VARELA
Engineering & Management

City of Entiat

WASTEWATER FACILITY PLAN

FUNDED BY:

State of Washington Department of Ecology

Agreement No. WQC-2025-CiEnti-00095

DEPARTMENT OF ECOLOGY
State of Washington

April 2025

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RENEE SWEARINGEN

CITY PUBLIC WORKS DIRECTOR
MARK BOTELLO

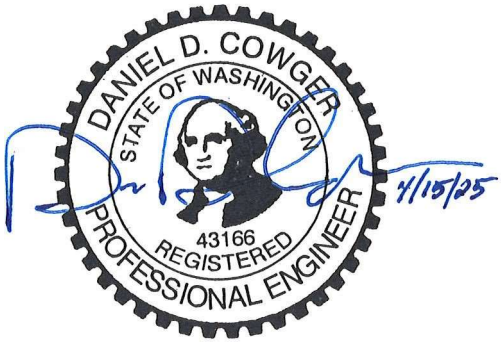
CITY CLERK/TREASURER
ANN BAIRD

CITY COUNCIL
DOUG BROWN
KELLY KRUEGER
MARIE STENBERG
ROBERT HARGADON
CLAY BRANDENBURG

CITY OF ENTIAT
Wastewater Facilities Plan and General Sewer Plan

April 2025

The technical material and data contained in this Report were prepared under the supervision and direction of the undersigned whose seal as a professional engineer licensed to practice as such in the State of Washington is affixed below.



_____
Professional Engineer

Varela Engineering & Management.
601 W. Mallon Avenue, Suite A
Spokane, WA 99201

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Administrative Extension for NPDES Permit No. WA0051276, October 10, 2022
NPDES Permit No. WA0051276; Expiration: July 31, 2022

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City of Entiat, WWTP and Collection System Needs Assessment RH2 Engineering, Inc. August 25, 2023

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Appendix F **Environmental Documentation**
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SEPA Documentation
SERP Documentation

Abbreviations

AC	asbestos cement sewer main material
ADF	average daily flow
ac-ft/yr	acre-feet per year (measure of water volume)
add'l.	additional
ave.	average
BSF	Base Sewage Flow
CCS	cross connection control specialist
CDBG	Community Development Block Grant
cfs	cubic feet per second
CIP	capital improvements plan
CY	cubic yards
DI	ductile iron sewer main material
dia.	diameter
DFW	Wash. State Department of Fish and Wildlife
DOH	Wash. State Department of Health
elev.	elevation
Ecology Or ECY	Wash. State Department of Ecology
ERU	equivalent residential unit
FF	fire flow
FmHA	Farmer's Home Administration, now known as Rural Development
gal	gallons
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GMA	Growth Management Act
LID	local improvement district
max.	maximum
MCL	maximum contaminant level
MDF	max day flow
MG	million gallons
mgd	million gallons per day
mg/L	milligrams/liter
MHI	median household income
mi.	mile
min.	minimum
NRCS	Natural Resources Conservation Service
NEPA	National Environmental Protection Act
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
PHF	peak hour flow
prv	pressure reducing valve
PVC	polyvinyl chloride (plastic) water main material
PWTF	Public Works Trust Fund
RCW	Revised Code of Washington
RD	Rural Development (formerly FmHA)
ROW	right of way
RDII	Rainfall-derived Infiltration and Inflow
SCADA	supervisory control and data acquisition (i.e., computerized control system)
SEPA	State Environmental Protection Act
UGA	urban growth area
ULID	utility local improvement distric

GO	general obligation bond
GSP	General Sewer Plan
GWI	Ground Water Infiltration
HP	horsepower
IOC	inorganic chemicals
LF or L.F.	lineal feet
VOC	volatile organic chemicals
WAC	Washington Administrative Code
WSDM	Water System Design Manual (published by DOH)
WSP	water system plan
WTP	water treatment plant
WWFP	wastewater facility plan
WWTP	Wastewater treatment plant
WWTF	Wastewater treatment facility

EXECUTIVE SUMMARY

Section 1: Introduction

- This document is a General Sewer Plan (GSP) and Wastewater Facility Plan (FP) for the City of Entiat prepared in general conformance with WAC 173-240-050 and WAC 173-240-060.
- The City of Entiat manages its wastewater system in accordance with the National Pollution Discharge Elimination System (NPDES) Waste Discharge Permit Number **WA0051276** administered by the Department of Ecology (ECY) effective date June 21, 2017. See **Appendix A**.
- Entiat completed comprehensive wastewater treatment plant upgrades in 2009 that are approaching 85% capacity and the City is initiating planning steps to increase plant capacity. The goal of the FP-GSP is to provide the City with a capital planning document with improvements to resolve the City's existing capacity issues and to work as a roadmap for their wastewater treatment and collection system for the next 20-years planning period.

Section 2: Basic Planning Data

- The City of Entiat is located in the center of Washington State in Chelan County, as shown on **Figure 2-1**; and lies 3 miles north of the junction of State Highway 97 and State Route 2, approximately 17 miles NNE of Wenatchee, 130 miles W of Spokane, and 91 miles S of the Canadian border.
- Entiat's existing boundaries including City limits, sewer service area, land use, and zoning are show in **Figures 3-1** and **4-1**.
- Entiat has a city service area of approximately 2.18 square miles.
- Entiat's history and natural environment are documented in **Section 2**.
- The City's sewer system is owned and operated by the City and governed by the City's municipal City Code. Section 13 of the code regulates the City's water and wastewater systems.

Section 3: Wastewater Planning

- The selected planning period for this GSP is 20-years. 40-year projections are also included for the purpose of sizing infrastructure with a service life greater than 20-years.
- Entiat's existing population is 1,360. Historical population figures are shown in **Table 3-1**.
- OFM, Chelan County, and City Comprehensive Plan growth projections are discussed in **Sections 3.4**.
- City selected growth rate rational is documented in **Section 3.4.5**. The City estimates near term growth (within the next 7 years) at 380 ERUs (see **Table 3-5**); and for the remainder of the planning period an annual growth rate of 2.0% per year. See **Exhibit 3-1** for a comparison of historical growth and projected growth.
- The following table, excerpted from **Section 3**, shows Entiat's growth projections:

Table ES3-6 Population Projections for Wastewater Planning

Year	Population	Annual Growth Rate	% of Existing
2024 (existing)	1,360	-	-
2031 (7-yr)	**2,314**	**7.9%**	**170%**
2044 (20-yr)	**3,000**	**2.0%**	**231%**

- The City would like the treatment plant to be expandible to twice the design capacity. This means the plant could be expanded to serve a population of roughly 6,000.
- Winter water use for 2022 and 2023 was evaluated and used to estimate existing ERUs. **Table 3-8** estimates existing ERUs and is summarized as follows:

Residential ERUs:	541
Non-residential ERUs:	167
Total ERUs:	708

- Wastewater Flows and loadings from 2019 through 2023 were evaluated. **Tables 3-13** to **3-20** and **Exhibits 3-2** to **3-8** document existing flows and loads.
- The following table is excerpted from **Section 3** and summarizes existing and projected flows and loads.

Table ES3-19 Projected Flows and Loadings and Existing Design Capacity

Flow or Loading	Existing (2024)	Criteria	Type	Projected (2044)	Existing WWTF Design Capacity
Service Area Population	1,360			3,000 (1)	
Avg Annual Flow (mgd)	0.095	100	gpcd	0.259	-
Max. Month Flow (mgd)	0.099	1.04	PF (3)	0.269	0.150 (4)
Max. Day Flow (mgd)	0.133	1.41	PF (3)	0.365	0.200 (5)
Peak Hour Flow (mgd)	0.352 (2)	3.7 / 3.4 (2)	PF (3)	0.892	0.480 (5)
Avg Month BOD Load (lbs/d)	173	0.20	lbs/d/cap	501	250 (4) / 302 (5) (6)
Max Month BOD Load (lbs/d)	226	-	n/a	-	
Avg Month TSS Load (lbs/d)	137	0.20	lbs/d/cap	465	250 (4) / 331 (5) (6)
Max Month TSS Load (lbs/d)	186	-	n/a	-	

1. *See **Section 3.4**.*
2. *Peak flow estimated using existing population and method outlined in Section C1-3.3.2 of the Criteria for Sewage Works Design – Ecology Publication # 98-37 WQ.*
3. *Peaking factor is the ratio of the peaked flow to average annual flow.*
4. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276).*
5. *From Facility Design Criteria in the 2007 WWTP Construction Drawings.*
6. *The permitted design capacity for both BOD and TSS are lower than the WWTP design capacity indicated on the 2007 construction drawings and noted in the ECY fact sheet. Both capacities (permitted and design) are shown in the table. The permit does not indicate if the limit is based on average or maximum load; however, it is assumed it is based on max month. This is consistent with the RH2 2023 system evaluation technical memorandum.*

- The following table excerpted from **Section 3** shows the existing/projected flows as a percent of the existing WWTP design capacity. As can be seen from this table, the existing WWTP is nearing capacity under existing flows and cannot meet future projected flows.

Table ES3-20 Existing/Projected Flows/Loads as Percent of WWTP Design Capacity

Flow or Loading	Existing (2024) % of Design Capacity [1]		Projected (2044) % of Design Capacity [1]	
Max. Month Flow (mgd)	66%		180%	
Max. Day Flow (mgd)	67%		183%	
Peak Hour Flow (mgd)	73%		186%	
	Permitted [2]	Design [3]	Permitted [2]	Design [3]
Max Month BOD Load (lbs/d)	90%	75%	241%	200%
Max Month TSS Load (lbs/d)	74%	56%	225%	170%

1. *Percentages based on flow/load and design capacity summary in **Table 3-19**.*
2. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276).*
3. *From Facility Design Criteria in the 2007 WWTP Construction Drawings.*

Section 4: Wastewater Collection System

- Entiat's collection system is shown in **Figure 4-1** and includes approximately 74,000 LF of sewer pipe ranging from 4" to 12" diameter, 291 manholes, and 5 lift stations.
- Entiat's wastewater collection system history is described in **Section 4.1.1**. The majority of the collection system was installed in 1977 and 1978.
- **Capacity Analysis:**
    - The City does not report any known capacity issues.
    - The existing collection system consist of 6 sewer basins served by 5 trunk mains. See **Figure 4-2**. **Table 4-5** provides growth assumptions and distribution of projected ERUs used for modeling.
    - Hydraulic modeling of the system was completed and evaluated existing conditions as well as projected 20-year and 40-year conditions. Conclusions include:
        - The majority of Entiat's collection system has significant additional capacity. See **Figure 4-3.**
        - Hydraulic deficiencies occur in Trunk Main 4 under current conditions at two locations. The following upgrades are recommended:
            - Upsize 8" main in SR97 from Stoneridge St. to Pine Meadows Dr. to 12" diameter – $550K
            - Upsize 8" main in Shamel St to the Shamel St lift station to 12" diameter – $656K
        - Trunk Mains 1 and 3 have segments that are nearing capacity under future conditions. If lift stations are upgraded, parts of the collection system may need to be upgraded to pass the increased flows. Additional testing is needed to further

determine exiting peak flow condition and recommended upgrades. See Discussion in **Section 4.2.4.3** for additional evaluations needed.

- **Collection System Condition Evaluation:**
    - City staff were interviewed as part of this evaluation and available operations information reviewed. In general, the City reports that Entiat's collection system is in good condition with few reported problems.
    - System GIS mapping and manhole inspections were completed as part of this planning process.
    - Condition issues and recommendations are included in Section 4.3.1. Notable recommendations include:
        - Some existing manholes are old brink-lined manholes and should be replaced.
        - Root intrusion is occurring in some older segments. Recommendations for rehabilitation or replacement are provided ranging in cost from 250K to 915K.
        - Recommend the City upgrade their RV dump station ($100K to $500K).
- **Lift Station Evaluation:**
    - The City operates five wastewater lift stations. The lift stations were evaluated and following summarizes the findings. Notable recommendations include:
        - Add emergency backup generators to all City lift stations except the lake Front Lift Station (4 total).
        - Complete a capacity evaluation of the Shamel St. Lift Station to estimate existing/future peak flow. Upgrade pumps as needed to accommodate. Depending on capacity change, the downstream trunk main may need to be upsized. See **Section 4.2.4.3**.
- A summary of the collection system improvements recommended in the 20-year planning period are included in **Table 4-15** which is excepted below:

Table ES4-15 Summary of Proposed Improvements

Description	Estimated Cost
Existing to 20-Yr Improvements:	
Collection System - Capacity Improvements:	
4.2.4.2 – New 12" Main in SR97 (Trunk Main 4)	Cost: $520K
4.2.4.2 – New 12" Main in Shamel St. (Trunk Main 4)	Cost: $656K
4.2.4.3 – TBD - Upsize Trunk Main 3 [1]	Cost: TBD - $1 Million
Collection System - Condition Improvements:	
4.3.1 – Replace brick lined manholes (9 @ $7,500)	Cost: $67.5K
4.3.1 – CIPP line or Replace 8" Mains on Kinzel and Hyland Ave.	Cost: Clean/Video: $30K CIPP line: $250K Or Replace [2]: $915K
4.3.1 – RV Waste Disposal Station	Cost: $100K to $500K [3]
Lift Stations – Improvements:	
4.4.1.1 – School Street Lift Station – Backup Generator	Cost: $100K
4.4.1.3 – Shamel Street Lift Station – Evaluation/Improvements	Cost: LS Eval/testing: $20K Upsize pumps: $150K Upsize FM: TBD Generator: $100K
4.4.1.4 – Stone Ridge Lift Station – Backup Generator	Cost: $100K
4.4.1.5 – Shadow Ridge Lift Station – Backup Generator	Cost: $100K

1. *Dependent upon updated peak flow estimate. See recommendations in **Section 4.4.1.3** regarding obtaining operational and flow data to update the peak flow estimate. Cost based on 31% replacement of Trunk Main 3.*
2. *See **Section 4.3.1**. Based on video inspection, if CIPP lining is not possible due to pipe condition then full replacement will be required.*
3. *Cost depends on options and sophistication of the RV dump station and thus a cost range is included. See **Section 4.3.1**.*

Section 5: Collection System I/I Evaluation

- City wastewater flows were reviewed and two methods used for calculating collection system infiltration and inflow (I/I) (see **Section 5.3**).
    - **Method 1** – Annual I/I Report based on ECY's "Information Manual for Treatment Plant Operators, Appendix I"
    - **Method 2** – EPA Region 1 Guide (June 2014): "Estimating Infiltration and Inflow"

- The 2022/2023 influent flow data show that the combined sanitary base flows, groundwater infiltration, and inflow are low and do not exceed the EPA guidelines for excessive infiltration or excessive inflow.
- This evaluation confirms the previous findings of low I/I in the collection system. While system I/I is not excessive, it is still recommended the City continue to find and eliminate any known sources of I/I.

Section 6: Existing Wastewater Treatment System

- This section provides a review of Entiat's existing Wastewater Treatment Plant, influent and effluent flows/loads, treatment performance, and ability to meet projected flows/loads.
- The existing treatment plant was installed in 2007. The treatment system consists of headworks with mechanical screening and grit removal, two SBR basins, UV disinfection, aerobic digestion, belt filter press dewatering, and the discharge outfall. **Table 6-1** summarizes current design parameters. History and description of the existing treatment plant is included in Section 6.2 and Section 6.2,
- The City of Entiat's WWTP discharges to the Columbia River and is regulated under NPDES Permit WA-0020559. Discharge limits apply to effluent BOD, TSS, fecal coliform, and pH as summarized in **Table 6-2**.
- Treatment plant performance:
    - Influent flow and loading data indicate the facility is operating near capacity but effluent consistently meets permit limits for BOD, TSS, fecal coliform, and pH (see **Tables 6-3 to 6-5**; **Exhibits 6-3 to 6-19**). Effluent ammonia, while not having permit limits, frequently has very high concentrations.
- Treatment plant capacity:
    - Influent flow and loading data from 2019–2023 indicate the facility is operating near capacity. BOD loadings exceeded 85% of design capacity in multiple months.
    - While the WWTP is performing within permit limits, it is nearing design constraints and projected flows and loadings under 20-year growth scenarios will exceed design capacity.
    - System expansion is needed to accommodate projected growth and maintain compliance.
- Remaining plant capacity and plant optimization:
    - The City issued a moratorium to avoid increasing influent flows that would exceed treatment plant capacity. Since the WWTP upgrades will take time to construct, in the interim the City would like to be able to allow some limited additional service connections.
    - **Section 6.9.1** provides an estimate of theoretical remaining treatment plant capacity. However, existing operational conditions are not ideal (high MLSS and low DO in the SBR basins) and periodically nitrification is being inhibited resulting in spikes in effluent ammonia.
    - **Section 6.9.2** provides operational recommendations that should be implemented immediately. These recommendations should be completed before additional service connections are allowed.

- The City does not currently have an effluent ammonia limit. However, due to the periodic elevated ammonia, a future limit could be imposed. See optimization recommendations in **Section 6.9.2**. The City also suspects influent toxicity may be partly responsible. It is recommended the City locate and eliminate any potential sources of influent toxicity.
- Effluent temperature and mixing zone evaluations were completed and are documented in **Sections 6.11 to 6.15**. Notable findings include:
    - The reasonable potential evaluation for controlled substances indicate that there is no reasonable potential to exceed receiving water quality for effluent ammonia, copper, and zinc using calculated dilution factors for the projected flows.
    - The US Environmental Protection Agency (EPA) prepared the "Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load", August 13, 2021 which imposes temperature waste load allocations (WLA) for municipal dischargers, dams, and tributaries. Entiat has a WLA that allows the current permitted discharge to continue but does not allow for growth.
    - Based on the effluent temperature evaluation, we recommend the City reserve room on the site near the outfall to allow for heat reduction measures when required by a future NPDES permit. We also recommend the City participate in TMDL implementation discussions ECY, your permit manager, and the other nearby municipalities impacted by the TMDL.

