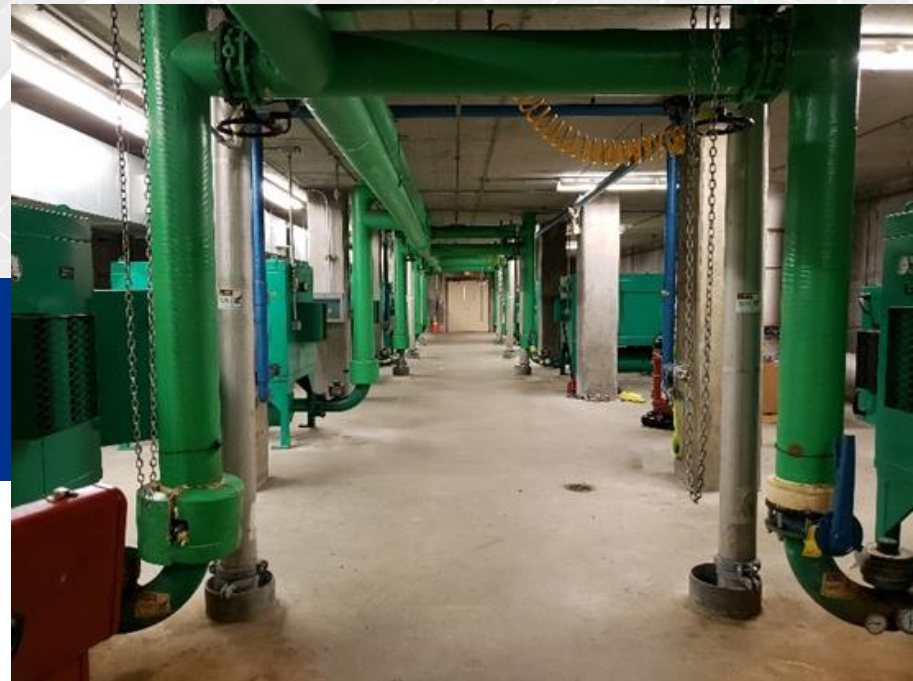


# Wastewater Treatment Plant Operations and Facility Study

City of Northfield, MN.

June 8, 2021 (Presentation to the City Council)

July 21, 2021 (City Staff presentation to EQC)



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# Agenda

1. Background
2. Capacity Assessment
3. Facility Plan Update Items
4. Implementation and Spending Plan
5. Next Steps
6. Questions/Comments

# 1. Background



# Incidents that prompted review of the WWTP

- Jan 2018: Flooding of the Biological Aerated Filter (BAF) building basement due to a pipe plug failure.
  - 5 ft of water in basement, 200 gal released to ground
  - Wiring and actuator replacements

# Incidents that prompted review of the WWTP

- May 2018: Fire in the biosolids handling facility
  - Significant damage
  - Required emergency biosolids hauling
  - Required emergency temporary treatment system
  - Repair and rebuild of the permanent facility

# Incidents that prompted review of the WWTP

- July 2018: Pipe failure in the Sludge Pump Room
  - 6 ft of wastewater in basement
  - 1 MG discharge to river

# Project Deliverables

- Operations Study and Condition Assessment
  - Completed April 2020
  - Operations recommendations are being implemented
  - Condition assessment results used to inform the Facility Plan Update and improve CMMS data capture
- Facility Plan Update
  - Drafts Oct 2020 and Jan 2021
  - Discussed today

