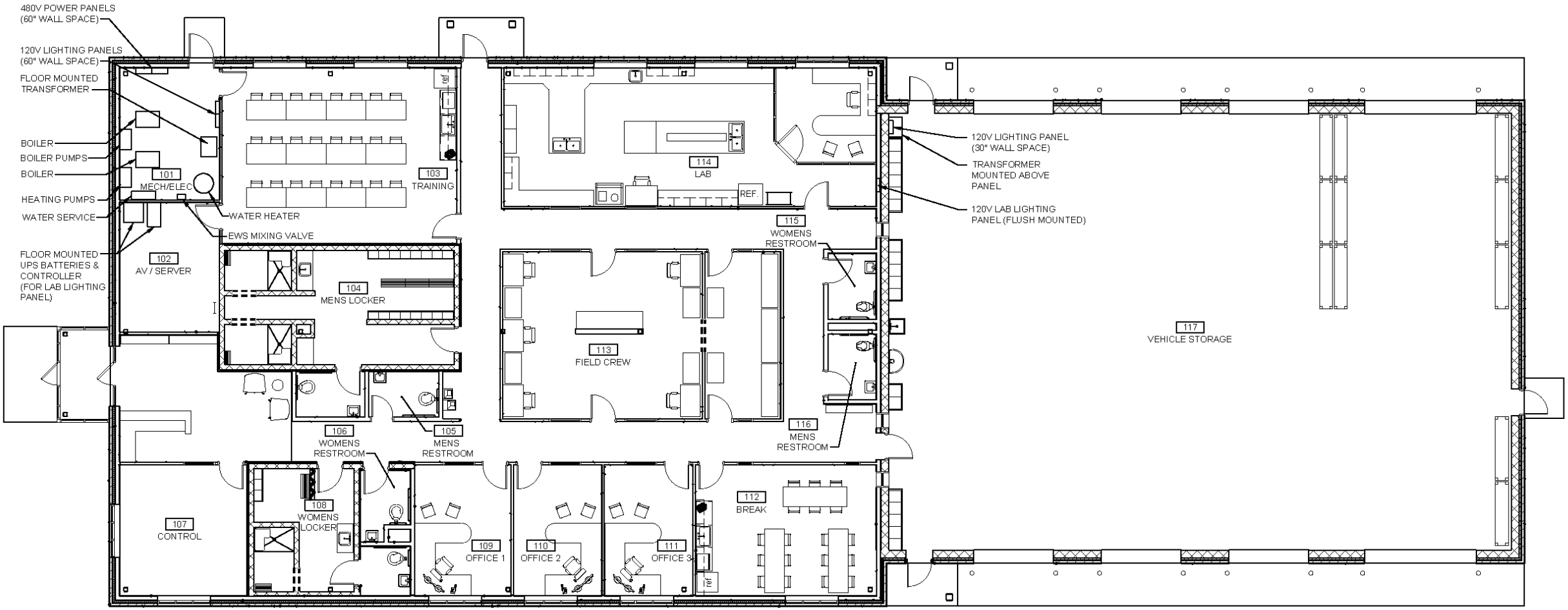
Solids Processing Economic Analysis

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



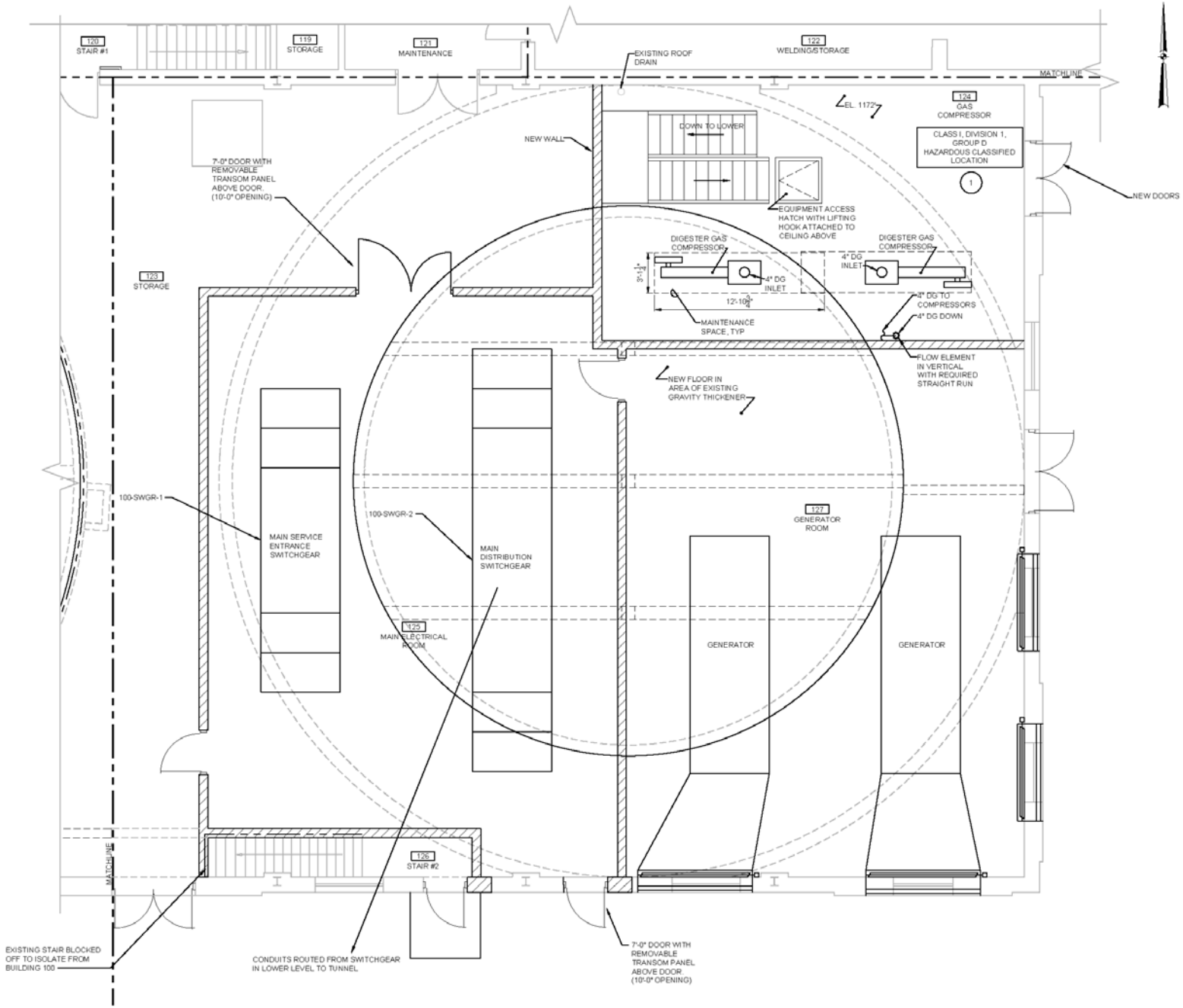
Solids Processing User Costs





GRADE PLAN

0 1' 8'



PARTIAL GRADE PLAN

0 1' 4'

GENERAL NOTES:

1. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO CONSTRUCTION AND/OR FABRICATION.
2. REFER TO 001 SERIES OF DRAWINGS FOR THE SPACE ENVIRONMENT/HAZARDOUS RATING SCHEDULE REGARDING ENVIRONMENTAL CONDITIONS ANTICIPATED WITHIN EACH SPACE AND ALLOWABLE MATERIALS OF CONSTRUCTION TO BE USED WITHIN EACH SPACE.
3. HAZARDOUS RATINGS IDENTIFIED ON THIS DRAWING INDICATE SPACES IN WHICH A HAZARDOUS ENVIRONMENT MAY GENERALLY EXIST. CONTRACTOR SHALL REFER TO SPACE ENVIRONMENT/HAZARDOUS RATING SCHEDULE IN 001 SERIES OF DRAWINGS FOR ADDITIONAL INFORMATION EXPLAINING THE EXTENT AND ENVELOPE ASSOCIATED WITH THESE HAZARDS.