Section 7: Treatment System Evaluation and Improvements

- This section provides an evaluation and recommendations for the individual components of Entiat's existing wastewater treatment plant (WWTP) including a condition assessment and ability to meet the design criteria.
- Recommended treatment plant improvements:
    - **Influent Metering** – Replace meter and incorporate into new headworks facility.
    - **Headworks** – Construct new headworks facility.
    - **Secondary treatment system (SBR)** – Maintenance upgrades needed to the existing SBR system. Secondary system expansion needed to accommodate future flows/loads – see below.
    - **UV Disinfection** – Upgrade UV disinfection system w/ new in-vessel reactors.
    - **Solids Handling** – New facilities needed – see below.
    - **Electrical and Controls** – Upgraded electrical and controls including MCC, SCADA system and backup generator to support new facilities.
    - **Yard Lift Station, CCC system, Outfall, Misc. Systems** – Upgrades needed for reliability and code compliance.
    - Total estimated capital cost for recommended improvements (not including secondary system expiation or solids handling improvements): **$7.2M**.
- Secondary treatment expansion evaluation:

  - Five alternatives were explored:
    - **Alt 1:** Expand existing SBR system
    - **Alt 2:** Convert to continuous flow with clarifiers
    - **Alt 3:** Membrane bioreactor (MBR)
    - **Alt 4:** Aero-Mod or similar proprietary system
    - **Alt 5:** Oxidation ditch with clarifiers
  - Alternatives were evaluated based on performance, cost, operational complexity, and site suitability.
  - Capital costs range from $3.8M (Alt 1) to $7.4M (Alt 2).
  - Weighted ranking and qualitative comparison shown in **Table 7-22**.
  - **Alt 1: Expand Existing SBR System** ranked highest overall due to lowest capital cost, compatibility with existing infrastructure, and operational familiarity. Capital cost is estimated at **$3.8M**.
- Solids processing recommendations:
  - Solids production expected to double by 2044.
  - Aerobic digester volume and dewatering equipment are undersized and at the end of their service life.
  - Recommended improvements include:
    - New aerobic digester tanks
    - New dewatering facility w/ onsite storage for dewatered biosolids
    - New dewatering equipment (screw press)
  - Total estimated capital cost for solids handling improvements: **$3.5M.**
- Reclaimed water evaluation:
  - Potential applications for reclaimed water were evaluated and include irrigation for Entiat City Park and Entiat Irrigation District.
  - Significant capital costs, regulatory coordination, and uncertain cost recovery make reclaimed water infeasible at this time.

Section 8: Implementation and Financing

- The following provide as summary of capital improvements and project budget including inflation estimates for funding purposes.

Table ES8-1 Capital Improvements Plan and Estimated Project Costs

Description	Estimated Costs
Summary of Plant Improvements	$7,152,000
Secondary Treatment SBR Plant Expansion	$3,531,000
Plant Solids Handling Upgrades	$3,840,000
Collection System Upgrades Budget	$1,000,000
Total	**$15,523,000**

Table ES8-2 Estimated Project Budget for Funding

Description	Estimated Costs
Estimated Capital Cost	$15,523,000
Estimated Rate of Annual Inflation	3.0%
Inflation Allowance - years assumed	4
Total Inflation Contingency	12.6%
Total	**$17,470,000**

- This section explores a variety of funding options.
- ERU's revenues, O&M costs, and cost of service are summarized in **Section 8.3**.
- Rate impact for the proposed improvements based on various funding scenarios are summarized in the following table. **Table 8-7** provides additional detail.

Table ES8-6 Funding and Rate Impacts Summary (Abbreviated Table)

Description / Assumptions:	Ecology (ECY) Funding [1]		Rural Develop. (RD) Funding [2]		RD + ECY + Appropriation	
	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	Scenario #6 [3]
	ECY Loan Only	ECY Loan + Hardship Grant	RD Loan Only	RD Loan + RD Grant	ECY Hrd + RD Loan / Grant + Appropriation	Same as #5 + Increased Appropriation
Total Estimated Project Cost	$17,470,000					
Approximate Loan/Grant Ratio	100% / 0%	71% / 29%	100% / 0%	55% / 45%	39% / 61%	20% / 80%
Loan terms	30 years, 2%, 20% reserve		40 years, 3.25%, 10 % reserve		Combination of previous	
Potential Rate Impacts:						
Approx. Sewer Rate Req'd ($/mo/ERU)	$198	$166	$190	$143	$127	$108
Current (2025) Sewer Rate ($/mo/ERU)	$95	$95	$95	$95	$95	$95
Rate Impact ($/mo/ERU)	**$103**	**$71**	**$94**	**$48**	**$32**	**$12**

- Following summarize project timeline and next steps:

Table ES8-8 Projected Timeline Estimate

Task/Description	Estimated Timeline
WWFP/GSP Review and Approval	May 2025
Submit WWFP/GSP to ECY	May 2025
WWFP/GSP Review, Revisions, ECY approval	Aug – Sep 2025
Design Phase Timeline (funding dependent)	
Design funding:	
Submit PWB application for design loan/grant	May 2025
Submit ECY SCPPL request for design funding (potential 50% forgivable loan)	October 2025
Determine local contribution City will include (City decision)	July 2026
Design Engineering/P&S/bid documents	Sep 2025 – Aug 2026
ECY review/approval	Aug – Dec 2026
Environmental and Culture Review Process and Clearances	
If RD funding is utilized (see Construction Funding Acquisition), environmental clearances required prior to RD funding obligation. Conduct environmental in conjunction with design phase	Jan – Aug 2026
Construction Funding Acquisition	
Funding acquisition timeline is variable – duration could range from 1 year to 3 years, or longer, depending on availability of funding, City's tolerance of rate increase levels, and City involvement in appropriation requests • For planning, estimate 30-month (2.5 year) funding timeline	May 2025 – Oct 2027
Submit funding requests: • ECY SCPPL request construction funding • PWB construction funding • RD funding application (requires environmental clearances) • State appropriation request • Federal appropriation request	 Sep 2025 Jun 2025 (Jun 2026) Dec 2025 – Jan 2026 Jan 2026 (& 2027) Mar 2026 (& 2027)
After initial funding indications, assess whether a phased implementation plan is necessary. Developed proposed phasing plan, timeline, and cost breakouts anticipated	May 2026 – Dec 2026
IACC conference/set up tech team meeting Oct 2025 (and Oct 2026 if needed)	Oct 2025 (& 2026)
Monitoring / updating funding status and development; coordination	Monthly / Quarterly
Construction Phase (funding dependent)	
• Bid/award/notice to proceed	Jan – Mar 2028
• Construction phase	Apr 2028 – Oct 2029

- Additional implementation discussion is included in **Section 8.5**.

1.0 Introduction

Varela Engineering and Management (Varela) entered into an agreement for engineering services with the City of Entiat in December 2023 to prepare a Wastewater Facility Plan (FP) and General Sewer Plan (GSP) consistent with WAC 173-240-060 and WAC 173-240-050. The FP-GSP is intended to address planning, evaluation and recommendations for the City's sanitary collection system and treatment facility, and to provide a long-term planning tool for the City's next 20-year planning period.

This work is funded in part by a loan through the Washington State Department of Ecology (ECY) State Revolving Fund (SRF), Agreement No. WQC-2025-CiEnti-00095.

1.1 Purpose and Scope

This document is a General Sewer Plan (GSP) and Wastewater Facility Plan (FP) for the City of Entiat prepared in general conformance with WAC 173-240-050 and WAC 173-240-060.

Entiat completed comprehensive wastewater treatment plant upgrades in 2009. The upgrade included metering upgrades, headworks improvements, installation of two sequencing batch reactors, UV disinfection, and other site and solids handling improvements. However, the 2009 upgrades are approaching 85% capacity and the City is initiating planning steps to increase plant capacity.

The City also issued a moratorium on development (Ordinance 2022-850) last year to ensure that the available sewer capacity is not over committed to proposed developments. The moratorium specifically notes the need to complete water and sewer planning documents. The City also completed a preplanning WWTP and collection system needs assessment which also recommended the City complete a GSP and FP. The City is initiating this planning to maintain sufficient capacity and system serviceability for the next 20 years.

This Engineering Report (FP and GSP) and associated work includes the following:

- Document current and projected wastewater flows and loads
- Document planning assumptions and allocation of future growth consistent with City planning
- Treatment plant evaluation; identification of system deficiencies and recommended improvements
- Alternatives analysis for treatment plant capacity improvements
- Treatment plant upgrade recommendations and implementation
- Collection system hydraulic modeling and capacity/condition evaluation; identification of system deficiencies and recommended improvements
- Estimation of costs, rate impacts, and financial planning

The goal of the FP-GSP is to meet the requirements of 173-24-050 / 173-240-060; and to provide the City with a capital planning document with improvements to resolve the City's existing capacity issues and to work as a roadmap for their wastewater treatment and collection system for the next 20-years planning period.

1.2 City Participation

The City contributed significantly to the evaluations documented herein including review/input on technical memorandums (TM-01 to TM-09), and review of this final report. Public works committee meetings to

discuss findings were held on: 6/5/2024, 9/18/2024, and 3/10/2025 and included City staff (public works staff and WWTP operations staff) and elected officials (mayor and council members).

1.3 Regulatory Requirements

The following regulatory requirements are used in this report.

City "National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit"

The City of Entiat manages its wastewater system in accordance with the National Pollution Discharge Elimination System (NPDES) Waste Discharge Permit Number **WA0051276** administered by the Department of Ecology (ECY) effective date June 21, 2017. See **Appendix A**.

The permit expired on July 21, 2022. The City received an Administrative Extension for NPDES Permit No. WA 0051276 on October 10, 2022. See **Appendix A**.

1.4 Approvals Required

This Engineering Report and future plans/specifications must be submitted to the Washington State Department of Ecology (ECY) for review and approval prior to implementing.

2.0 Basic Planning Data

2.1 Introduction

This section provides general planning information that affects Entiat's wastewater treatment system including general planning information, background on Entiat's climate and environment, land use planning, and design standards and organizational rules/regulations that govern the system.

2.2 Location and Ownership/Management

The City of Entiat is located in the center of Washington State in Chelan County, as shown on **Figure 2-1**. The City lies 3 miles north of the junction of State Highway 97 and State Route 2, approximately 17 miles NNE of Wenatchee, 130 miles W of Spokane, and 91 miles S of the Canadian border. Entiat has a city service area of approximately 2.18 square miles.

The wastewater collection system and treatment system are owned, operated and maintained by the City of Entiat. The City of Entiat was incorporated May of 1944 and is a non-charter, code city. Entiat has a "Mayor-Council" form of government, as opposed to a "Council-Manager" form of government pursuant to CH. 35A.12 RCW The Mayor and council govern the functions of the City.

Contact information as follows.

	City of Entiat
Address:	14070 Kinzel St. Entiat, WA 98822
Phone:	(509) 784-1500

City Leadership

Leadership and decision making is provided by the Mayor and Council.

Mayor:	Renee Swearingen
Council:	Seat #1: Doug Brown Seat #2: Kelly Krueger Seat #3: Marie Stenberg Seat #4: Robert Hargadon Seat #5: Clay Brandenburg

Public Works

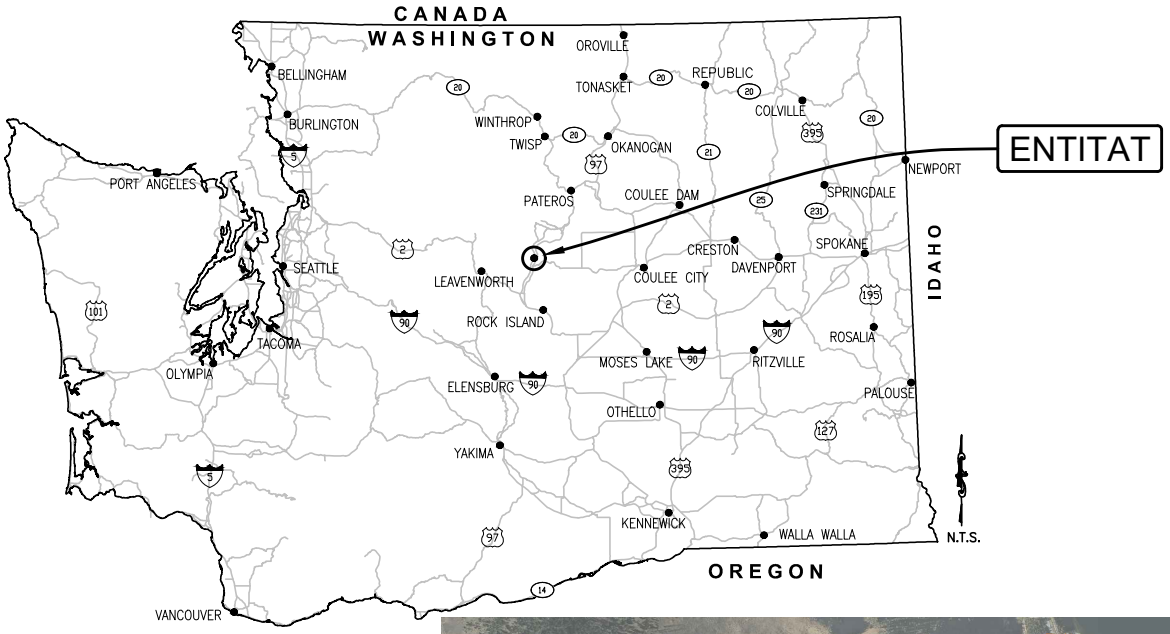
The daily operations to operate and maintain the wastewater collection system is performed by the Public Works Department lead by the Public Works Director and supported by his maintenance staff.

Public Works Director:	Mark Botello

Administration

Supporting the City leadership and public works is the administrative staff.

Clerk-Treasurer:	Ann Baird





1950106-Fig 2-1_Vicinity Map

SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-01-06
DATE:	1/24/24

VARELA
Engineering & Management

CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

VICINITY MAP

FIGURE
2-1

Clerk-Treasurer: Chelsea Potter

2.3 City Boundaries and Service Area

The existing City boundaries including City limits, sewer service area, land use, and zoning are show in **Figures 3-1** and **4-1.**

Growth within the UGA is anticipated to occur as described in other sections of this report. The majority of the sewer system connections are single family residential. The sewer service also serves some commercial and industrial connections.

2.4 System Background

2.4.1 *General Information*

Following is general Information regarding the City of Entiat:

Elevation:	930 feet
Land Area:	2.82 square miles
County:	Chelan
Year Incorporated:	1944
The Average Maximum Temperature:	87 (F)
The Average Minimum Temperature:	21 (F)
Average Total Precipitation:	13.14 inch
Average Total Snowfall:	39 inches

2.4.2 *History of Entiat*

Entiat, the smallest incorporated municipality in Chelan County, is located on the west bank of the Columbia River, approximately halfway between Lake Chelan to the north and Wenatchee to the south. The Entiat Valley was difficult to reach and did not see permanent non-Native settlement until the late 1880s. Originally part of Okanogan County, in 1899 the region was included in the newly created Chelan County. Early settlers in the Entiat Valley relied primarily on logging, farming, and ranching. Aided by irrigation projects, fruit production soon became a primary economic activity. The Great Northern Railway bridged the Columbia River south of Wenatchee in 1892, and more than two decades later ran its line north along the river's west bank, securing Entiat's continued existence and at least modest prosperity.

Perhaps uniquely, Entiat has had to move twice since its founding in the 1890s, forced first by fire and, 40 years later, by inundation when the Rocky Reach Dam was completed. The town's last move, in the early 1960s, presented unique challenges for the community. But its people persevered, and between 1970 and 2020 the town's population more than tripled.

Entiat, Washington, has a deep-rooted history tied to its waterways and infrastructure development. The area was originally home to the Chinook tribe, who called it “Enteatqua,” meaning “Rapid Water,” a name reflecting its location at the confluence of the Columbia and Entiat rivers. Chief Silico Saska’s camp became a central trading hub, marking the beginnings of a community that would face numerous transformations.

The first settlers, arriving in the late 19th century, established a vibrant community on the north side of the Entiat River. Wooden structures housed essential businesses, and the first sawmills provided jobs while also contributing to the area's growing infrastructure. In 1908, T.J. Cannon developed a mill dam to supply electricity to Entiat and Waterville, further modernizing the town. By the early 1900s, a basic water system

was in place, pumping water from local springs into a reservoir. Despite these advancements, the town was devastated by a fire in 1913, destroying most structures except for six. This event forced the community to rebuild closer to the railroad, which had been constructed in 1914 to support the burgeoning fruit industry.

Rebuilding after the fire, the second town featured modern amenities, including sidewalks and improved water infrastructure. A new school, churches, and fruit warehouses supported the growing population. However, in 1921, another fire struck, destroying the remaining structures from the first town and further challenging the community's resilience. By the mid-20th century, the construction of the Rocky Reach Dam on the Columbia River once again uprooted Entiat. The dam's reservoir flooded the second townsite, necessitating a third relocation to higher ground.

The Rocky Reach Hydroelectric Project marked a pivotal moment for Entiat. Residents were compensated by the Chelan County Public Utility District (PUD) and relocated to a newly planned townsite. Modern water and sewer systems were installed, providing the foundation for the town's continued growth. However, not all businesses rebuilt, leading to a more dispersed layout along Highway 97A.

2.4.3 *Wastewater System Background*

The City of Entiat operates a Publicly Owned Treatment Works (POTW) facility under the National Pollutant Discharge Elimination System (NPDES) Permit No. WA 0051276. The City's facility is referred to herein as the Wastewater Treatment Plant (WWTP). The City of Entiat, with an estimated population of 1,360 maintains this wastewater collection system and treatment facility within the City limits. The facility is located along the Columbia River in Chelan County, Washington. Collection is performed using a conventional gravity system with the aid of five lift stations. The system primarily serves residential services, with some commercial and industrial services along US Highway 97A (US 97A) and Shamel Street.

In 1958 the construction of Rocky Reach Dam drastically altered the landscape, flooding Entiat's second townsite. This prompted a second relocation, with residents and businesses moving to higher ground. As part of this transition, the Chelan County Public Utility District (PUD) installed new water and wastewater lines, providing Entiat with a more comprehensive system. This upgrade marked a significant shift, setting the stage for further improvements in the years to come.

The City's original treatment plant and most of the collection system were built in 1977 and 1978, with significant upgrades in 2009. The original treatment system consisted of a headworks, aeration basin (oxidation ditch), secondary clarifier, chlorine contact chamber, belt filter press, and outfall structure. The headworks included a communitor and grit chamber; however, the grit chamber required periodic cleaning which was addressed by the treatment plant operator at the time by letting it build up and then having a septage company remove and dispose of the grit.

In 2009, a major upgrade was completed to increase the WWTP capacity and address deficiencies identified in the City's Comprehensive Sewer Plan (CSP) and Facility Plan (FP). Treatment plant upgrades included a mechanical bar screen and grit removal at the headworks, two SBRs, a UV disinfection system, and other facility improvements. The secondary clarifier was removed, and the abandoned oxidation ditch was converted to an aerobic digester for solids handling. The chlorine disinfection system was replaced with UV disinfection.