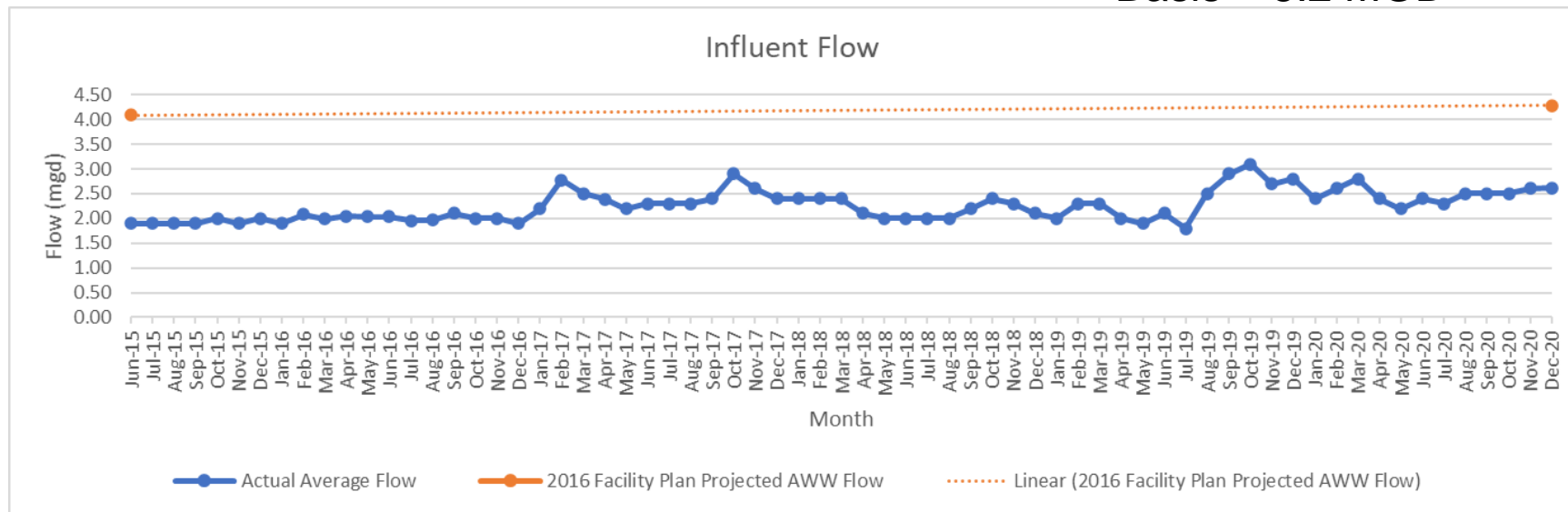
## 2. Capacity Assessment



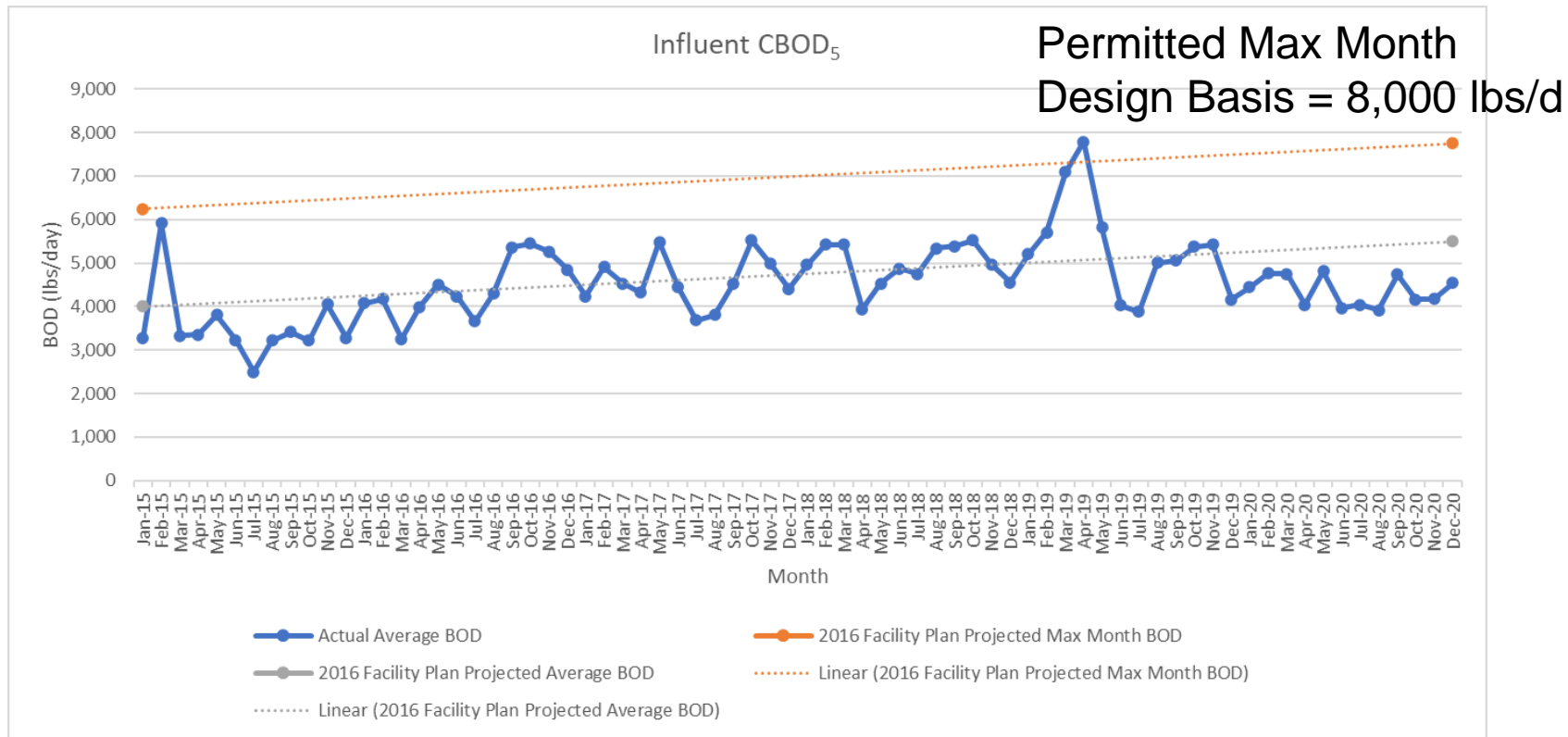