DESIGNER NOTES:

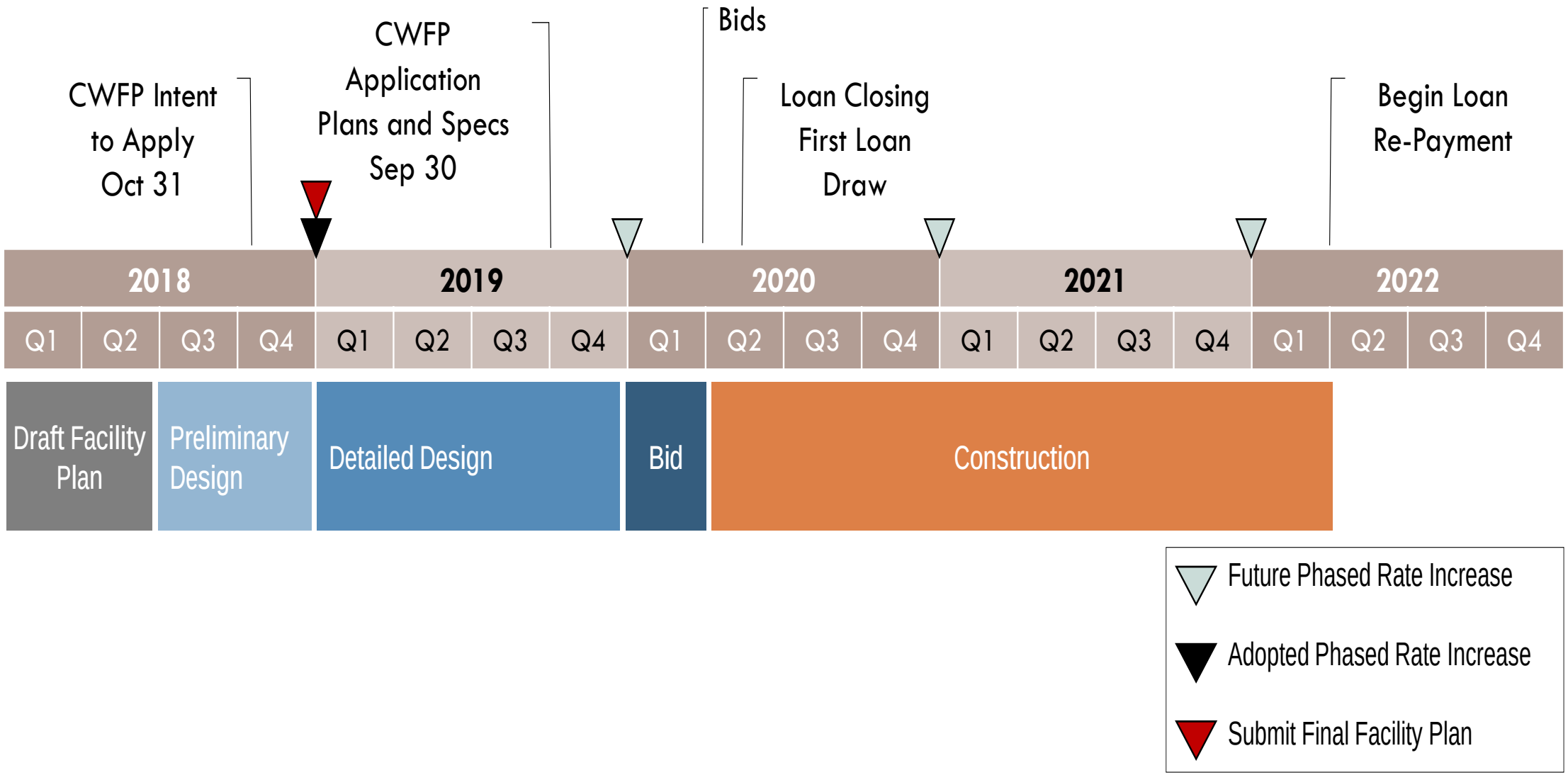
1. GAS HANDLING ROOM HVAC:

   COMBUSTIBLE GAS DETECTION
   CONTINUOUS VENTILATION AT 12 AH/HR
2. COOLING WATER TO EACH COMPRESSOR.
3. EQUIPMENT WEIGHT:

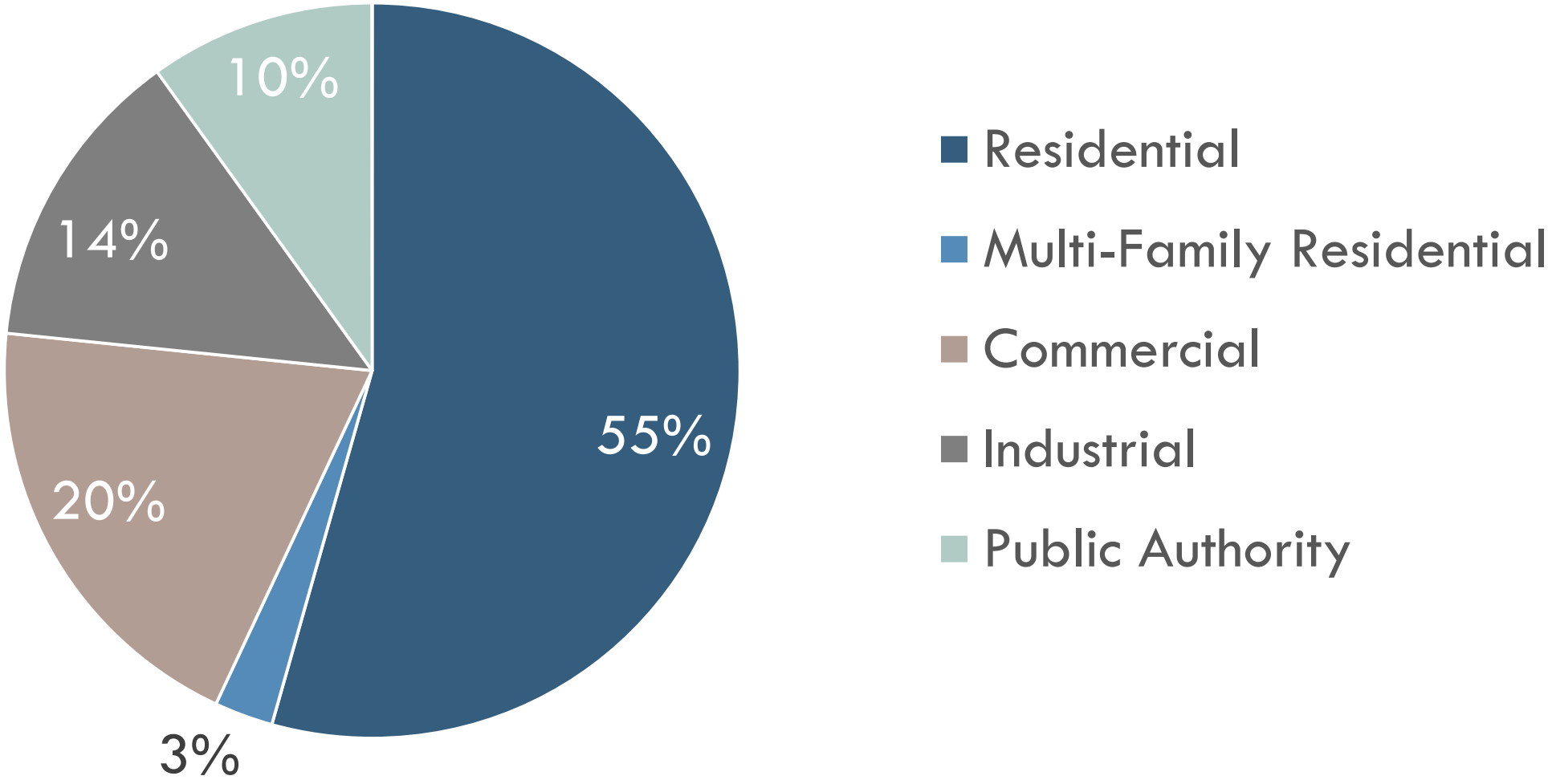
   COMPRESSOR: 3,000 LBS + MOTOR

KEY PLAN

Schedule

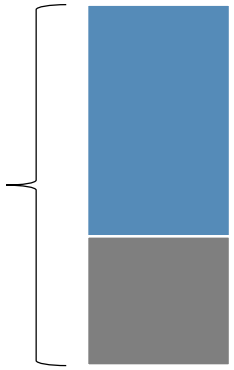

CWFP Intent to Apply Oct 31
CWFP Application Plans and Specs Sep 30
Bids
Loan Closing First Loan Draw
Begin Loan Re-Payment
2018
2019
2020
2021
2022
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
Draft Facility Plan
Preliminary Design
Detailed Design
Bid
Construction
Future Phased Rate Increase
Adopted Phased Rate Increase
Submit Final Facility Plan