The wastewater collection system consists of approximately 61,000 lineal feet (LF) of gravity main and 12,000 LF of pressure main. Much of the gravity system, 50,000 out of the 61,000 total, is 8-inch polyvinyl chloride (PVC) pipe.

Table 2-1 General Information for Entiat WWTP

Owner:	City of Entiat
Facility Name and Address:	City of Entiat Publicly Owned Treatment Works 1961 Lakeshore Drive Entiat, WA 98822
Phone Number:	(509) 784-1500
NPDES Permit Number:	WA 0051276
Type of Treatment:	Sequencing Batch Reactors and UV disinfection
Discharge location:	Columbia River, River Mile 485.0 Latitude: 47° 40' 41" N Longitude: 120° 12' 20" W
Water Body ID Number:	WA-CR-1040

2.5 Natural Environment

2.5.1 *Climate*

Entiat's climate is characterized as Continental with hot dry summers and mild to severe winters. Prevailing winds come from the west and southwest most of the year. January / December Average low of 19° F. July average high of 82.2°F. Extreme recorded temperatures range from a winter low of minus 15 degrees Fahrenheit to a July reading of 110 degrees Fahrenheit.

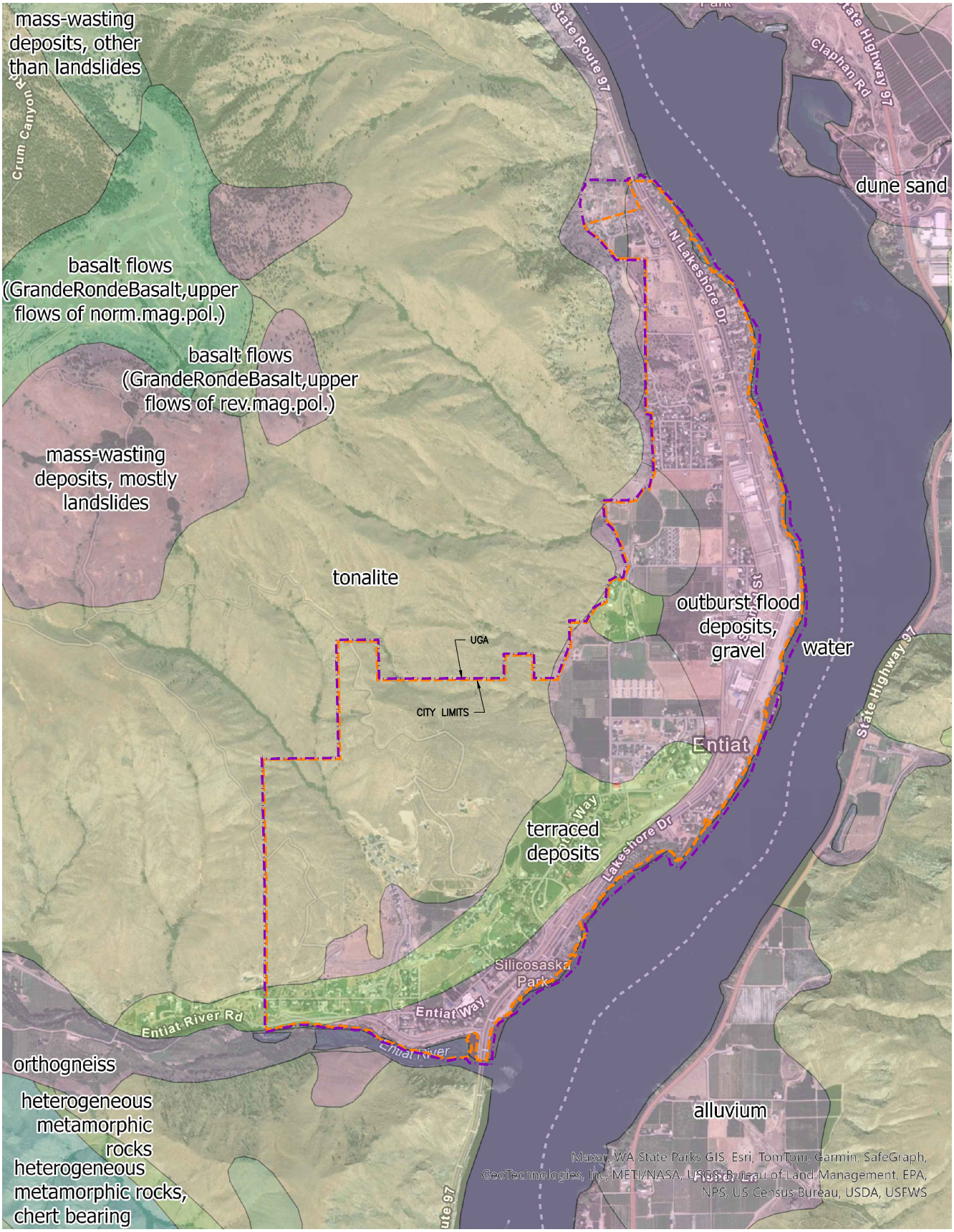
Average annual precipitation 13.14 inch with the majority falling between November to March with December being the wettest month with an average of 2.39 inches. Average annual snowfall 39 inch. The dry season lasts from late-June to early October withy August being the driest month with an average of 0.26 inches of precipitation.

2.5.2 *Geology and Soils*

NRCS Surface Geology for the Entiat area is shown in **Figure 2-2** and NRCS Soil Survey is shown in **Figure 2-3**.

The geology of the planning area is characterized by underlying rock formations, covered by a shallow mantle of soils in the valleys with frequent rock outcroppings in the mountainous areas. Throughout much of the planning area the bedrock is igneous in nature, with granite and diorite predominating. Mineralized formations occur in the Entiat Planning Area, which produced a total of 66.5 million dollars of copper, gold, zinc, and silver from 1938 through 1957. Glacial features such as cirques, truncated spurs, moraines, horns and U-shaped valleys are common in the mountains, while alluvial deposits and glacial drift are found along the valley floors.

Soils are the product of climate, slope, geology and vegetation with the added dimension of time. The combined working of these factors has resulted in a wide variety of soil conditions in the planning area. Throughout much of the area, the soil is underlain with alluvial deposits and glacial drift. Volcanic pumice and ash from the Glacier Peak region have added substantially to the depth and character of the soil in many areas. The mountainous terrain, with characteristically steep slopes and high elevations, consist largely of rock outcroppings and shallow soils.



1950106-Fig 2-2_Surface Geology

SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
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DATE:	1/24/24

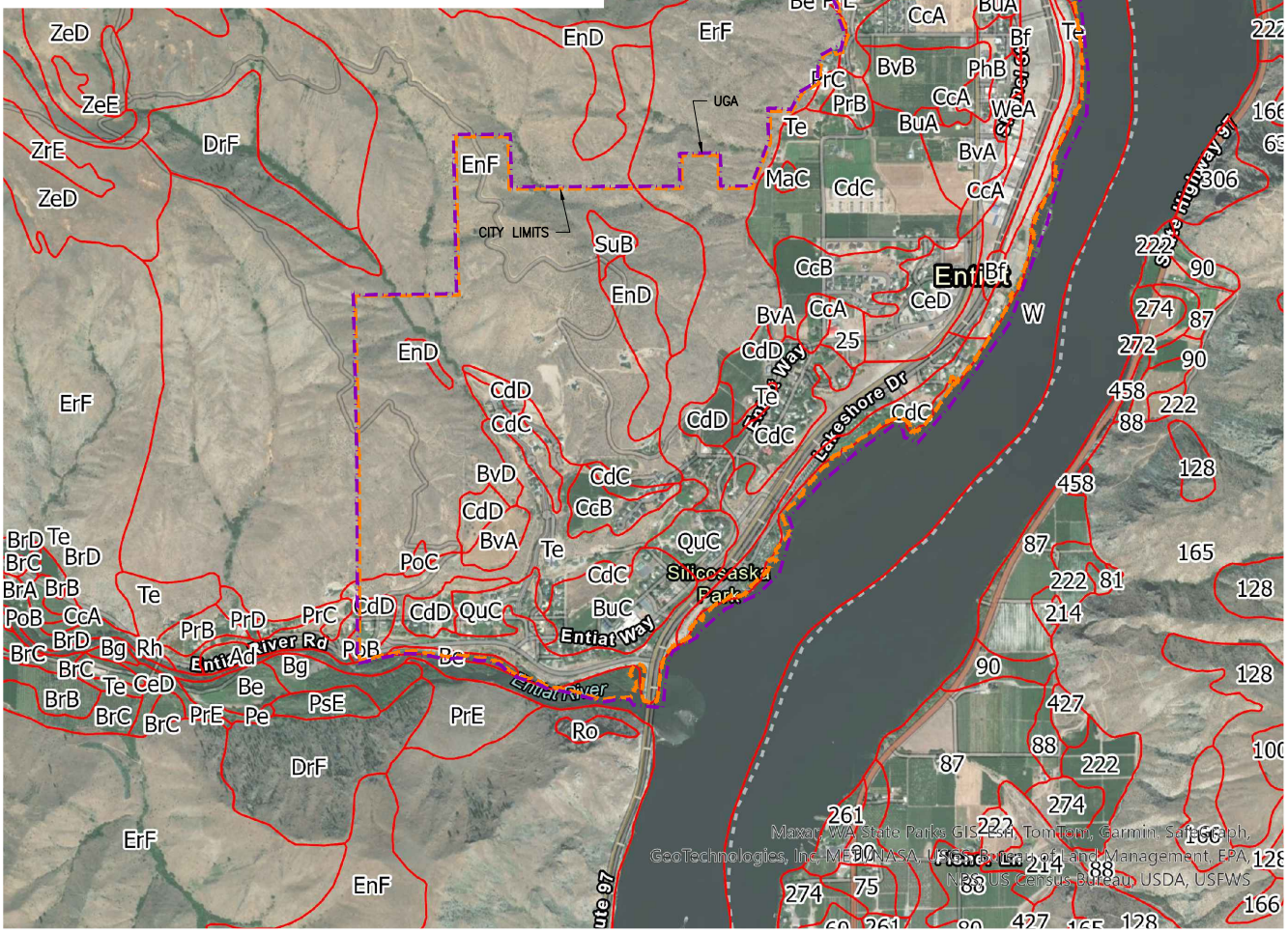
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CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

NRCS SURFACE GEOLOGY

FIGURE
2-2

SOIL	NAME
25	Gravel pits
AkD	Anatone–Rock outcrop complex,0 to 25 percent slopes
Be	Beverly fine sandy loam
Bf	Beverly gravelly fine sandy loam
Bg	Beverly very gravelly loamy fine sand
BuA	Burch fine sandy loam, 0 to 3 percent slopes
BuC	Burch fine sandy loam, 8 to 15 percent slopes
BvA	Burch loam, 0 to 3 percent slopes
BvB	Burch loam, 3 to 8 percent slopes
BvD	Burch loam, 15 to 25 percent slopes
CcA	Cashmont sandy loam, 0 to 3 percent slopes
CcB	Cashmont sandy loam, 3 to 8 percent slopes
CdC	Cashmont gravelly sandy loam, 8 to 15 percent slopes
CdD	Cashmont gravelly sandy loam, 15 to 25 percent slopes
CeD	Cashmont stony sandy loam, 0 to 25 percent slopes
DrF	Dinkelman–Rock outcrop complex, 0 to 60 percent slopes
EnD	Entiat sandy loam, 0 to 25 percent slopes
EnF	Entiat sandy loam, 25 to 65 percent slopes
ErF	Entiat–Rock outcrop complex, 25 to 65 percent slope
MaC	Malaga gravelly fine sandy loam, 3 to 15 percent slopes
PlD	Peshastin stony loam, 0 to 25 percent slopes
PoB	Pogue fine sandy loam, 3 to 8 percent slopes
PoC	Pogue fine sandy loam, 8 to 15 percent slopes
PrC	Pogue gravelly fine sandy loam, 8 to 15 percent slopes
PrB	Pogue gravelly fine sandy loam, 3 to 8 percent slopes
PrE	Pogue gravelly fine sandy loam, 25 to 45 percent slopes
PsE	Pogue very stony fine sandy loam, 0 to 45 percent slopes
QuC	Quincy loamy fine sand, 0 to 15percent slopes
Ro	Rock outcrop
SuB	Supplee very fine sandy loam, 3 to 8 percent slopes
Te	Terrace escarpments
W	Water
ZeC	Zen silt loam, 8 to 15 percent slopes
ZeD	Zen silt loam, 15 to 25 percent slopes
ZeE	Zen silt loam, 25 to 45 percent slopes



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1950106–Fig 2–3_Soils

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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

NRCS SOIL SURVEY

FIGURE
2-3

There are three primary soil groups in the Entiat Area: the Burch-Cashmont soil association, the Entiat-Dinkelman soil association, and the Rock Outcrop Rockland Terrace Escarpments association.

The Burch-Cashmont soils are found on level areas and slopes up to 25 percent. Most of the Burch-Cashmont soils are derived from older alluvium and are found on hillsides above the Columbia River extending up to the 1,000-foot elevation west of the City. These soils are gravely sandy loam, 21 -inch-thick topsoil with 7 inches of subsoil, and 60 inches of sandy loam in the substratum. If these soils are irrigated (as is the case in the orchards), runoff is rapid and the erosion hazard is high.

Entiat-Dinkelman soils are found mainly on slopes between 1,000 feet to 2,400 feet in elevation. The soils are well-drained, moderately coarse, sandy loams, with 3 inches of topsoil, 5 inches of gravelly sandy loam subsoil, with a loam substratum of 10 inches. Below 18 inches, the loam is underlain by igneous bedrock that is fairly thick. Runoff on slopes over 25 percent is rapid, and winter erosion hazard is very high.

Another less important soils group is the Entiat Rock Outcrop soils group located on the extreme northern end of the City of Entiat. Rock Outcrop Rockland Terrace soils consist mainly of sandstone, basalt, granite, schist, Of gneiss, and very shallow soils. Rocklands are used mainly for range and wildlife, especially chukars, partridge, and quail.

2.5.3 *Topography and Surface Drainage*

Area topography and surface drainage is shown on **Figure 2-4**. Virtually all of the City's existing and future sewer service area is located on slopes averaging 8 percent, with a range between 5 to 20 percent.

The eastern part of the City is predominantly flat with grades typically below 5 percent. Steep terrain exists in the southwestern portion of the City, where it extends westerly up the foothills of the Entiat Mountains, a subset of the Cascade Range. Elevations within the City range from 700 to 1,850 feet Above Mean Sea Level (AMSL)

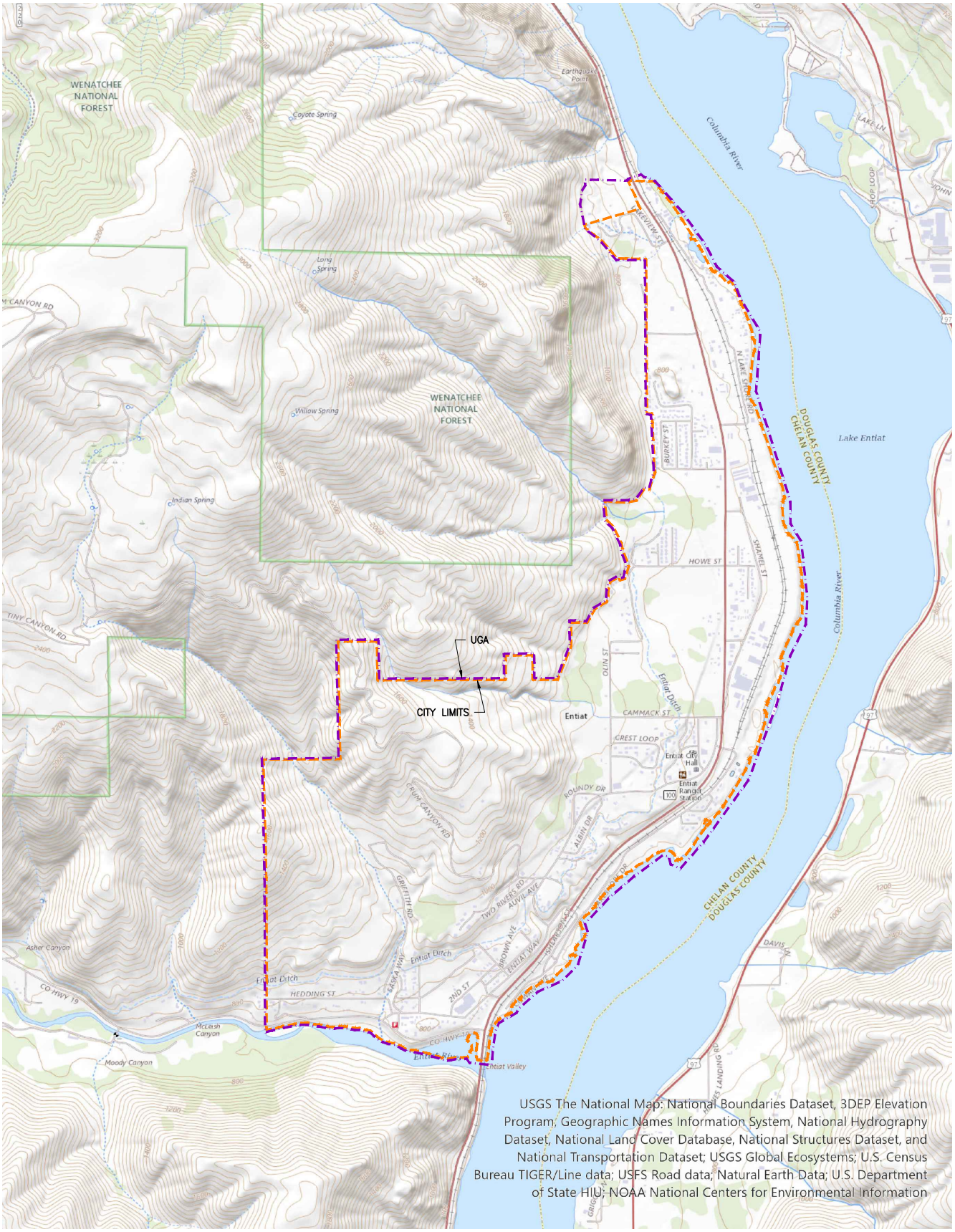
Most all of the residential areas and orchards are located on these moderate slopes, which extend up to the 1,000-foot elevation. West of the 1,000foot elevation, the topography changes markedly with slopes ranging between 20 percent and 60 percent. Areas above the 1,000 foot elevation may be too steep for ultimate development into residential property.

