Appendix L

WWTP Review Workshop

**City or Richland
Sewer Comprehensive Plan
Wastewater Treatment Plant**

**Workshop 1
Process and Condition
Assessment
July 9, 2014**

Objectives

- Present/discuss
  - Projected flow and loads vs. permitted values
  - Liquid stream unit process preliminary capacity evaluation
- Present solids stream current and projected flows and loads
  - Run solids model to evaluate current and future loadings
- Gather information on current condition and operational constraints of unit processes.
- Gather information on current operation and maintenance personnel structure and responsibilities

Agenda

- Liquid Stream
  - Permit
  - Unit processes
- Present solids stream flow and loads
- Plant walk-through
- Plant Operations and Maintenance information gathering

Liquid Stream-Flows and Loads

Effluent Permit

EFFLUENT LIMITS: OUTFALL # 001		
Parameter	**Average Monthly** [a]	**Average Weekly** [b]
Biochemical Oxygen Demand (5-day)	30 mg/L, 2,588 lbs/day 85% removal of influent BOD	45 mg/L, 3,882 lbs/day
Total Suspended Solids	30 mg/L, 2,852 lbs/day 85% removal of influent TSS	45 mg/L, 4,278 lbs/day
Fecal Coliform Bacteria [c]	200/100 mL	400/100 mL
pH [d]	Daily minimum is equal to or greater than 6.0 and the daily maximum is less than or equal to 9.0.	
Parameter	**Average Monthly**	**Maximum Daily** [e]
Total Residual Chlorine	Not Applicable	0.5 mg/L
Total Ammonia, as N (NH$_3$-N)	18.5 mg/L	27.7 mg/L

Partial Nitrification Required to Remove ~ 50% of influent Ammonia

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Current Flow and Loads

	Flow (MGD)	BOD (PPD)	TSS (PPD)	BOD mg/L	TSS Mg/L
Average Day	5.70	11,181	12,985	235	273
Maximum Month	6.25	14,099	18,146	270	348
Peak Day	7.50	18,870	26,241	302	420
Peak Hour	9.41	N/A	N/A		
Permit					
Maximum Month	11.4	17,250	21,500	181	226
Percentage of Permit (%)	52	81	85		

Flows are well below permitted values
Loads are approaching 85% trigger value
for rerating study or engineering report

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Projected Flow and Loads

	Flow (MGD)	BOD (PPD)	TSS (PPD)	(BOD) mg/L	TSS Mg/L
Average Day	7.99	15,666	18,190	235	273
Maximum Month	8.78	19,730	25,470	269	348
Peak Day	10.50	26,470	36,740	301	418
Peak Hour	13.18	N/A	N/A		
Permit					
Maximum Month	11.4	17,250	21,500	181	226
Percentage of Permit (%)	77	114	118		

Flows remain below permitted values.
Loads exceed current plant rated capacity

Nutrient Loads

	Nitrogen (TKN)	Phosphorous (TP)
Average Day	1,494	284
Maximum Month	2,063	556
Peak Day	N/A	N/A
Permit		
Maximum Month Ammonia	2,750	N/A
Maximum Month TKN	~2,750	N/A
Effluent Limit at MM Flows Current / (Future)		
Max Monthly (ppd)	986 (1290)	
Max Daily (ppd)	1730 (2540)	

Plant Hydraulics

- Hydraulic Model developed during 2003
- Pinch Points
  - Chlorine Contact Weir (10.6 mgd)
  - Secondary and Primary Weir (14.4 mgd)

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Future Permit Constraints

- Nitrification (fresh water mussel toxicity)
- Human Health Hazard

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Liquid Stream-Unit Processes

Screening System

- Minimal information in existing documentation
- Components
  - Two channels
  - 1 mechanical bar screen (3/8" spacing)
  - 1 manual bar screen
  - Washer/compactor with screenings bin
- Installed in 1986
- Screening system is near the end of its useful life.
- Plant reports recent screen failure caused week long shut-down required use of manual bar screen.

Screening

- Orange Book:
  - 1-3 fps through screens
  - Redundant screen at average annual flows
- Existing screens equipment meets capacity for projected flows
- Screenings Upgrade Project
  - Replace existing screens with new technology
  - Install two new screens to enhance redundancy and eliminate existing step screens at Primary Clarifier Splitter Box
- Key concerns:
  - Hydraulic loss across screens (blinding) with new technology
  - Channel hydraulics considering current channel lay-out
  - Effective screen cleaning

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Washing/Compacting

- Orange Book:
  - Recommends washing screening from less ½ inch openings
  - Recommends compacting to aid in disposal opportunities.
- Existing screenings equipment meets capacity for projected flows
- Screenings Upgrade Project
  - Replace existing washer compactor
  - Relocate in separate space from screens to
- Key concerns:
  - Enhance odor control and treatment in facility
  - Screenings Volume

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Influent Pumping

- Minimal information in previous capacity assessments and facility plans
- Components
  - 4 pumps-(24 mgd firm capacity)
- Installed in 1986
- Key Concerns
  - Reliability
  - Energy Efficiency