Primary Revenue Sources for Wausau Wastewater Utility



The Structure of a Residential Wastewater Bill

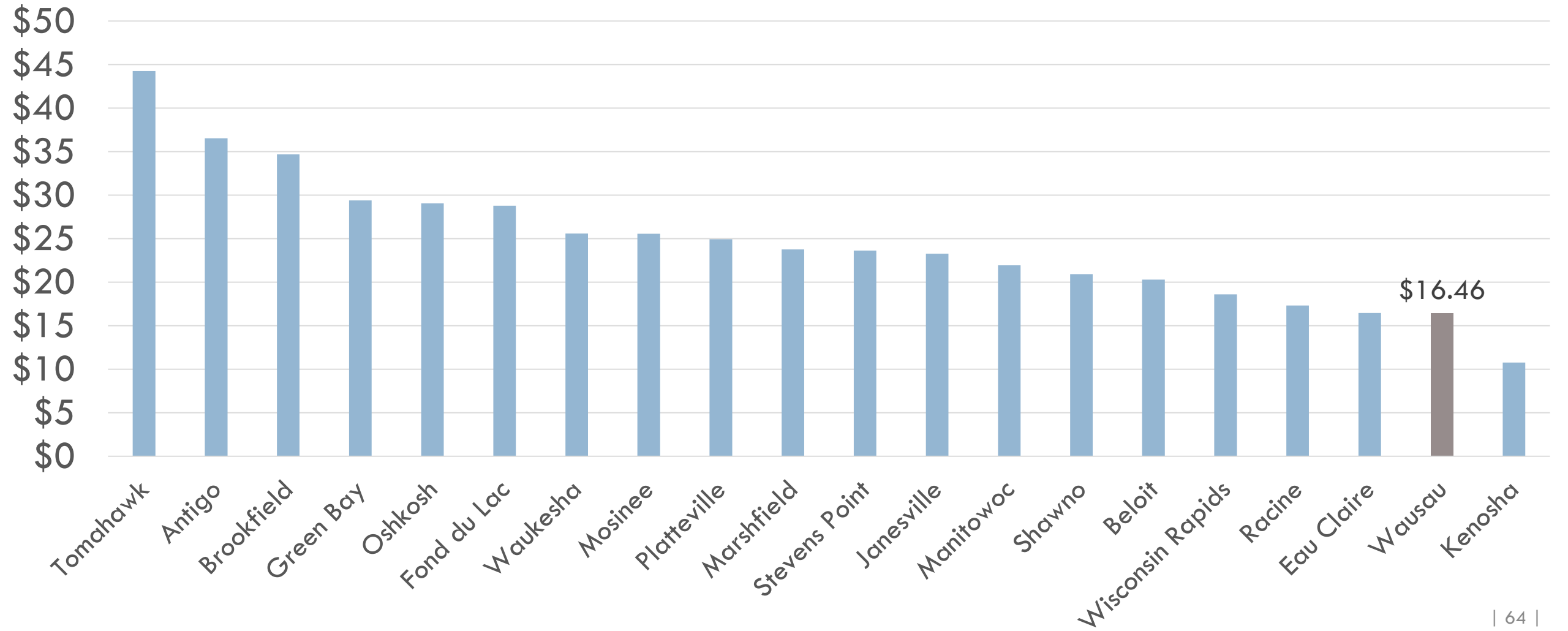
Residential Wastewater Bill



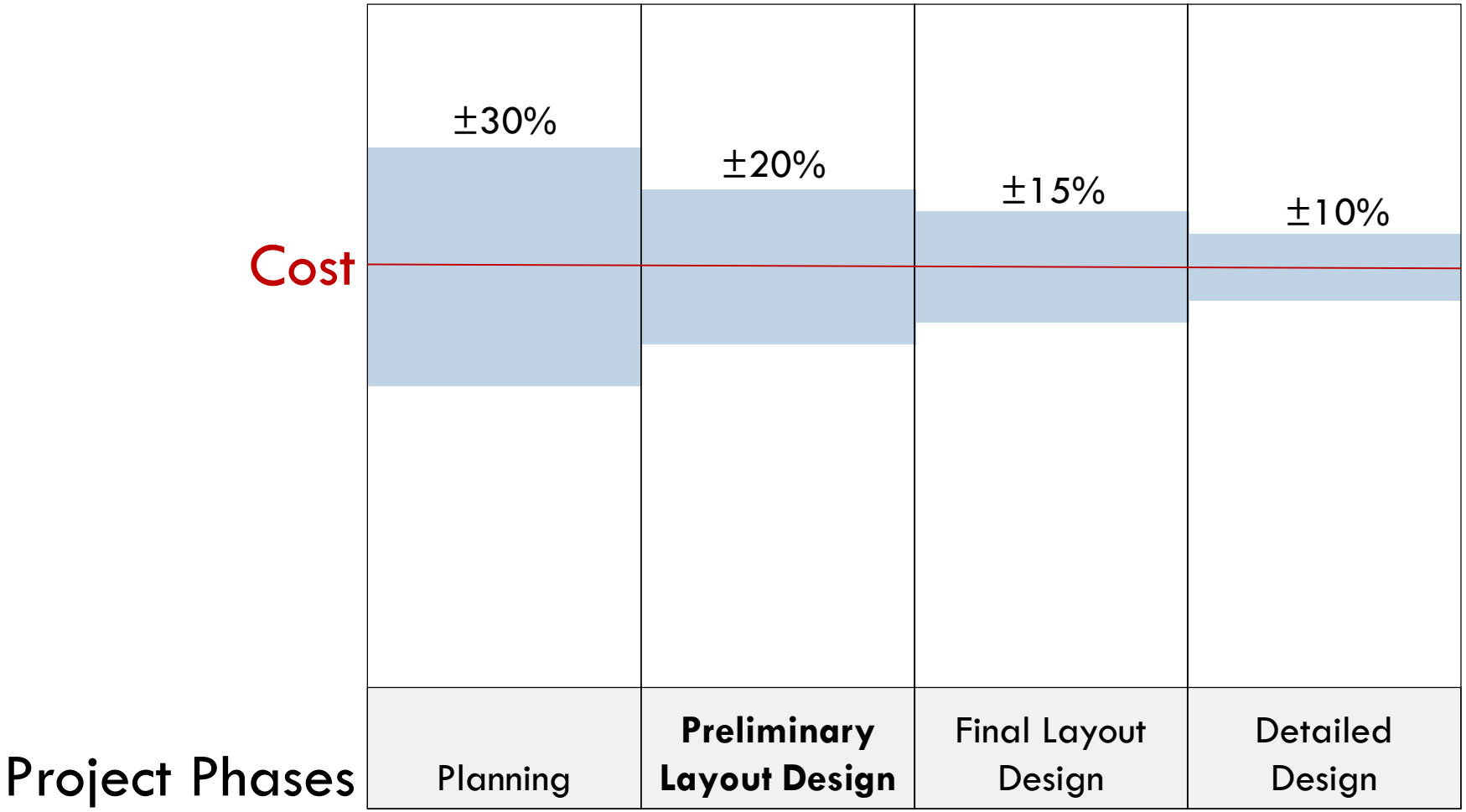
Use-Based Cost = $2.59/100 cubic Fee

Fixed Cost = $17/quarter

Comparison of Current Monthly Residential Wastewater Bills [37.4 kgpy]



Cost Opinion Accuracy



Opportunity to Influence Cost