# Recent Trends – Plant Influent Flow

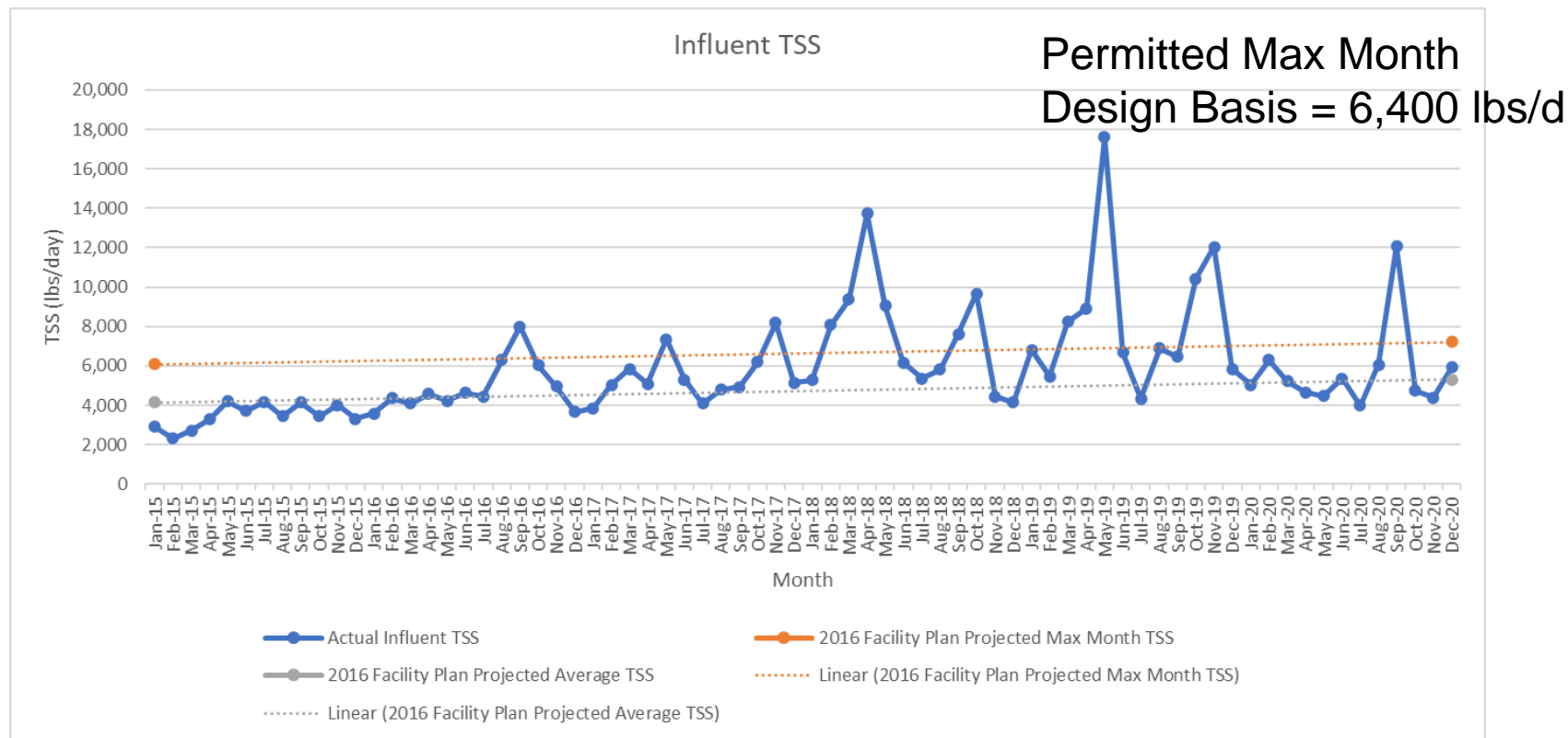
Permitted AWW Design  