There are minor exceptions to these general patterns. In the lower service area, there are 30 percent slopes just west of State Route 97 resulting from road cuts. Also, in the steeper areas, the ravine bottoms have slopes of 10 to 15 percent.

2.5.4 *Surface Water, Wetlands and 100-year floodplain*

The City of Entiat fronts the Rocky Reach Hydroelectric Project reservoir on the main stem of the Columbia River. Properties fronting the reservoir are subject to an easement allowing the pool to be raised to 715. These properties are predominantly developed as residential and light industrial land uses. The Entiat City Park (Will Risk Park) is, owned by the Chelan County PUD and operated by the City. It is also located on the frontage.

The City Limits also front the Entiat River along its southerly boundary which provides a physical barrier between the riparian area and developed properties that lie to the north. Chelan County maintains the road that follows the river to the west, and much of the river frontage is within the county right of way. Plans are currently being prepared to develop an area near the mouth of the river as an interpretive park.



1950106-Fig 2-4_Topo

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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

TOPOGRAPHY AND SURFACE DRAINAGE

FIGURE
2-4

Land development and activities along the Rocky Reach reservoir and the Entiat River are subject to compliance with the Shorelines Management Act. As lead agency, the City uses the SEPA review process to ensure new development meets the requirements of the act.

Flood Plain information is shown on **Figure 2-6**. The limits of the Rocky Reach reservoir 100 year flood plain are not clearly defined on FEMA maps although it is reasonable to consider all areas below elevation 715 as flood plain. Flood plains along the Entiat River are located upstream of the City frontage.

Wetlands are shown on **Figure 2-5.** The National Wetlands Inventory map identifies all of the Rocky Reach reservoir and Entiat River frontage as Level 1 Critical Wetlands Area. Based on existing conditions along the reservoir, it is likely this designation is also limited to the areas below elevation 715. Wetland conditions exist along the Entiat River and would be subject to protection under state and federal regulations.

2.5.4.1 Watershed

A watershed is an area of land where topographic features such as hills and valleys encourage water to flow toward a single river system or other body of water. Precipitation is the main source of recharge for both ground water and surface water within the Entiat Watershed. The higher elevations in the northwest portion of the watershed receive more precipitation annually, most of which occurs as snow. The lowest elevations, near the town of Entiat, receive precipitation as described in previous sections.

Melt water from the snowpack supplies most of the stream flow in spring and early summer. Melt water volumes can vary greatly from year to year. Nearly all of the precipitation runoff and snowmelt occurs during the months of April through July.

Runoff within the watershed can vary widely from one year to the next. For instance, stream gage data from 1972 indicated runoff was 451,140 acre-feet. The next year, runoff was measured at 178,970 acre-feet, a reduction of 272,170 acre-feet. (Note: Acre-feet is a volume that equals the amount of water contained in a one-acre area with a water depth of one foot.)

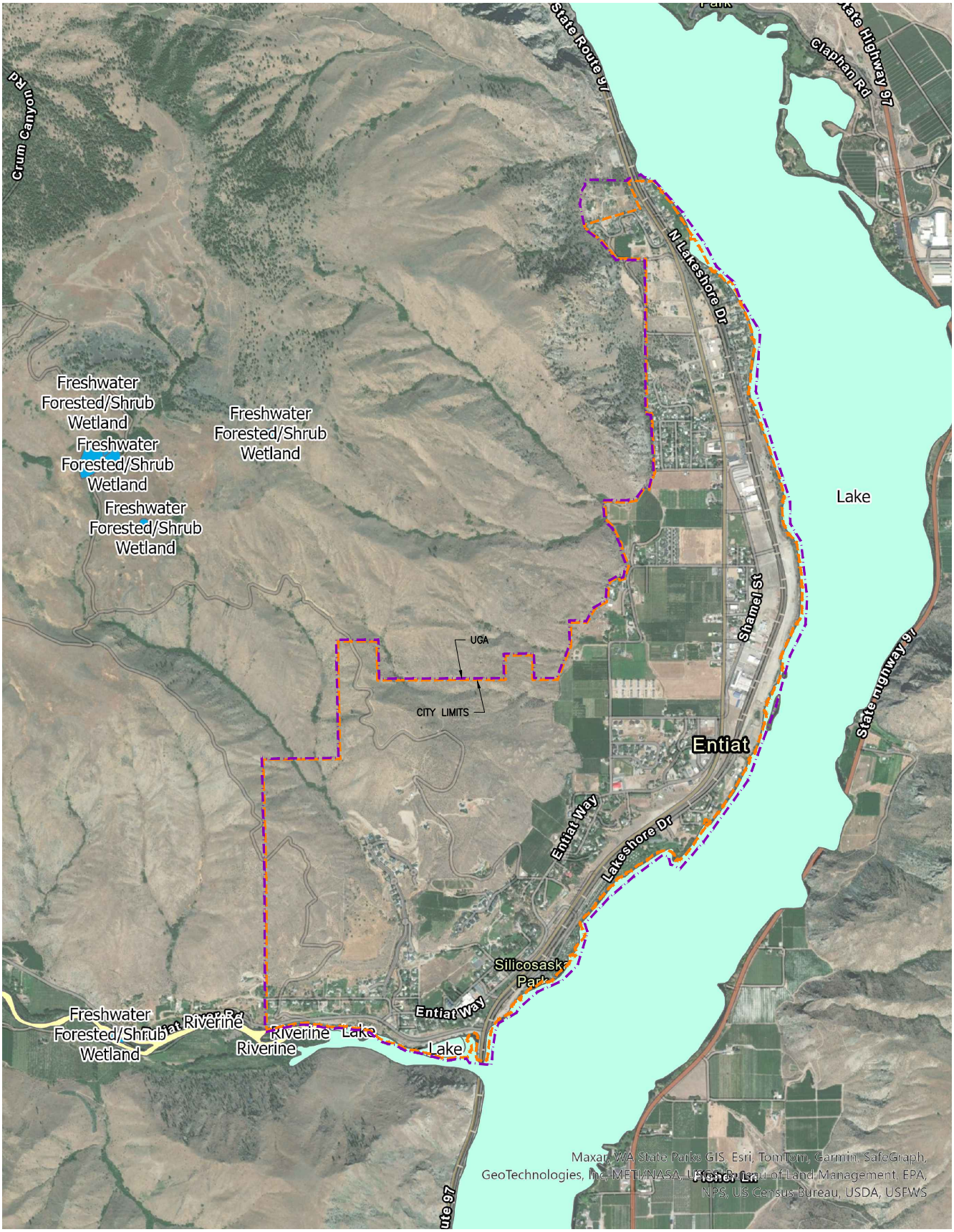
The Entiat River is the major surface water source in the watershed. In addition to the Entiat River, there are dozens of small creeks and streams tributary to the river. Land use can affect the demand for and use of water. Some land uses, such as irrigated agriculture, require large amounts of water on a seasonal basis. Other land uses, such as timber production or range lands, require less water.

Land use in the Entiat Watershed has not changed much over the last century. As the watershed is 87% forested, timber is the largest land use. Agricultural uses, both irrigated and non-irrigated, are the second biggest land uses. Most of the irrigated agricultural use is located along the Entiat River and downstream from the town of Ardenvoir. There are also 9,000 acres of range land, mostly located in the lower part of the watershed near the town of Entiat. Residences and businesses are mostly found in the southeastern portion of the watershed near the towns of Ardenvoir and Entiat.

2.5.4.2 Groundwater

Ground water is primarily generated through infiltrating rain and melt water. Most of the wells in the Entiat River Watershed are developed in shallow alluvial or glacial sediments. Water yields in the sediments are substantially higher than from the bedrock.

Studies of the ground water system, or aquifer, indicate most of the area is underlain with weathered bedrock ranging from 13 to 110 feet thick, with areas of significantly thicker bedrock below the weathered



1950106-Fig 2-5_Wetlands

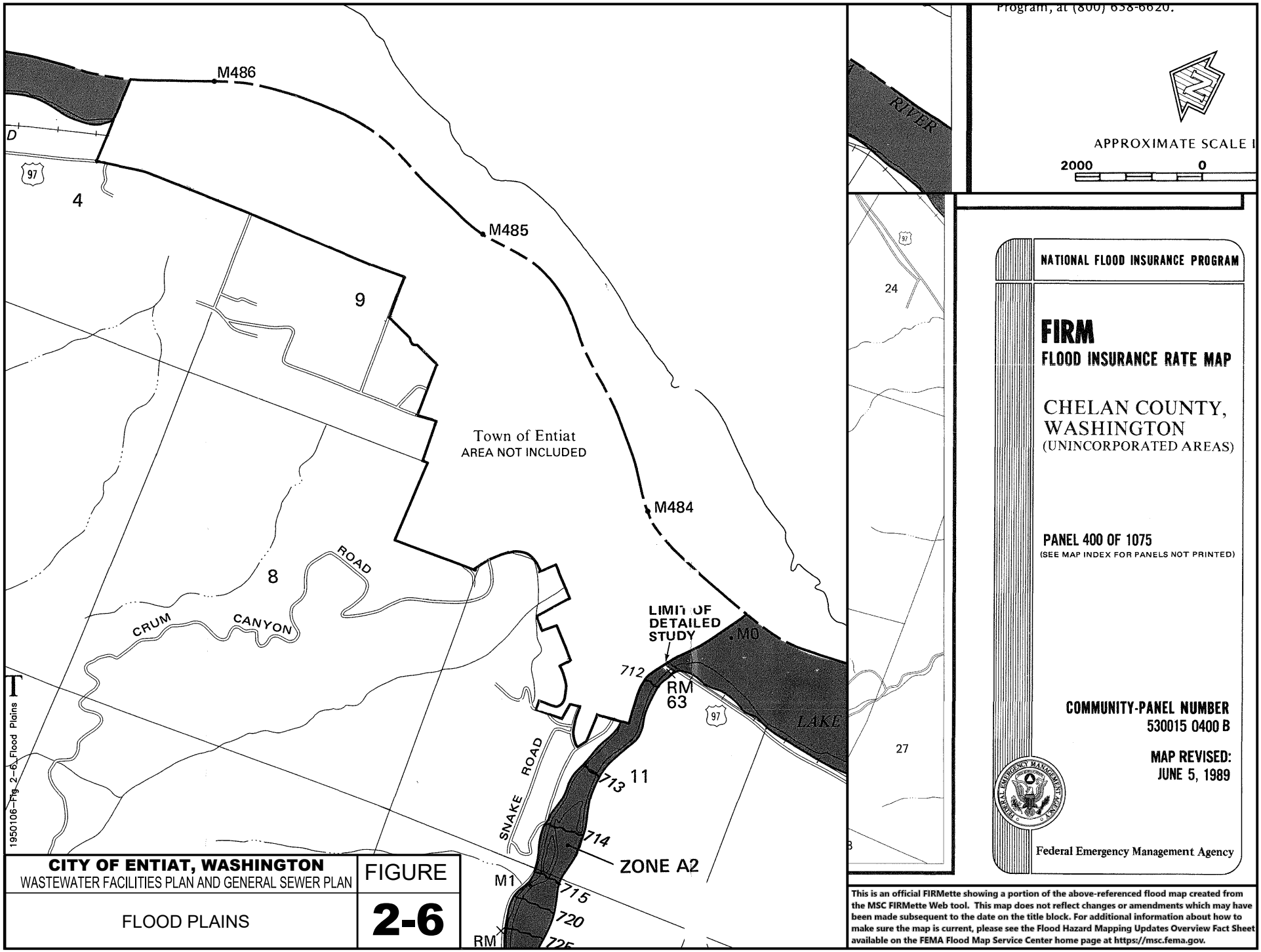
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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

WETLANDS

FIGURE
2-5



CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

FLOOD PLAINS

FIGURE **2-6**

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.

zone. This bedrock generally occurs from 50 to 100 feet below the surface. In the river valley, the bedrock is covered with sediment composed of sand, gravel, cobbles, and occasional finer grained material. These layers of sediment serve as the primary aquifer for the Entiat watershed and contain the vast majority of the area's ground water, although the bedrock can produce modest quantities of water.

A hydrologic connection between surface water and ground water is possible when the soil structure dividing them is porous enough to allow the waters to mingle. In the Entiat Watershed, there is strong connection between the ground water system and the Entiat River, particularly in the sediments.

Because there is a permeable soil layer composed of coarse sands, gravels and cobbles separating the Entiat River aquifer from the river, fairly unrestricted interaction between the surface water and the aquifer is likely to occur.

Each season, a significant portion of the melt waters, and some of the rainwater infiltrates downward through the soil to become groundwater. This groundwater discharges to the Entiat River and its tributaries, supplying much of the stream flow from later summer through winter.

2.5.4.3 Columbia River

The Columbia River is located east of the Town of Entiat. It is the largest river in the Pacific Northwest region of North America and the fourth largest river in the United States by volume. It flows from north to south past Entiat and is a main drainage for the area. The Columbia is a slow moving, alluvial river with a drainage basin roughly the size of France. The City's WWTP is located adjacent to the Columbia River.

2.6 Sewer System Organization

2.6.1 *Governing Authority*

The City of Entiat owns and operates the wastewater collection system and treatment facility, a municipal corporation in the State of Washington. The Entiat City Council is responsible for establishing policies, defining system services, and governing financing, construction and operation of the wastewater system.

2.6.2 *Ordinances and Policies*

The City of Entiat regulates its water and wastewater systems under Title 13 of the municipal code. Following summarizes sections of the City's municipal Code governing the sewer system:

Table 2-2 Municipal Code References Governing Sewer System

Municipal Code Section	Chapter	Description
Title 3 Revenue and Finance	City Services Schedule of Fees	Assessment of fees for City services including sewer
Title 13 Public Services	Chapter 13.10 Sewers	Sewer system regulations
	Chapter 13.15 Cross Connections	Cross connection control requirements
	Chapter 13.20 Utility Main Charges	Utility main charges to be assessed on new connections
	Chapter 13.25 Developer Extension Connection Charges	Policies and fees for connecting to City sewer
	Chapter 13.30 Municipal Equipment Usage	City authorization to install, repair, and maintain various pipes and associated equipment while operating the system
	Chapter 13.35 Developer Extension Manual	Developer standards
	Chapter 13.40 Utility reimbursement Agreements	Agreement for reimbursement of utility costs
Title 15 Buildings and Construction	Chapter 15.08 Building Codes	Adopted building codes that affect construction including sewer facilities
Title 19 Development Standards	Chapter 19.02 General Provisions	General provisions for development standards

2.6.3 *Design Standards*

The State of Washington Department of Ecology Orange Manual requirements for Sewage Works Design states that sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow (I/I).

The City adopts the latest edition of the “Standard Specifications for Road, Bridge and Municipal Construction” as prepared by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association to govern all aspects of sanitary sewer system improvements including but not limited to materials, labor, equipment for installation, workmanship, testing, etc. Any material, design, standard, or testing not specifically addressed within the City Code and/or design/construction requirements and/or this document (see following section), shall be as per the standard specifications.

Additionally, the City has a Developer Extension Manual (Standard Plan Guidebook) dated February 2006, prepared by Hammond Collier, Wade & Livingstone, Inc. for use a guideline for development of City infrastructure including sewer. This manual is adopted in the City Municipal Code Chapter 13.35.

2.7 Land Use

Figure 3-1 shows land use zoning throughout the City and its surrounding Urban Growth Area. As seen in the figure, the majority of the City area is zoned residential. The City covers about 2.8 square miles with a population of 1360 persons in 2024. **Table 2-2** shows existing land distribution and area totals.

Table 2-3 Existing Land Use Distribution (excerpted from 2023 Comp. Plan)

Land Use	Acres	Percent of Total
Single family residential	248	21.5
Multifamily residential	4	0.3
Mobile home parks	2	0.2
Agricultural	244	21.1
Commercial	17	1.5
Public & Quasi Public	179	15.5
Manufacturing	25	2.2
Vacant	435	37.7

2.7.1 *Entiat Comprehensive Plan*

Entiat updated their comprehensive plan in 2023 and it functions as the City's guiding document for projected growth. According to the document, the City wants to encourage development in urban areas while reducing the inappropriate conversion of undeveloped land into sprawling, low-density development.

The plan also encourages the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and parks, protect the environment, and enhance the states high quality of life.

Because the "community" of Entiat extends beyond the actual city limits, The plan has an emphasis on being complementary to Chelan County's comprehensive plan.

Entiat is not currently constrained on the availability of land to meet current and projected needs; however, it is somewhat constrained by minimum funding resources for public utilities.