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Grit Removal

- Minimal information in existing documentation
- Components
  - Single Grit Basin
  - Aeration System
  - 3 Grit Pumps
  - 2 classifiers
- Installed in 1986 with equipment replacements to maintain reliability

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Aerated Grit Basin

- Orange Book:
  - Depth-to-width ratio: 1.5:1 to 2:1
  - Air supply: 3 to 5 cf per min
  - Detention time: 3 to 5 min @PD
- Existing grit basin meets projected flows
- Key concerns:
  - Effective grit removal
  - Protection of downstream process equipment
  - redundancy

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Grit Pumps/Aeration Equipment/Classifiers

- Orange Book:
  - No recommendations
- Existing auxilliary equipment meets capacity for projected flows
- Key concerns:
  - Pump/Piping and classifier wear
  - Reliability and redundancy

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Primary Splitter Box Band Screens

- No information or drawings on these screens.
- Field investigation of step screens indicated step screens are effective in removing additional material
- Odor production and maintenance demands remain a concern for plant staff

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Primary Clarification

- Removal performance evaluation in 2003 Capacity Assessment
- Components
  - Two Primary Clarifiers with Mechanism
  - 2 pumps that alternate between scum and sludge
- Installed in 1986
- Primary sludge is thickened in the clarifiers prior to conveyance to digestion.

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Primary Clarifiers

- Orange Book:
  - 800-1200 gpd/sf (AA)
  - 2000-3000 gpd/sf (PD)
  - Max 2.5 hr detention time
- Existing primary clarifier design capacity meets projected flows per capacity assessment
- Key concerns:
  - Operational management of two vs one clarifier(s)
  - Particulate removal/thickening capacity of single clarifier at higher flows
  - Primary sludge flow measurement and conveyance

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Sludge/Scum Pumps

- Orange Book:
  - Redundant Pump at average annual flows
- Key concerns:
  - Reliability
  - Operational range to meet future loadings at minimum thickening rates
  - Ability to accurately measure flow to digesters

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Secondary Treatment

- Multiple biological models and process analysis used during capacity assessment
- Components
  - Two six-stage Aeration Basins with optional selector zone
  - Aeration Blowers (2-300 hp and 4-125 hp)
  - Fine bubble strip diffuser
  - Two 110 ft. Secondary Clarifiers
  - Two RAS pumps
  - Two WAS pumps
- Equipment and process upgradesduring multiple plant improvements

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Aeration Basins

- Orange Book:
  - 15 ppd BOD/1000 cf at average
- Other Criteria
  - Min 1.5 day SRT
  - Max MLSS 3000 mg/L
- Existing Aeration Basins design capacity MAY meet projected bod loads.
- Key concerns:
  - Projected loadings exceed rated capacity of Secondary System
  - Transition from operating one to two aeration basins and multiple blowers
  - Redundancy at average annual loads
  - Sufficient SRT during winter months to meet ammonia removal requirements.

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Secondary Clarifier

- Orange Book:
  - 1200 gpd/sf (PD)
  - Redundancy largest unit out-of-service and still 75% design flow capacity
- Other Criteria
  - 30 ppd/SF loading (at 150 SVI)
  - State Point Analysis to determine factor of safety
- Existing secondary clarifier capacity MAY meet projected flow and loads assuming (150 svi and maximum mlss of 2300)
- Key concerns:
  - Historically high RAS rates increases loadings to clarifiers
  - Projected loads exceed the design capacity of existing clarifiers
  - Historically high SVI

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Disinfection

- Limited information in the documentation
- Components:
  - Gas chlorination system,
  - Small mixing/contact system
- Plant is undertaking hypochlorite upgrade with packaged system
- No dechlorination system
- To meet disinfection contact time criteria, outfall must be used.
- Chlorine is measured at contact chamber and at outfall.

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Solids Stream-Loadings

Solids Loadings Current and Projected

	TPS (ppd)	WAS(ppd)
Current		
Average Day	5200	3900
Maximum Month	6300	4800
Peak Day	8300	5600
Projected		
Average Day	7200	5500
Maximum Month	8800	6700
Peak Day	11600	7900

Additional 30% added to TPS data to account for mismeasurement of TPS

Digestion

- Evaluated in 2003 Capacity Assessment. Targeted for improvements
- Components
    - Two 900,000 gallon digesters
    - Recirculation Pumps
    - Conveyance Pumps to Dewatering
    - Gas system
    - Multi fuel boiler
- Installed in 1986
- Key Concerns
    - NFPA 820 Compliance
    - Foaming
    - Capacity to take one digester out of service.

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Condition Assessment Walk-through

- Results included in Sewer Comp Plan.
- Evaluation based on criticality and condition

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Sewer Comprehensive Plant WWTP Chapter Scope

- 2003 plan simply reiterated findings from the capacity assessment.

- Similar level of effort, but identifying current/future capacity limitations

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Summary

- Hydraulic capacity to meet projected flows

- Insufficient BOD and TSS Capacity to meet projected loads

- Rerating study or engineering study required when three consecutive months have flow or loads at 85% of rated capacity

- Influent TSS and BOD measurements may not be accurate

- Primary sludge flow measurements may not be accurate

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