Basis = 5.2 MGD



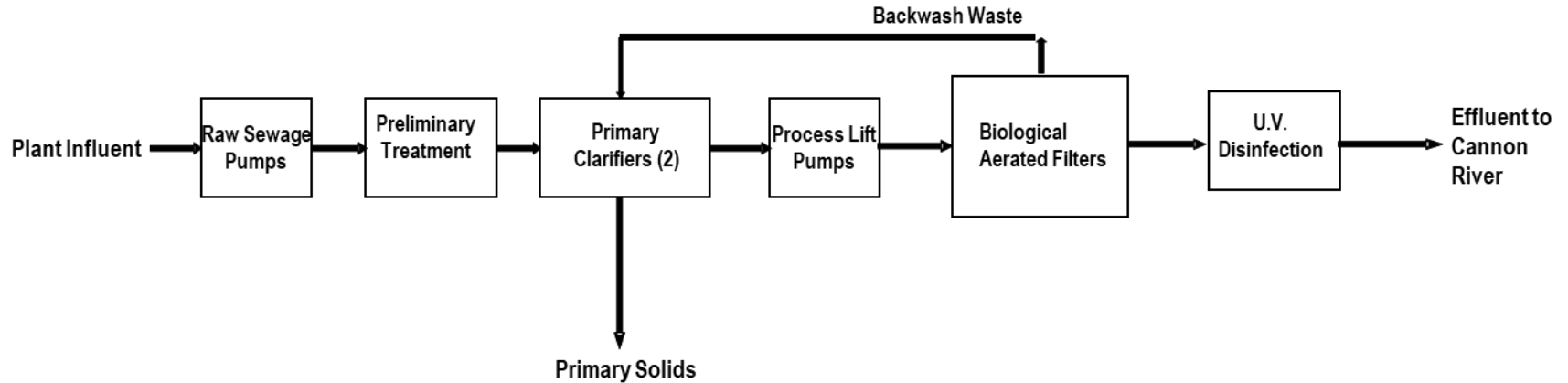
# Recent Trends – Plant Influent CBOD<sub>5</sub>