2.7.2 *Growth Management Act*

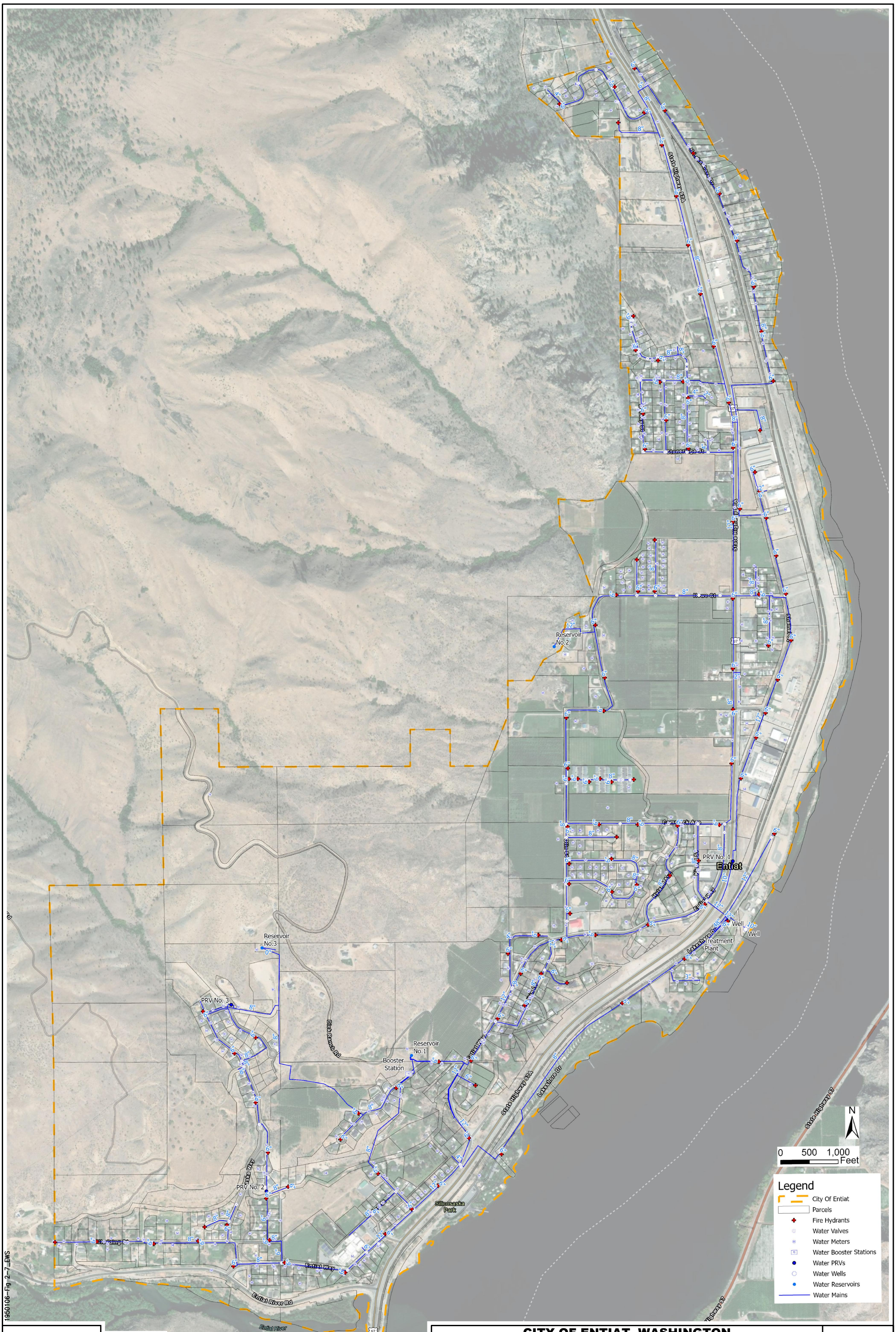
The Growth Management Act of 1990 was enacted to "reduce the inappropriate conversion of land to sprawling, low density development." The protection of "critical areas", including potable water, wildlife habitat, frequently flooded areas and sensitive natural resources was mandated by this legislation. In 1991, the law was amended to require the designation of urban growth boundaries around incorporated communities.

Chelan County is a Growth Management (GMA) county of which Entiat is an unincorporated City. Entiat follows planning and land use guidelines provided by the Chelan County Comprehensive Plan.

2.8 Existing Water System and Wells

Entiat's existing water system is shown on **Figure 2-7**. In the 1950's, the City relocated its town center in conjunction with the construction of the Rocky Reach Dam. During that time the core of the City's water system was constructed. The City's water service area covers the area within the City limits and some portions of unincorporated Chelan County.

The City's water system is served by Wells No. 1 and 2, which pump directly into the 958 pressure Zone and the Two Rivers and Olin Avenue reservoirs. The Two Rivers Booster Pump Station (BPS) feeds the Dick Ranch reservoir, which in turn supplies the 1314 and 1140 pressure zones.



1950106-Fig. 2-7_EWS

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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

FIGURE

EXISTING WATER SYSTEM

2-7

Wells No. 1 and 2 are located along Lakeshore Drive, east of US Highway 97A and near the west bank of the Columbia River. The wells were originally drilled in 1958, Well No. 1 had its pump replaced in 2013, and Well No.2's was replaced in 2016. The pumps are controlled by the water level in the Two Rivers Reservoir.

2.9 Adjacent Sewer Systems

The immediate area surrounding the City utilizes septic systems as the main method of wastewater disposal. Other systems in the area include Orondo located 4 miles south of Entiat and across the Columbia River, Waterville located 8 miles to the East across the Columbia River, Chelan located 15 miles to the northeast, and Wenatchee located 16 miles to the south,

2.10 Related Plans

This Facility Plan and General Sewer Plan (FP-GSP) utilizes information from the:

- 2023 City of Entiat Comprehensive Plan
- 2023 Collection Needs and WWTP Assessment
- 2024 City of Entiat Water System Plan (draft)
- Chelan County Comprehensive Plan
- 2004 Wastewater Facility Plan and Plan to Maintain Adequate Capacity

2.11 Planning Period

This FP-GSP provides 20-year planning projections but also includes 40-year projections to allow for consideration and evaluation of proposed infrastructure with service lives that extend beyond the 20-year horizon.

3.0 Wastewater Planning Data

3.1 Introduction

This section reports the City's wastewater management history, outlines the City's expected growth, and provides existing and projected flows and loadings for this Wastewater Facilities Plan and General Sewer Plan's (FP-GSP) planning period.

3.2 Background

During preparation of this GSP-FP, Varela met with City staff and elected officials to discuss population projections. Planning information provided in this report is based on City input and projections.

3.3 Sewer Service Area and Land Use

3.3.1 *Sewer Service Area and Land Use*

The City's incorporated limits, current sewer service area, and existing wastewater system are shown in **Figure 4-1**. The sewer service area generally corresponds to the City's incorporated limits.

The City's existing and future urban growth area (UGA), as well as current land use designations, are shown on **Figure 3-1**.

3.3.2 *Planning Horizons*

Entiat's GSP-FP is based on a 20-year planning horizon typical for wastewater evaluations. However, some wastewater infrastructure components have service lives longer than 20 years. Capital facilities that are costly and difficult to upgrade incrementally should also consider planning horizon closer to their service life. Because Entiat has significant open land surrounding the service area and thus the potential to experience significant growth beyond the 20 year horizon, longer range planning should be considered even if not ultimately implemented. This FP-GPS provides 20-year planning projections but also includes both a 40-year population projection and an estimate of ultimate population for evaluation of proposed infrastructure with service lives that extend beyond the 20 year horizon.

3.4 Planning Data and Future Population

3.4.1 *Introduction*

The Washington State Office of Financial Management, (OFM) provides the most current information and projections on growth for counties. Larger cities often have planning department which make these projections, while smaller systems may adopt their own projections based on one or more of the following: projections published by the OFM, historical population trends, known development plans, comprehensive plans, etc.

For the purposes of infrastructure planning, population at the end of the 20-year and 40-year planning periods are projected. Available data sources for Entiat includes the Washington State Office of Financial Management (OFM), historical population trends, County projections, known development plans, City staff input, and the City of Entiat Comprehensive Plan. There is no known state or federal agency which makes predictions for smaller cities such as Entiat. Therefore, based on the available data, the following sections develop population projections for the City.

Ordinance No.: 2023-877
EXHIBIT A

City of Entiat
Official Zoning Map

18.06.101 Official zoning map.

(1) The zoning district of the city of Entiat are hereby designated by a legend on the official zoning map, together with all explanatory matter thereon. The official zoning map is hereby adopted by reference as "Exhibit A" and declared to be a part of this title.

(2) The official zoning map shall be identified by the signature of the mayor, attested by the city clerk-treasurer under the title "Entiat Official Zoning Map," along with the ordinance number and the date said ordinance was adopted.

(3) If, in accordance with the provisions of this title and Chapter 35A.63 RCW, changes are made in zoning boundaries or any other matter portrayed on the official zoning map, such changes shall be entered on the official zoning map promptly after the amendment has been approved by the city council with an entry citing the appropriate ordinance number and signed by the mayor and attested by the city clerk-treasurer.

(4) Regardless of the existence of purported copies of the official zoning map which may from time to time be made or published, the official zoning map which shall be located in Entiat City Hall shall be the final authority as to the current state of zoning in the city. (Ord. 735 S 1 [Exh. A], 2012; Ord. 701 S 1 [Exh. A], 2009; Ord. 673 S 1 [Exh. B], 2007; Ord. 607 S 1, 2003)

Entiat Official Zoning Map

ADOPTED BY THE CITY COUNCIL OF THE CITY OF ENTIAT, at regular meeting thereof this 14th day of December 2023.

CITY OF ENTIAT, a Municipal Corporation

Michael Buckingham
Mayor of Entiat

ATTEST:

Ann Baird
City Clerk/Treasurer

City Limits
Urban Growth Area (UGA)
Parcels

Entiat Zoning

- Residential High
- Residential Medium
- Residential Low
- Waterfront Business
- Waterfront Parks
- Waterfront Transition
- Highway Commercial
- Mixed Tourist
- General Public

1950106-Fig 3-1_Land Use Map (Zoning)

CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

LAND USE MAP

FIGURE
3-1

N

1 inch equals 0.25 miles

0 0.25 0.5 1 Miles

3.4.2 *Historical Population Trends*

The historical population of Entiat is shown in the following table.

Table 3-1 City of Entiat Historical Population

Year	Population	Annual Growth Rate	Source	Year	Population	Annual Growth Rate	Source
1968	360	-	OFM Est.	1996	675	21.62%	OFM Est.
1969	365	1.39%	OFM Est.	1997	801	18.67%	OFM Est.
1970	360	-1.37%	OFM Est.	1998	865	7.99%	OFM Est.
1971	366	1.67%	OFM Est.	1999	935	8.09%	OFM Est.
1972	361	-1.37%	OFM Est.	2000	957	2.35%	Census
1973	373	3.32%	OFM Est.	2001	975	1.88%	OFM Est.
1974	375	0.54%	OFM Est.	2002	990	1.54%	OFM Est.
1975	374	-0.27%	OFM Est.	2003	1,010	2.02%	OFM Est.
1976	381	1.87%	OFM Est.	2004	1,010	0.00%	OFM Est.
1977	406	6.56%	OFM Est.	2005	1,055	4.46%	OFM Est.
1978	415	2.22%	OFM Est.	2006	1,105	4.74%	OFM Est.
1979	365	-12.05%	OFM Est.	2007	1,130	2.26%	OFM Est.
1980	445	21.92%	Census	2008	1,160	2.65%	OFM Est.
1981	467	4.94%	OFM Est.	2009	1,170	0.86%	OFM Est.
1982	465	-0.43%	OFM Est.	2010	1,112	-4.96%	Census
1983	425	-8.60%	OFM Est.	2011	1,135	2.07%	OFM Est.
1984	500	17.65%	OFM Est.	2012	1,135	0.00%	OFM Est.
1985	492	-1.60%	OFM Est.	2013	1,140	0.44%	OFM Est.
1986	495	0.61%	OFM Est.	2014	1,140	0.00%	OFM Est.
1987	485	-2.02%	OFM Est.	2015	1,155	1.32%	OFM Est.
1988	433	-10.72%	OFM Est.	2016	1,180	2.16%	OFM Est.
1989	435	0.46%	OFM Est.	2017	1,195	1.27%	OFM Est.
1990	449	3.22%	Census	2018	1,205	0.84%	OFM Est.
1991	450	0.22%	OFM Est.	2019	1,255	4.15%	OFM Est.
1992	455	1.11%	OFM Est.	2020	1,326	5.66%	Census
1993	465	2.20%	OFM Est.	2021	1,340	1.06%	OFM Est.
1994	545	17.20%	OFM Est.	2022	1,355	1.12%	OFM Est.
1995	555	1.83%	OFM Est.	2023	1,360	0.37%	OFM Est.

The Table above shows that Entiat's population has steadily increased over the last 55 years at an average annual rate of 2.45%. Entiat has experienced some periods of lower growth, or even decreasing population, and some periods of accelerated growth.

Table 3-2 shows the average annual growth rate for selected ranges.

Table 3-2 Historical Average Annual Growth Rate – Selected Ranges

Year Range	Initial Population	Ending Population	Average Annual Growth Rate
1968 to 2023	360	1,360	**2.45%**
1968 to 1993	360	465	**1.03%**
1993 to 2009	465	1,170	**5.94%**
2009 to 2023	1,170	1,360	**1.08%**

Prior to 1993, Entiat's average annual growth rate was approximately 1%. From 1993 to 2009 population rate growth increased significantly to approximately 6% per year. Then after 2009 the growth rate returned to approximately 1% per year.

3.4.3 *Washington State OFM Projections and City Comprehensive Plan*

The Office of Financial Management makes three population projects for each county, a low, medium, and high series. OFM does not make projections for towns and cities. For Chelan County, OFM projected average growth rates for 2022 to 2044 are as follows:

High Series:	1.43% per year
Intermediate Series:	0.70% per year
Low Series:	0.33% per year

Entiat's Comprehensive Plan projects population based on: 1) OFM estimated growth rates, and 2) coordination with Chelan County coordinated planning. The following excerpt is from the City's comprehensive plan.

> *The Office of Financial Management prepared population projections for all counties in the State. It is the responsibility of the County in cooperation with the cities to allocate those projections out to local areas. Chelan County created draft population and housing needs for numbers in April 2019. The city projections shown below are from the OFM and Chelan County:*

Table 3-3 Excerpt from City's 2023 Comprehensive Plan (Based on April 2019 projections)

Region	Persons per household	2017 Population	Estimated minimum dwellings	2037 Population	Estimated Minimum dwellings	20-year increase in dwellings
Entiat UGA	2.64	1,188	450	1,420	538	174

As indicated, the City's comprehensive plan projects an average annual growth rate of 0.90% (calculated from preceding table). This is based on April 2019 Chelan County population projections consisting of Chelan County OFM intermediate series projections distributed to various Chelan County planning areas (including the Entiat UGA) at proportions determined by Chelan County planning committee.

3.4.4 *Updated Chelan County Projections for Entiat*

Chelan County updated their population projections in September of 2023 for UGA areas located within the County. The projections were provided by the City and are summarized in the table below.

Table 3-4 Chelan County Projections for UGA Areas (Updated Sept. 2023)

UGA Area	Share of Pop. Growth[1]	Adjusted Pop. Allocation	2022 OFM Est.	Projections					20 yr change
				2026	2030	2040	2045	2046	
Manson UGA	3.37%	3.37%	2,103	2,189	2,280	2,483	2,574	2,592	403
Chelan UGA	3.43%	3.43%	4,704	4,791	4,884	5,090	5,183	5,201	410
Entiat UGA	**2.23%**	**2.23%**	**1,361**	**1,418**	**1,478**	**1,612**	**1,673**	**1,684**	**267**
Leavenworth UGA	3.43%	3.43%	3,041	3,128	3,221	3,428	3,521	3,539	410
Peshastin UGA	-0.43%	0.00%	655	655	655	655	655	655	-
Cashmere UGA	3.23%	3.23%	4,153	4,235	4,322	4,517	4,604	4,621	386
Wenatchee UGA	59.59%	59.59%	41,019	42,530	44,141	47,731	49,347	49,660	7,130
Urban	74.86%	75.28%	57,036	58,945	60,980	65,516	67,557	67,953	9,007
Rural	25.14%	24.72%	23,614	24,241	24,909	26,398	27,069	27,198	2,958
Total	100.00%	100.00%	80,650	83,186	85,889	91,914	94,626	95,151	11,965

1. *The share of population growth presented in the above table was calculated using the same methodology as the population allocations adopted under Chelan County Resolution 2015-112 for the last periodic update cycle.*
2. *The UGAs listed above include incorporated areas located within them, if any.*
3. *Based on 2000 to 2020 growth*

The updated county projections are based on a 0.70% OFM intermediate series projection (see previous section). The intermediate series projection is then allocated to the various UGA areas at the proportions shown in the Table.

Entiat's projected growth rate, based on the Chelan County projections, is 0.9% annual growth from 2022 to 2045. The growth rate in the updated County growth projections were repeated in the City's 2023 Comprehensive Plan.

3.4.5 *City Input / Growth Rate Selection Rational*

Varela met on 4/9/24 with Entiat City staff and Mayor to discuss growth projections documented herein, as well as growth rate assumptions. During that meeting the City provided planning projections to be used for the General Sewer Plan and Facility Plan (GSP-FP).

Following summarizes City rational for the selected growth rate:

- The City feels OFM and County projected growth rates are significantly low and not adequate for Entiat.
- In recent years, development requests have increased within the Entiat UGA. The City anticipates ongoing/increasing development; and the City anticipates growth will significantly exceed previous estimates.
- The City has issued a moratorium on specific development size and type due to ongoing worries regarding current capacity of the existing water/wastewater systems and ability to serve future developments.

- Significant existing developments are currently in queue and/or waiting for the City to lift the current growth moratorium. After the moratorium is lifted, the City anticipates these developments will result in significant immediate growth currently being prevented by the moratorium.

- The City would like the GSP-FP planning projections to include the known near-term development plus a growth rate of 2% per year. The City feels this is a reasonable projection of growth. Note, the County provides population projections which are based on OFM projections. See preceding tables for County populations. The City projections assume the county populations as a baseline and add anticipated growth to arrive at the figures included herein.

- The City would also like the wastewater treatment plant (WWTP) to be expandable to twice the proposed design capacity.

3.4.6 *Expected Near Term Growth*

As noted in the previous section, at the 4/9/24 meeting, the City provided known developments that are either in-progress and/or held up due to the City's development moratorium. The following table summarizes expected near-term growth:

Table 3-5 City of Entiat – Near-Term Growth [1]

Year	Number of Units	Est. ERUs
Single Family Residential		
Stone Basin Subdivision	21	21
Roundy Subdivision	8	8
River Village Subdivision	120	120
Grubb Subdivision	5	5
Multi-Family [2]		
Entiat Townhomes Development	34	24
Cooper Apartments	120	84
Weider Apartments	150	105
Commercial [3]		
Cooper Commercial	3	13
Subtotal (ERUs):		**380**
Persons per ERU:		2.51 [4]
Estimated Near-Term Growth (persons):		**954**

1. *Development information taken from City staff PowerPoint presentation provided to Varela. See TM-01A.*
2. *Multi-Family ERUs are estimated assuming 0.7 ERUs/unit.*
3. *Commercial ERUs are based on **Table 3-8** estimates each non-residential connection at 4.4 ERUs per connection.*
4. *Based on existing population divided by number of residential sewer connections.*

The City projects this anticipated growth will occur within the next 7 years.

3.4.7 *Selected Growth Rate / Population Projections*

The City selected an annual growth rate of 2.0% based on criteria outlined in previous sections. It is assumed the near-term growth (954 persons) will occur over the next 7 years (after the growth moratorium is lifted). It is then projected Entiat will grow at a rate of 2.0% annually for the remainder of the 20-year planning period.

Based on these assumptions, the following Table provides updated population projections for the 20-year planning period.

Table 3-6 Population Projections for Wastewater Planning

Year	Population	Annual Growth Rate	% of Existing
2024 (existing)	1,360	-	-
2031 (7-yr)	**2,314**	**7.9%**	**170%**
2044 (20-yr)	**3,000**	**2.0%**	**231%**

3.4.8 *Growth Rate Comparison*

The following graph shows historic population data along with several of the different projected growth rates for Entiat including: 1) 0.70% OFM low series, 2) 0.9% Chelan County projection, 3) 1.1% average Entiat historic growth rate since 2009, 3) 1.5% growth rate, 4), City selected 2.0% growth rate, and 5) 2.5% average historic growth rate since 1968.