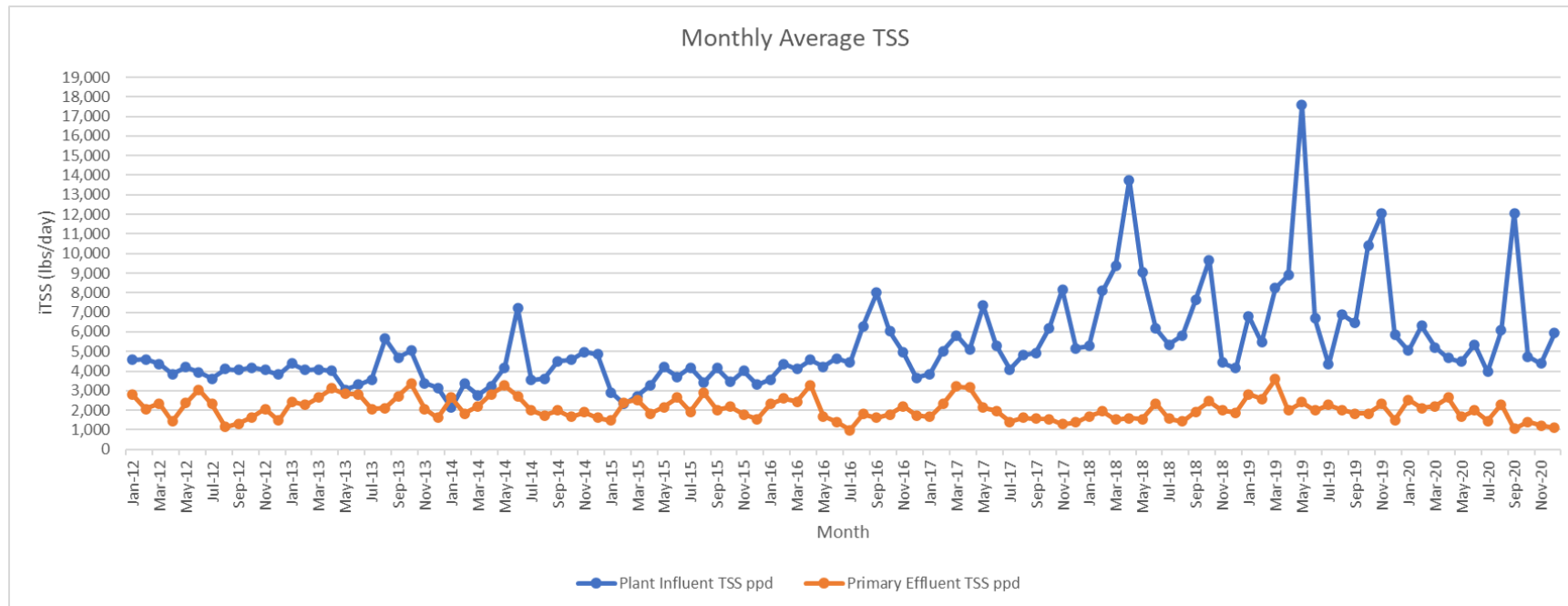
# Recent Trends – Plant Influent TSS



# Why Does the Plant Perform Well at High TSS Influent Loads?



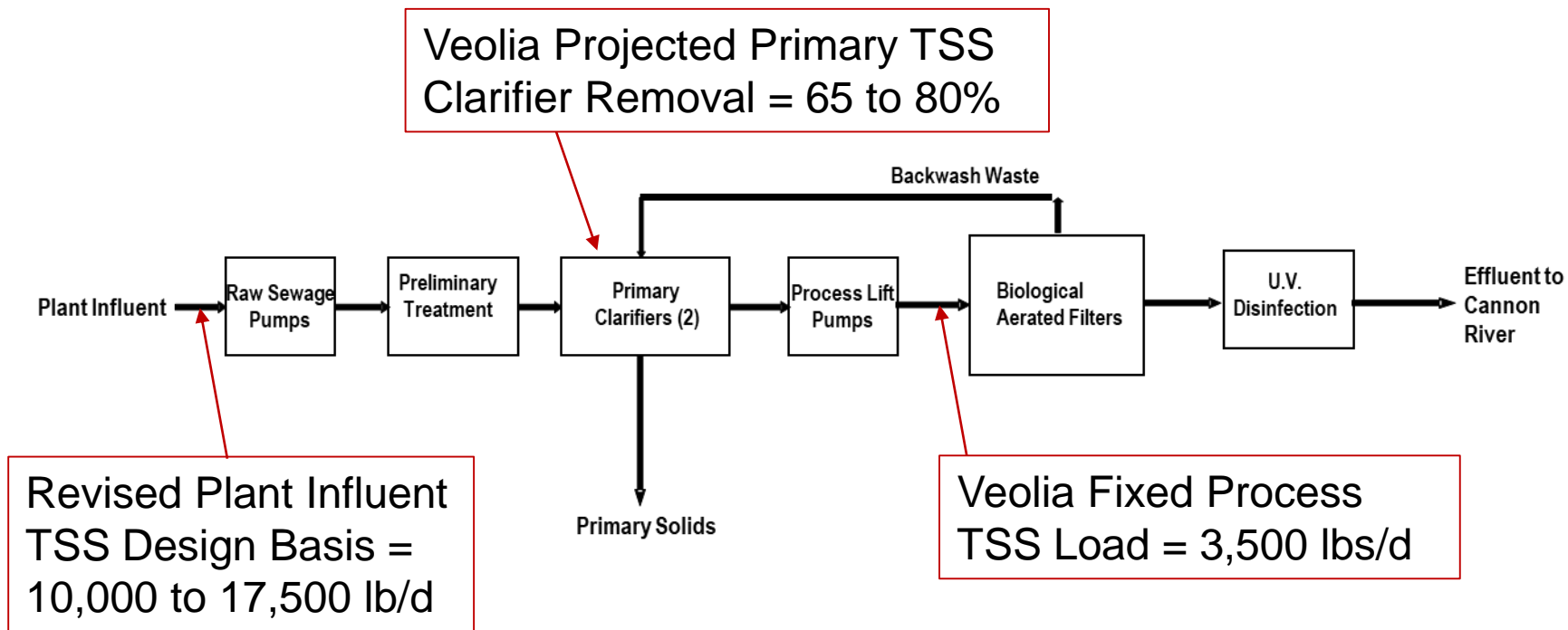
# Primary Clarifiers Perform Far Better than Design Criteria



# Kruger (Now Veolia) Review of Performance

- Performed simulations using latest design tools
- Fixed the primary effluent to match historical performance at 3,100 lb/d and then projected to 3,500 lb/d by 2040
- Confirmed the existing BAF process can handle the future flow and load cases through 2040 easily with 10 cells in service.

# Revised Plant Influent TSS Design Basis



# Future Flow and Load Projections

Item	Original/Permitted Design Basis	2025	2030	2035	2040
Population		23,228	24,174	25,155	26,177
AWW Flow (mgd)	5.2	3.25	3.38	3.51	3.65
CBOD <sub>5</sub> – Max Month (lb/d)	7,999	7,504	7,657	7,817	7,984
TSS – Max Month (lb/d)	6,400	8,817	9,118	9,432	9,758
	<b>Revised Design Basis</b>				
TSS – Max Month (lb/d)	10,000 to 17,500 <sup>a</sup>	8,817	9,118	9,432	9,758