Table 3-7 provides the corresponding increase in population associated with each growth rate as well as overall % increase over the planning period. Note, the 2.0% growth rate is bolded in both **Exhibit 3-1** and **Table 3-7** since it is the City selected growth rate and is used herein for planning purposes.

Exhibit 3-1 Historical Growth Vs. Various Projected Growth Rates

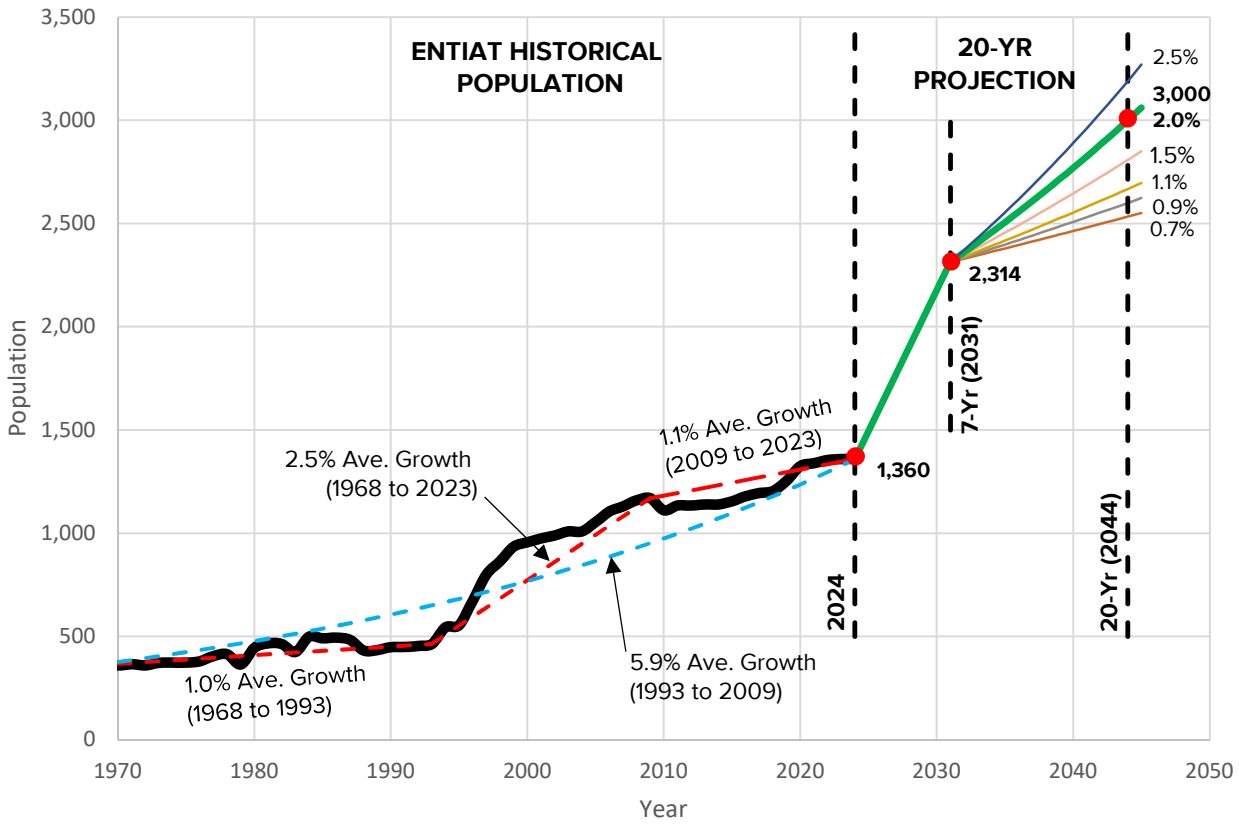


Table 3-7 Historical Growth Vs. Various Projected Growth Rates

Growth Rate	Projection Desc.	Existing Population (2024)	Near Term Development (2031) [2]	20-Yr (2044)		
				Pop.	Increase	% Increase
0.70%	OFM (Intermediate Series)	1,360	2,314	2,534	1,174	86%
0.90%	Chelan County / City Comp Plan	1,360	2,314	2,600	1,240	91%
1.10%	Entiat Historical Growth (from 2009 to Current)	1,360	2,314	2,668	1,308	96%
1.50%	-	1,360	2,314	2,808	1,448	106%
2.00%	**City Selected Growth Rate [1]**	**1,360**	**2,314**	**3,000**	**1,640**	**121%**
2.50%	Entiat Historical Growth (from 1968 to Current)	1,360	2,314	3,190	1,830	135%

1. *See **Section 3.4.5** and **Section 3.4.7**.*
2. *See **Section 3.4.6**.*

3.5 Future System Expansion Beyond Design Capacity

During the 4/9/24 meeting, future expandability beyond the design criteria was discussed (in the event actual growth outpaces the projected growth assumptions herein). The City would like the treatment plant to be expandible to twice the design capacity. This means the plant could be expanded to serve a population of roughly 6,000.

3.6 Population per Household

The City currently serves roughly 541 residential sewer connections. Based on the existing population of 1,360 residents and 541 residential connections, it is estimated that Entiat's population per single-family residence is approximately 2.51 capita/connection.

Based on the existing calculated population per household, the proposed 2044 population of 3,000 (an increase of 1,640 persons) will result in an additional 653 residential connections and supporting commercial connections.

3.7 Equivalent Residential Units

3.7.1 *Introduction*

The Washington State Department of Health (DOH) defines an equivalent residential unit (ERU) as the amount of water consumed by a typical full-time single-family residence. DOH requires water system systems track water use and represent both residential water use and non-residential water use in terms of ERUs. This allows non-residential water uses to be related to the effect that particular connection has on the system as compared to a single-family residence.

ERU numbers for Entiat's water system are typically included in the City's Water System Plan (which is currently being prepared by RH2 Engineering). However, ERU estimates for the water system do not necessarily correspond exactly to sewer system ERUs. This is in part due to summer irrigation demand which can account for a large component of the water system demand, and thus skew water system use away from flows that directly translate to sewer flows. Winter water use is therefore a better estimate of sewer ERUs and is commonly used to estimates sewer system base flow and sewer system ERUs.

3.7.2 *Winter Water Use Data and Current ERUs*

The City provided 2022 and 2023 winter water meter data. The following table summarizes the estimated number of existing winter water system ERUs which is used as an estimate of sewer system ERUs.

Table 3-8 Winter Water Meter Data and Estimated Sewer ERUs

Water Connection Type	# of Water Connections	Estimated Customers To STP	Winter Water Use (gal) [1]	Est. res. sewer contribution per Connection	Estimated ERUs
Residential	555 [1]	541 [2]	2,798,662	160	541
				Residential Total	**541**
Multi Family Residential	4	4	407,707	n/a	100
Commercial/Misc. Non-Residential	25	25	102,023		25
Industrial	2	2	113,679		28
City	5	5	19,470		5
School	2	2	37,247		9
				Non-Residential Total	**167**
				Ave. ERUs / non-residential connection	4.4
				Total ERUs	**708**

3. *Monthly average. Based on City winter water meter records for 2022 and 2023 (November through February).*
4. *Based on 2024 number of sewer residential customers. The City reports that the number of sewer connections is less than the water system connections due to residences that are connected to water only and not the sewer system. These residences reportedly have septic systems that were grandfathered in and not required to connect to the sewer system.*
5. *See previous discussion regarding water system ERUs vs. estimated sewer system ERUs.*

3.7.3 *Existing ERU Distribution and ERUs per Acre*

The following table shows estimated sewer system ERU distribution by land area.

Table 3-9 Existing Distribution of ERUs and ERU per Acre

Customer Type	Existing Sewer ERUs		Existing Developed Areas [1]	ERUs/Acre
	# of ERUs	% of Total		
Residential	541	76.4%	248	2.2
Non-Residential	167	23.6%	48	3.5

1. *Existing developed area is based on Entiat Comprehensive Plan 2003 Table L.1 Existing Land Uses. Agricultural and Public lands areas are excluded from the calculation.*

3.8 Buildout ERU Estimate

Entiat's sewer service area includes significant undeveloped land area. Based on Table L.1 in the City's Comprehensive Plan, approximately 60% of the total land area in the UGA is undeveloped and/or agricultural area with potential to be developed in the future. Additionally, some existing developed areas have potential for additional development and increased density.

Entiat's *2023 WWTP and Collection System Needs Assessment (RH2 - August 25, 2023)* provides a buildout ERU estimate for each of Entiat's six sewer basins. See attached **Figure 4-2** for sewer basin boundaries.

The following excerpts and tables are from the report. The buildout ERU estimate is included herein to illustrate the development potential of the area and to use as a basis for distribution of future ERUs within the service area.

3.8.1 *Buildout ERU Estimate Methodology*

Excerpted from the *2023 WWTP and Collection System Needs Assessment:*

> *Utilizing Chelan County LiDAR data, terrain slopes were delineated for each basin. In terms of area, Basin No. 1 has the largest amount of undeveloped land, although nearly all of it exceeds 10-percent slope and much of it exceeds 20-percent slope above 1,000 lf in elevation. Basin No.2 has similar topography issues, with approximately 85 acres of developable land and most of it lying on slopes greater than 10 percent. Basin No. 3 has the most readily developed land, with over 100 acres of residential zoned land sloped less than 10 percent. Basin No. 3 also has undeveloped land zoned for commercial and industrial usage along US 97A and Shamel Street. Basin No. 4 has approximately 18 acres of developable residential land. Basin Nos. 5 and 6 are fully saturated in residential zoned areas but have small commercial zones ready to be developed along US 97A.*
>
> *Utilizing the derived slope data and GIS zoning data, total areas below a 30-percent slope for each basin and each land designation were determined. Twenty-five percent of the area available for development was removed from these totals to account for right-of-way (ROW), utility structures and other infrastructure, leaving 75 percent as developable land. The residential densities determined in the 2019 Entiat Comprehensive Plan were applied to each zone area to determine potential ERUs due to growth in each basin.*

Table 3-10 lists the developable acreage per basin by zone.

Table 3-10 Developable Land Designations per Basin in Acres [1]

Land Designation	Acres per Basin 1	2	3	4	5	6	Total
Low Density Residential	370	124	159	6	33	15	**707**
Undevelopable Land (Slope > 30 percent)	32	15	25	0	0	0	**72**
Developable Land	338	109	134	6	33	15	**635**
Medium Density Residential	0	27	84	45	0	0	**156**
High Density Residential	0	0	47	0	0	0	**47**
Commercial	0	0	46	17	14	18	**95**
Transition	0	0	27	16	4	0	**47**
Total	**338**	**136**	**338**	**84**	**51**	**33**	**980**

1. *Excerpted from Entiat's* 2023 WWTP and Collection System Needs Assessment (RH2 - August 25, 2023).

Table 3-11 calculates the potential ERUs, assuming 25 percent of the developable land is reserved for ROW and the remaining 75 percent is used for development.

Table 3-11 Developable Land Designations per Basin in Acres [1]

Land Designation	ERU per Acre	ERU per Basin 1	2	3	4	5	6	Total
Low Density Residential	4	1,014	327	402	18	99	45	**1,905**
Medium Density Residential	10	0	203	630	338	0	0	**1,171**
High Density Residential	15	0	0	529	0	0	0	**529**
Commercial	1.3	0	0	45	17	14	18	**94**
Transition	2	0	0	41	24	6	0	**71**
Total ERUs		**1,014**	**530**	**1,647**	**397**	**119**	**63**	**3,770**
% of Total		27%	14%	44%	11%	3%	2%	100%

1. *Excerpted from Entiat's* 2023 WWTP and Collection System Needs Assessment (RH2 - August 25, 2023).

3.9 Distribution of Projected ERUs

Since the population of the planning area is not evenly distributed over the entire area, it is necessary to distribute the existing and future population and associated wastewater flows to the areas where they will occur. Weighting the distribution of the projected population increase over the service area provides a more accurate evaluation than distributing the flows uniformly. This allows the sewer system planning to be tailored to the components of specific sub areas.

The following table shows projected growth for each sewer system basin for various planning horizons.

Table 3-12 Distribution of Existing and Future ERUs by Sewer Basin

Description	Sewer Basin 1	2	3	4	5	6	Total
Distribution of Existing ERUs [1]	22%	19%	28%	20%	8%	4%	100%
Existing ERUs	708 ERUs						
Existing ERUs by Basin	**153**	**133**	**201**	**140**	**56**	**25**	**708 ERUs**
20-Year ERU Projections (population 3,000)							
Distribution of New ERUs [2]	27%	14%	44%	11%	3%	2%	100%
New ERUs	854 ERUs [3]						
New ERUs by Basin	230	120	373	90	27	14	854 ERUs
Total ERUs by Basin	**383**	**253**	**574**	**230**	**83**	**39**	**1.562 ERUs**
40-Year ERU Projections (population 6,000)							
Distribution of New ERUs [2]	27%	14%	44%	11%	3%	2%	100%
New ERUs	2,416 ERUs [3]						
New ERUs by Basin	650	340	1,055	254	76	40	2,416 ERUs
Total ERUs by Basin	**803**	**473**	**1,256**	**395**	**132**	**65**	**3,124 ERUs**
Build Out							
Total ERUs by Basin	**1,014**	**530**	**1,647**	**397**	**119**	**63**	**3,770 ERUs**

1. *Based on % of ERU allocation per basin in Table 3 in Entiat's* Collection System Needs Assessment (RH2 - August 25, 2023).
2. *See* ***Table 3-11****.*
3. *Estimated number of new ERUs is calculated by dividing the projected population increase by the existing population and multiplying times the existing number of ERUs.*

3.10 Wastewater Flows and Loadings

3.10.1 *Introduction*

This section provides an estimate of future flows and loadings to be treated at Entiat's wastewater treatment plant. The estimate is based on projected population growth within the sewer service area and flows and loadings currently entering the treatment plant.

Sanitary sewer flows that enter the treatment plant include the following components:

- Residential and commercial flows from the city sewer service area
- Industrial flows from U.S. Castings
- Infiltration and inflow (I/I) from the sewer collection system

This section evaluates current flows and loadings to the City's treatment plant using Discharge Monitoring Reports (DMR's) between January 2019 and December 31, 2023. Historical and current flows and loadings are used to develop per capita ratios for influent flow, biochemical oxygen demand (BOD) and total

suspended solids (TSS). The calculated per capita ratios are used with population projections to estimate future flows and loadings to the treatment plant.

Population projections for Entiat are developed in previous sections and provide projected population based on a variety of sources. For wastewater planning purposes and representing plant capacity, the projections developed in this section are used herein and summarized below.

Existing population (2024):	1,360
Projected 2044 population:	1,832
Annual Growth Rate:	1.5%

3.10.2 *Erroneous Influent Meter Data / September 2022 Replacement*

The treatment plant's influent flow meter was replaced in September 2022. Influent flows prior to September 2022 are incorrect. Historic flow data shows influent flows after the meter replacement are nearly twice as high as with the old meter.

Existing flow estimates herein are based on available flow data after the influent meter was replaced. Given the relatively short period of time the new flow meter has been in service, we recommend the City monitor flows variations (increases or decreases from the estimates herein). Existing and projected design flows should be updated if existing flows deviate from the estimates herein.

3.10.3 *Treatment Plant Influent Flows and Loadings*

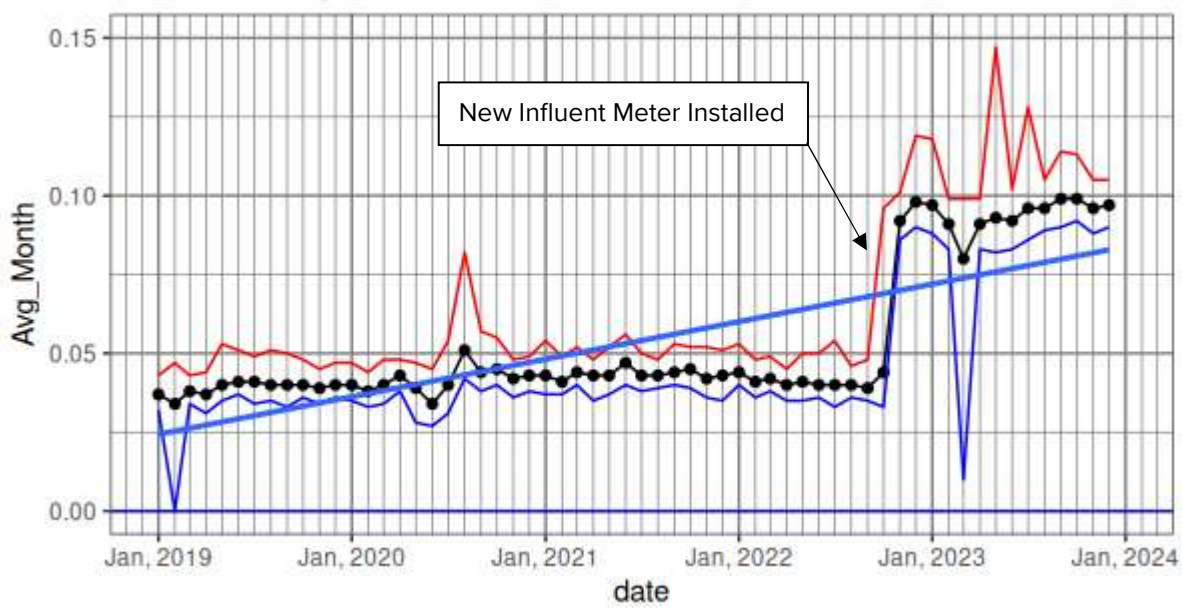
Entiat's wastewater treatment system is permitted by NPDES WA0051276, dated June 21, 2017, which expires July 31, 2022. An Administrative Extension was issued on October 10, 2022 extending the permit until reauthorization.

The City's NPDES permit requires the City to report continuous influent flow data and weekly influent BOD_5 and TSS data. Effluent pH is measured five times a week while effluent temperature, dissolved oxygen (DO), Fecal Coliform, BOD, and TSS are measured weekly and effluent ammonia is measured bimonthly. A variety of other effluent constituents are also measured twice a year.

Wastewater flows are measured at the treatment plant's influent flow meter located in a below grade concrete vault adjacent to the WWTP headworks. Effluent samples are taken downstream of the UV disinfection system.