<sup>a</sup> For primary clarifier percent removals of 65 to 80



### 3. Facility Plan Update Items



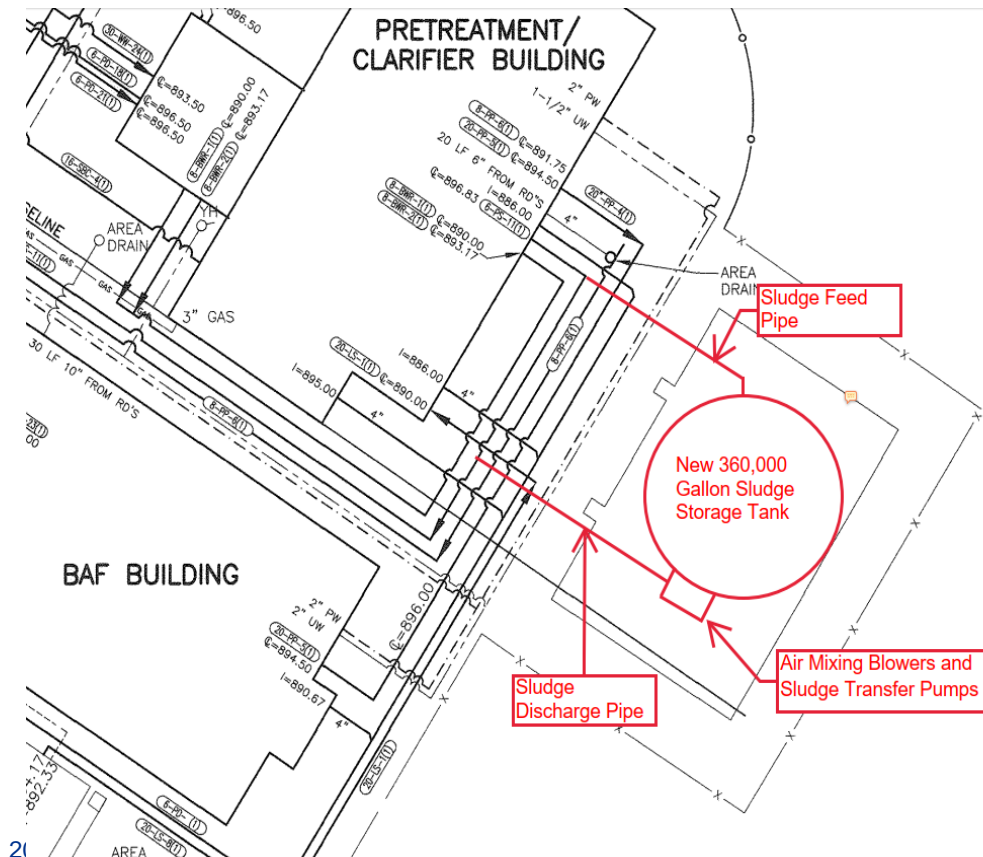
# 2016 Facility Plan

- What recommendations have already been completed?
  - UV Disinfection
  - Biosolids Processing Facility
  - BAF Gate Replacement

# Liquid Sludge Storage

- Why is it needed?
  - Existing Sludge Holding Tank = 3 days storage
  - Biosolids processing facility has a single train. Major equipment failure requires immediate corrective action
- Proposed Facility
  - Add 360,000-gal storage tank to increase sludge storage from 3 days to 10 days.

# Liquid Sludge Storage

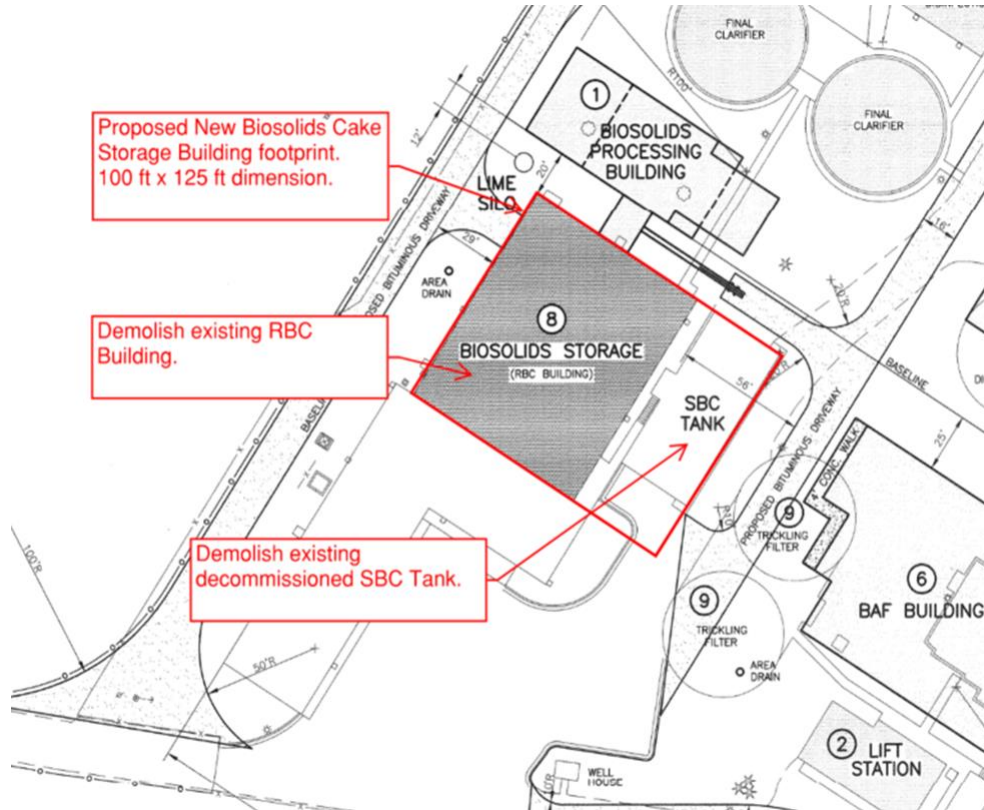


- New Cost Estimate = \$3.8M

# Biosolids Cake Storage

- Why is it needed?
  - Existing storage facility = 40 to 80 days of storage
  - Existing storage facility is deteriorating
  - Typical recommended criteria = 180 days storage
- Proposed Facility
  - Demolish existing facility and construct new storage facility with 180 days of storage at 2040 average solids production.

# Biosolids Cake Storage



- New Cost Estimate = \$3.9M

# BAF Process Blower Replacement

- Why is it needed?
  - 11 existing rotary lobe process blowers
  - Age and excessive maintenance requirements
  - Improve efficiency
- Blower evaluation
  - Compared replacement in kind (rotary lobe), but with added VFD versus replacement with high-speed turbo (HST) blowers.

# BAF Process Blower Replacement

- HST options requires fewer larger blowers
- The energy usage with HSTs is estimated to be approximately 79 percent of rotary lobe blowers with VFDs.
- HST Cost Estimate = \$2.1M
- Rotary Lobe Cost Estimate = \$1.9M
  - Constructing the rotary lobe option is less disruptive to plant operations



# BAF Process Blower Replacement

Blower Type	Capital Cost	Annual Electric Cost	20-year Life Cycle Electric Cost	Life Cycle Cost of Capital and Electric
HST Blowers	\$2,119,000	\$48,900	\$886,500	\$3,005,500
Positive Displacement (Rotary Lobe) Blowers with VFDs	\$1,901,600	\$62,200	\$1,128,300	\$3,029,900
Assumes 3.25% discount rate and 2.3% inflation				

# Equipment Renewal Recommendations – Age and Condition

Item	Facility Plan Update Capital Cost
Influent Lift Pumps	\$720,000
Preliminary Treatment	\$300,000
Primary Clarification	\$354,000
Process Lift Pumps	\$210,000
HVAC Equipment Replacement	\$215,568
Roof Replacement	\$763,000
Standby Generator	\$600,000

# Control System and Card Access System Upgrades

- Major control system upgrades were completed on the UV Disinfection Facility (2017) and the Biosolids Dewatering and Process Facility (2020).
- Pretreatment Building, BAF Building, and Influent Pump Building require upgrades.
- Expand the existing card access system to all external doors on each plant building.

# Control System and Card Access System Upgrades

Item	Facility Plan Update Capital Cost
Control System and Card Access System Upgrades	\$864,000

# Water Supply System

- The WWTP utility water is supplied from an onsite well
- The well has limited capacity and will not meet the demands of a fire suppression system.
- Fire suppression system requirements are still being investigated.
- \$1M cost to connect the City water supply if fire suppression is required

## 4. Implementation and Spending Plan



# Implementation and Spending Plan

Item	2022-2025	2026-2030
Liquid Sludge Storage	\$3,820,313	
Biosolids Cake Storage		\$3,945,875
Influent Lift Pumps	\$720,000	
Preliminary Treatment		\$300,000
Primary Clarification	\$354,000	
Process Lift Pumps		\$210,000
BAF Blower Replacement	\$1,901,600	
Control System and Card Access System Upgrades	\$864,000	
HVAC Equipment Replacement	\$215,568	
Water Supply System		\$1,000,000
Roof Replacement	\$763,000	
Standby Generator		\$600,000
<b>Total</b>	<b>\$8,638,481</b>	<b>\$6,055,875</b>

## 5. Next Steps





## 6. Questions/Comments