Influent flows and loadings from January 2019 through December 2023 were initially used to determine seasonal influent trends and to develop per capita ratios for influent flows and loadings. **Figure 3-2** graphs monthly influent flows for this time period. The graph indicates when the new influent meter was installed in September 2022.

Exhibit 3-2 Entiat Monthly Influent Flows from 2019 through 2023



1. *Red – Monthly Peak Flow MGD*
2. *Black – Average Monthly Flow (MGD)*
3. *Blue – Minimum Monthly Flow and Trend line for Average Monthly Flow (MGD)*

Figure 3-3 shows the seasonal variation in monthly average influent flow between 2019 and December 2023. As can be seen on the figure, influent flows are fairly uniform throughout the year, increasing in the fall and winter. This flow pattern indicates that seasonal precipitation does not have a significant impact on influent wastewater flows. Influent flows are uniform throughout the year indicating that the sewer collection system has little I/I.

Exhibit 3-3 Entiat Seasonal Influent Flows (Monthly Average 2019 through 2023)

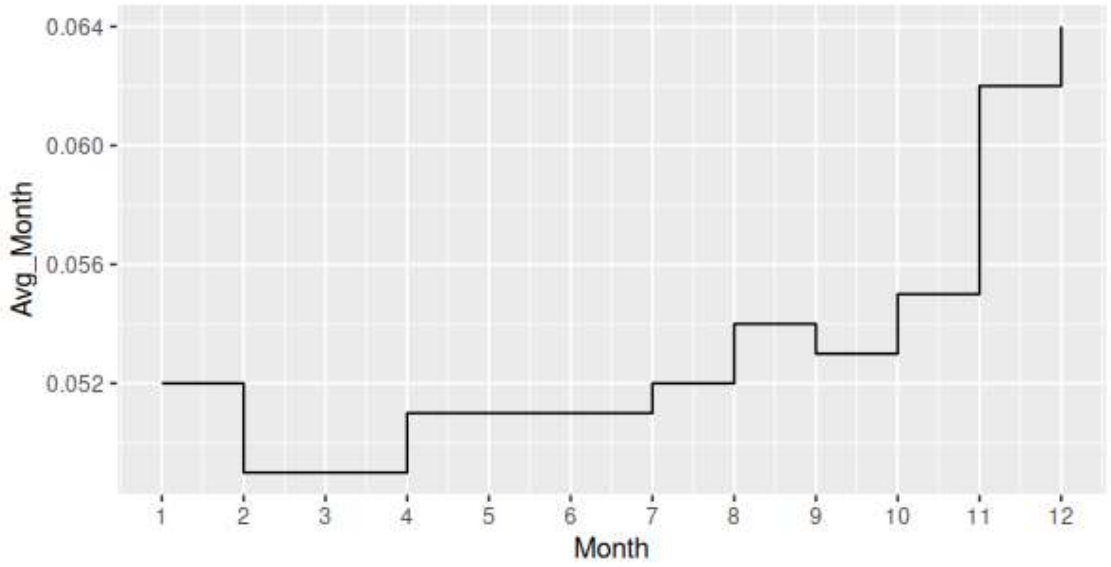
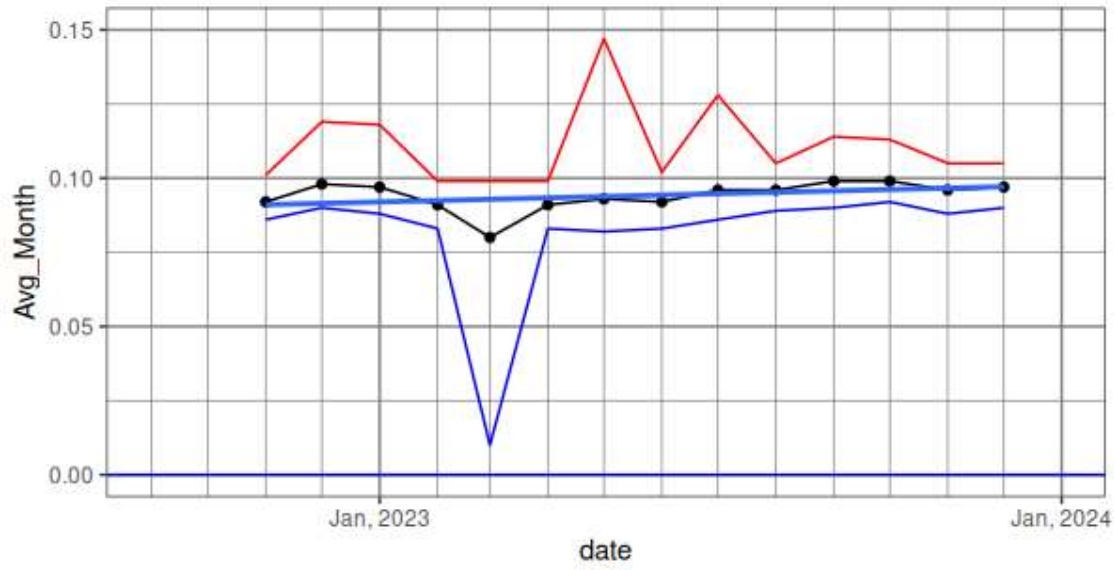


Figure 3 shows monthly influent flows after the new flow meter was installed from September 2022 through December 2023. This is the data period used to calculate per capita influent flows and loadings.

Exhibit 3-4 Entiat Influent Flows from September 2022 through 2023



1. *Red – Monthly Peak Flow MGD*
2. *Black – Average Monthly Flow (MGD)*
3. *Blue – Minimum Monthly Flow and Trend line for Average Monthly Flow (MGD)*

Table 3-13 summarizes the influent flow information.

Table 3-13 Wastewater Influent Flow

		Maximum Month		Maximum Daily	
Year	AAF (MGD) [1]	MMF (MGD) [2]	Peaking Factor	PDF (MGD) [3]	Peaking Factor
2022	0.095	0.098	1.03	0.119	1.26
2023	0.094	0.099	1.06	0.147	1.57
Average	**0.094**	**0.099**	**1.04**	**0.133**	**1.41**
Maximum	**0.095**	**0.099**	**1.05**	**0.147**	**1.56**

1. *AAF = Average Annual Flow*
2. *MMF = Maximum Month Flow*
3. *MDF = Peak Daily Flow*

Influent BOD and TSS concentrations are measured weekly. **Table 3-14** and **Figures 3-5** through **3-8** show BOD and TSS influent parameters.

The concentration of influent BOD5 and TSS are shown for 2019 through 2023. The mass flow rate (lbs/day) of BOD and TSS is calculated from measured influent flow and concentration so only includes the period between September 2022 and December 2023 since the influent flow meter was measuring influent flows incorrectly prior to that.

Table 3-14 Influent BOD and TSS Loading

Year	Avg. Annual BOD_5 (lbs/d)	Max Month BOD_5 (lbs/d)	Avg. Ann. TSS (lbs/d)	Max Mo. TSS (lbs/d)
2022	156	192	118	144
2023	189	260	156	228
Average	**173**	**226**	**137**	**186**
Maximum	**189**	**260**	**156**	**228**

Exhibit 3-5 Average Month BOD Loading (lbs/d)

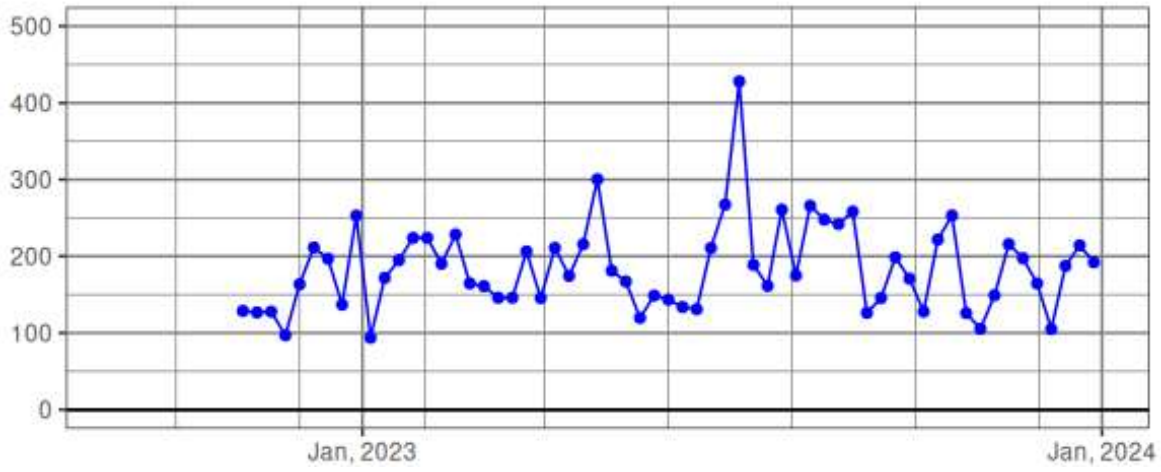


Exhibit 3-6 Average Month BOD Loading (mg/l)

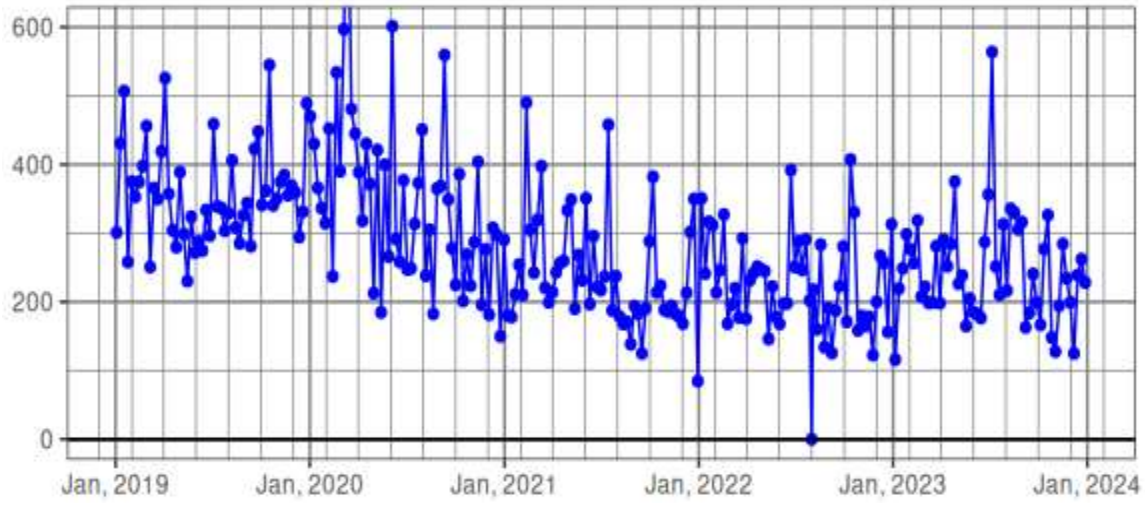


Exhibit 3-7 Average Month TSS Loading (lbs/day)

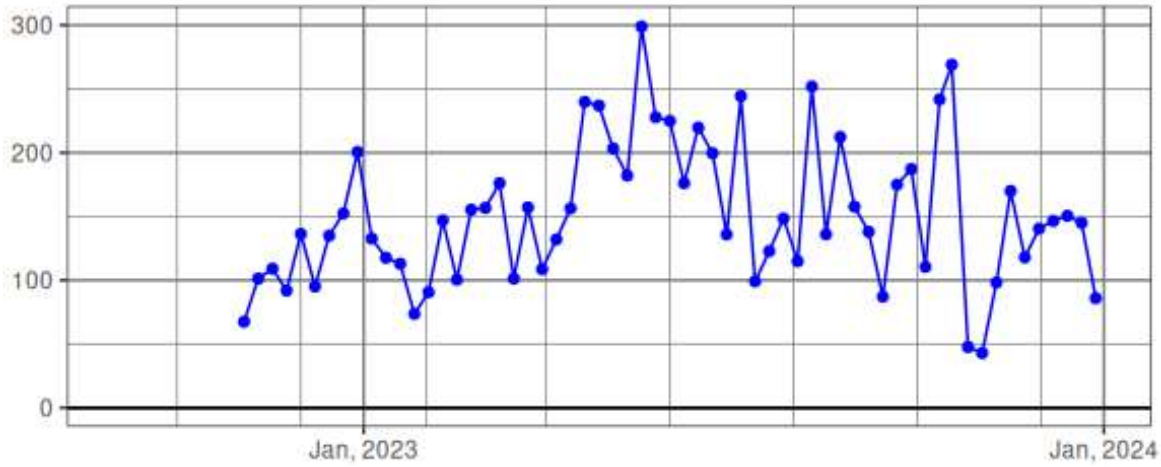


Exhibit 3-8 Average Month TSS Loading (mg/l)

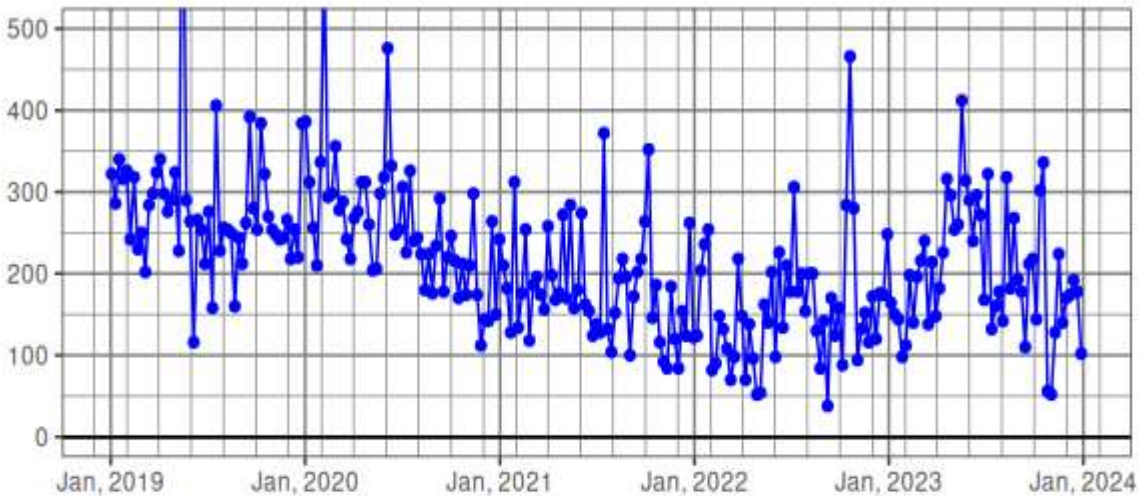


Table 3-15 provides a summary of influent flows and loadings and calculates a per capita ratio for influent flow, BOD, and TSS. The table includes the recommended values for new facilities from the ECY Orange Book. These ratios are used to estimate future influent characteristics.

The per capita flows and loadings shown in **Tables 3-16** to **3-18** are based on influent measurements.

Table 3-15 Flow and Loading Summary

Parameter Description	Existing Influent Flow	New Design Parameters [1]
Population (2024)	1,360	---
Average Daily Flow	70 gpcd	100 gpcd
Max Week Flow	77 gpcd	---
Max Month Flow	73 gpcd	---
Average Daily BOD	0.14 lbs per capita/d	0.2 lbs per capita
Max Month BOD	0.17 lbs per capita/d	---
Average Daily TSS	0.10 lbs per capita/d	0.2 lbs per capita
Max Month TSS	0.14 lbs per capita/d	---

1. *Design for new facilities Table G-2 EC Orange Book*

Table 3-16 Influent Flow per Capita

		Minimum Month		Average Month		Maximum Month		Maximum Week		Peak Day	
Year	Pop	Flow (MGD)	Per Cap	Flow (MGD)	Per Cap	Flow (MGD)	Per Cap	Flow (MGD)	Per Cap	Flow (MGD)	Per Cap
2022	1,356	0.092	68	0.095	70	0.098	72	0.104	77	0.119	88
2023	1,360	0.080	59	0.094	69	0.099	73	0.103	76	0.147	108
Avg.	**1,358**	**0.086**	**63**	**0.095**	**70**	**0.099**	**73**	**0.104**	**76**	**0.133**	**98**
Peak	**1,360**	**0.092**	**68**	**0.095**	**70**	**0.099**	**73**	**0.104**	**77**	**0.147**	**108**

Table 3-17 Influent BOD per Capita

		Minimum Month		Average Month		Maximum Month	
Year	Pop	BOD (lbs/d)	Per Capita	BOD (lbs/d)	Per Capita	BOD (lbs/d)	Per Capita
2022	1,356	120	0.09	156	0.12	192	0.14
2023	1,360	154	0.11	189	0.14	260	0.19
Average	**1,358**	**137**	**0.10**	**173**	**0.13**	**226**	**0.17**
Peak	**1,360**	**154**	**0.11**	**189**	**0.14**	**260**	**0.19**

Table 3-18 Influent TSS per Capita

		Minimum Month		Average Month		Maximum Month	
Year	Pop	TSS (lbs/d)	Per Capita	TSS (lbs/d)	Per Capita	TSS (lbs/d)	Per Capita
2022	1,356	92	0.07	118	0.09	144	0.11
2023	1,360	109	0.08	156	0.11	228	0.17
Average	**1,358**	**101**	**0.07**	**137**	**0.10**	**186**	**0.14**
Peak	**1,360**	**109**	**0.08**	**156**	**0.11**	**228**	**0.17**

3.11 Industrial Wastewater (U.S. Castings)

U.S. Aluminum Castings is located in Entiat and molds and machines aluminum products. Foundry operations include a lost foam foundry, a sand foundry and a permanent mold foundry. Support activities include a pattern shop, air-set core production, heat treatment, shell core production, isoset core production, maintenance operations, cleaning operations, non-destructive testing using X-ray, dye penetrant, and hydrostatic pressure procedures. U.S. Castings also operates a powder coating line for finishing parts made on-site and by other manufacturers. The facility operates three shifts a day up to seven days a week, depending on product demand. Up to 150 people are employed by the company.

The 2014 State Waste Discharge Permit Fact Sheet for the industry (ST0009199) includes the following observation indicating that the industry is well run and typically discharges effluent to the POTW within its effluent limits.

> *Based on the record and reasonable potential analysis for selected parameters, Ecology has determined a considerable reduction in monitoring is allowed. There is little risk of a categorical limit or local limit violation, the Entiat POTW operations, and ultimately surface water quality.*

The Fact Sheet (Table 5 Wastewater Characterization Final Effluent to City) shows that average flow is 5,325 gpd with a maximum value of 8,485 gpd. This is about six percent of the total influent flow to the WWTP. The industry flows are included with the WWTP influent wastewater flows.

3.12 Projected Flows and Loadings

Projected flows and loadings are estimated using projected future populations and flow and loading parameters from the current influent monitoring. Future projections are shown based on the per capita flows and loadings summarized in **Tables 3-15** to **3-18**.

Table 3-19 summarizes the criteria used to estimate future flows and loadings. Typical flow values for new residential developments are approximately 100 gpcd. Entiat historical usage would indicate that residential usage is less than 100 gpcd. To be conservative a value of 100 gpcd is used to estimate future flows.

Table 3-19 Projected Flows and Loadings and Existing Design Capacity

Flow or Loading	Existing (2024)	Criteria	Type	Projected (2044)	Existing WWTF Design Capacity
Service Area Population	1,360			3,000 [1]	
Avg Annual Flow (mgd)	0.095	100	gpcd	0.259	-
Max. Month Flow (mgd)	0.099	1.04	PF [3]	0.269	0.150 [4]
Max. Day Flow (mgd)	0.133	1.41	PF [3]	0.365	0.200 [5]
Peak Hour Flow (mgd)	0.352 [2]	3.7 / 3.4 [2]	PF [3]	0.892	0.480 [5]
Avg Month BOD Load (lbs/d)	173	0.20	lbs/d/cap	501	250 [4] / 302 [5] [6]
Max Month BOD Load (lbs/d)	226	-	n/a	-	
Avg Month TSS Load (lbs/d)	137	0.20	lbs/d/cap	465	250 [4] / 331 [5] [6]
Max Month TSS Load (lbs/d)	186	-	n/a	-	

7. *See **Section 3.4**.*
8. *Peak flow estimated using existing population and method outlined in Section C1-3.3.2 of the Criteria for Sewage Works Design – Ecology Publication # 98-37 WQ.*
9. *Peaking factor is the ratio of the peaked flow to average annual flow.*
10. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276).*
11. *From Facility Design Criteria in the 2007 WWTP Construction Drawings.*
12. *The permitted design capacity for both BOD and TSS are lower than the WWTP design capacity indicated on the 2007 construction drawings and noted in the ECY fact sheet. Both capacities (permitted and design) are shown in the table. The permit does not indicate if the limit is based on average or maximum load; however, it is assumed it is based on max month. This is consistent with the RH2 2023 system evaluation technical memorandum.*

Table 3-20 Existing/Projected Flows/Loads as Percent of WWTP Design Capacity

Flow or Loading	Existing (2024) % of Design Capacity [1]		Projected (2044) % of Design Capacity [1]	
Max. Month Flow (mgd)	66%		180%	
Max. Day Flow (mgd)	67%		183%	
Peak Hour Flow (mgd)	73%		186%	
	Permitted [2]	Design [3]	Permitted [2]	Design [3]
Max Month BOD Load (lbs/d)	90%	75%	241%	200%
Max Month TSS Load (lbs/d)	74%	56%	225%	170%

4. *Percentages based on flow/load and design capacity summary in **Table 3-19**.*
5. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276).*
6. *From Facility Design Criteria in the 2007 WWTP Construction Drawings.*

4.0 Wastewater Collection System

This section reports existing data and information on the City of Entiat's wastewater collection system and provides an evaluation of the collection system and improvements needed. The inflow and infiltration evaluation is provided in **Section 5**.

4.1 Existing Collection System

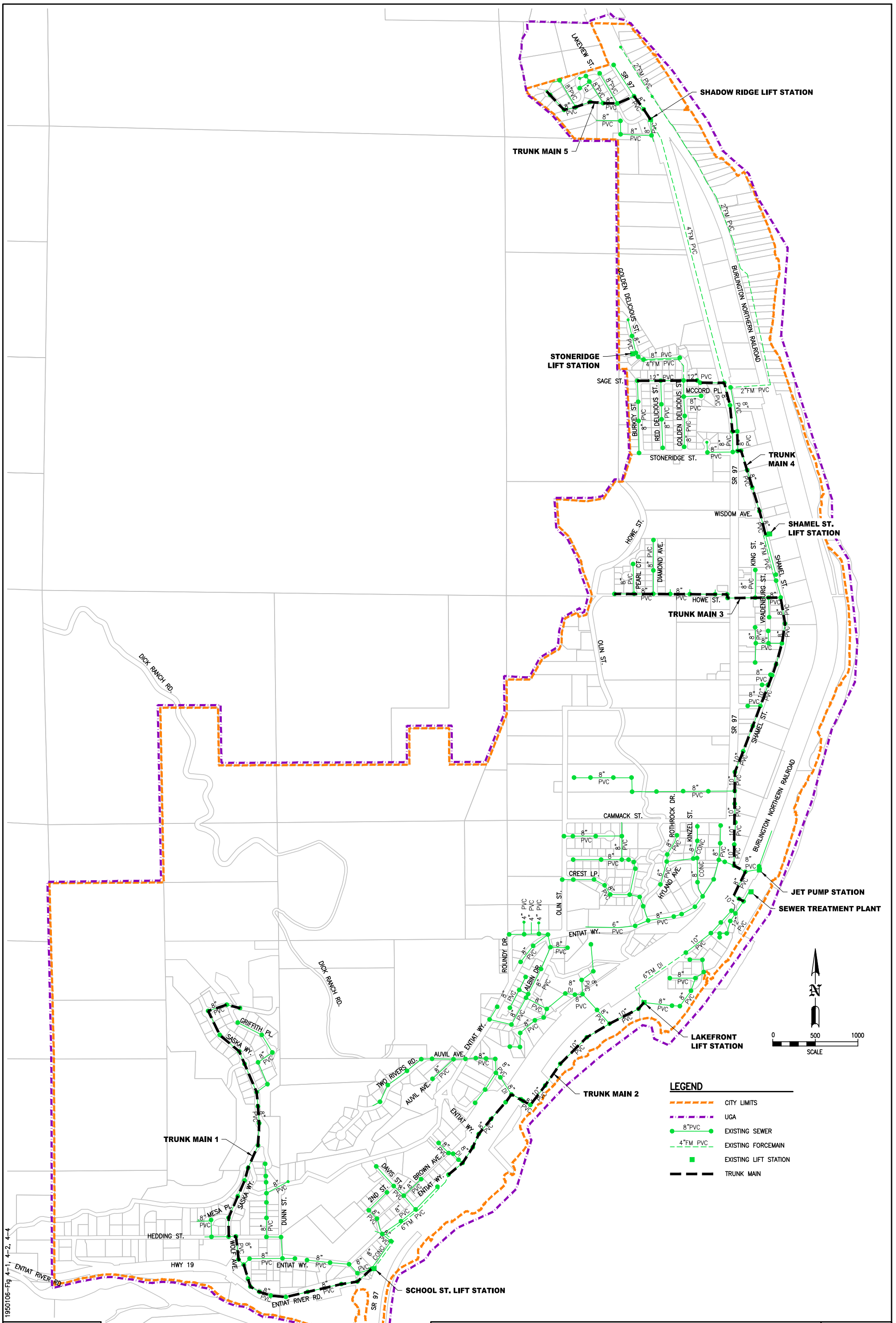
4.1.1 *System Description and History*

Entiat's existing collection system is shown on **Figure 4**-1. The majority of Entiat's wastewater collection system was constructed in 1977 and 1978 during which most of the collection system including four of the existing sewage lift station stations were constructed.

Prior to relocation of the town in 1958, all residences and business establishments used on-site septic tank and drainfield systems. At the time of the 1977 improvements, two separate and localized collection and treatment systems were present in the community. To the south, in the vicinity of the School, a treatment facility existed which served the School and a small number of residences in the immediate area. The package treatment plant had an outfall to the Columbia River near the Chelan County PUD Park. The collection system in the vicinity of the School was poorly constructed and the package treatment plant overloaded during storm events. As a result, the entire collection system in the vicinity of the School was replaced as part of the 1977 improvements. The School treatment plant was converted to a pump station to convey wastewater to the new treatment plant.

The second collection and treatment system, which existed at the time of the 1977 improvements, served the central business area. This system consists of approximately 3,070 feet of concrete pipe constructed in about 1958, which some is still in use today. An overflow lagoon in the vicinity of the present day treatment plant served the central area collection system as a point of wastewater disposal. The preexisting collection system serving the central area was cleaned and inspected in the 1977 improvements but was not replaced. The former overflow lagoon site was converted to an oxidation ditch extended aeration treatment system as part of the 1977 improvements.

The funding provided by the EDA in 1977 gave Entiat the opportunity to construct a new and greatly expanded sewer collection system. The gravity portion of the 1977 sewer collection improvements was constructed of SDR 35 PVC sewer pipe. Force mains were constructed of asbestos cement or PVC. The following table shows the design criteria for the collection system project completed in 1977.



1950106-Fig 4-1, 4-2, 4-4

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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

EXISTING COLLECTION SYSTEM

FIGURE
4-1

Table 4-1: Design Criteria for Existing Sewer Collection System

Description	Value
Population density	15 people (capita) per acre
Quantity of sanitary sewage	70 gals/capita/day
Infiltration and storm inflow allowance	30 gal/capita/day
Peak flow factor	3.0
Minimum velocity in pipe	2 ft. / sec.
Minimum slope for pipe 8" Pipe 10" Pipe	 0.40 feet/100 0.30 feet/100
Manhole spacing, maximum	300 to 400 feet
Diameter of gravity sewers is determined by means of Manning's pipe friction formula. For PVC, "n" of 0.09 was used.	
Manholes required at all breaks in grade and at all horizontal angles	

1. *Source: City of Entiat Wastewater Treatment Plant Facilities Plan and Plan to Maintain Adequate Capacity – December 2004.*

Miscellaneous collection system extensions and improvements have occurred since the 1977/1978 project. New collection system mains have been constructed of PVC generally meeting the design requirements of the Department of Ecology Criteria for Sewage Works Design (Orange Book – Publication #: 98-37 WQ).

4.1.2 *Collection System Mains*

The following table provides an inventory of the collection system sewer mains. Lengths are based on available information and approximate.

Table 4-2: Collection System Inventory

	Length of Sewer Main of Diameter Shown (LF)						
Description	2"	4"	6"	8"	10"	12"	Total
PVC	-	670	998	50,138	5,328	1,742	58,876
DI	-	-	-	481	-	-	481
Conc.	-	-	-	1,938	-	-	1,938
Unknown	-	-	-	396	-	-	396
						Gravity Total	61,691
Force Main	4,881	4,621	2,447	-	-	-	11,949
						Force Main Total	11,949
						Total Sewer Length	**73,640**

4.1.3 *Manholes*

The City maintains approximately 291 manholes throughout the collection system. The system consists of primarily concrete manholes (78%). The system also includes some masonry/brick manholes (3%) and 54 manholes (19%) of unknown material. Invert depths throughout the system range from 3 foot depth to 18 feet.

An inventory of the manholes is included in the following table.

Table 4-3: Manhole Inventory

Manhole Type	Number of MH's	% of Total
Concrete	228	78%
Brick	9	3%
Unknown	54	19%
Total	**291**	**100%**

4.1.4 *Lift Stations*

The City operates and maintains five wastewater lift stations. The existing lift stations are shown on the following table.

Table 4-4: Lift Stations

Description	Location	Year Constructed	Type	Capacity
School St. Lift Station	Entiat River Rd. / Hwy 97A	2007	Wet well / duplex submersible non-clog pump	250 gpm
Lakefront Lift Station	Entiat City Park	2007	Wet well / duplex submersible non-clog pump	410 gpm
Shamel St. Lift Station	Shamel St.	2007	Wet well / duplex submersible non-clog pump	165 gpm
Stone Ridge Lift Station	Golden Delicious St.	1998 / 2024	Wet well / duplex submersible non-clog pump	100 gpm
Shadow Ridge Lift Station	Lakeview St. / Hwy 97A	1998 / 2024	Wet well / duplex submersible non-clog pump	138 gpm

4.2 Collection System Capacity Analysis

Entiat's collection system is broken up into six basins shown on **Figure 4-2**, labeled Basins 1 to 6. The basins discharge to five trunk mains labeled 1 to 5. The collection system basins and trunk mains are both shown on **Figure 4-2**.

This section evaluates the capacities of the existing collection system under current and future flow scenarios, identifies capacity deficiencies, and provides recommended improvements needed to serve projected future flows and growth areas.

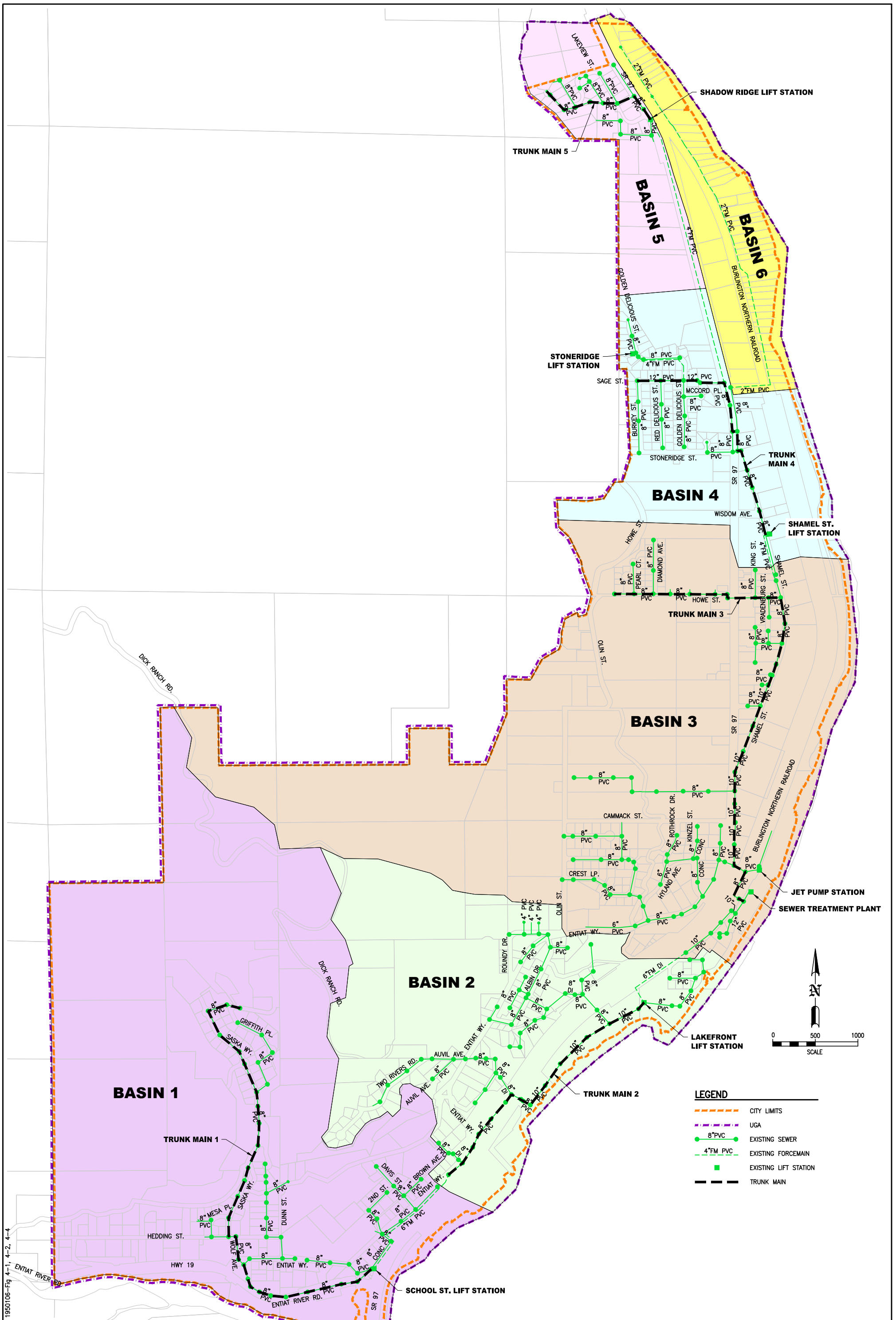
4.2.1 *Reported Capacity Issues*

The City reports that to their knowledge Entiat's collection system does not have known capacity issues, and shows with little to no evidence of surcharging, backups, or other capacity related issues.

4.2.2 *Basin Descriptions*

Existing sewer basins are shown on **Figure 4-2**. Following describe characteristics of each basin:

- **Basin 1:** lines the eastern and southern boundary of the Urban Growth Area (UGA) and has an 8-inch trunk main (Trunk Main 1) that follows Saska Way and Entiat River Road before emitting into the School Street Lift Station. Basin No.1 serves almost entirely residential dwellings and the school district.



1950106-Fig 4-1, 4-2, 4-4

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COLLECTION SYSTEM BASINS

FIGURE
4-2

Much of the land within Basin No. 1 sits at a steep incline from the existing collection system, making additional lift stations unlikely if development pushes northwest. However, depending on existing system elevations, a potential pressure line may be required if service is to be provided to parcels in the southwest corner of the city limits.

- **Basin 2:** receives wastewater pumped from Basin 1 on Entiat Way and conveys it via Trunk Main 2 along US 97A before cutting through the City Park to dispense in the Lakefront Lift Station. The trunkline is composed of 8-inch pipe but transitions to 10-inch pipe when passing through the City Park. Basin 2 primarily serves residential areas but also serves the City Park's 26 tent sites and 31 recreational vehicle (RV) sites.

  Much of the basin is already served or within the serving range of the existing collection system. There is undeveloped land to the northwest, and topography would facilitate linking this land with the two tributary sewers that discharge into the sewer trunkline.

- **Basin 3:** has several mains that discharge directly to the WWTP. The southern trunkline consists of 10-inch pipe that transitions to the 12-inch pipe and conveys wastewater lifted from the Lakefront Lift Station in Basin No.2. Between the Lakefront Lift Station's discharge point and the WWTP, there are only a few residential properties contributing flow to this main. The northern truckline (labeled Trunk Main 3) consists of an 8-inch pipe receiving sewage discharge lifted from Basin No.4's Shamel Street Lift Station. The northern trunkline transitions into a 10-inch pipe and then returns to an 8-inch pipe as it turns onto Lakeshore Drive and feeds into the WWTP.

  Basin No.3 serves a mixture of residential, commercial, and industrial areas, with tributary sewers in the west serving residential zones, while commercial and industrial zones adjoin the trunkline. Undeveloped land sits in the center and the east of Basin No.3. Neither area would require lift stations as they slope continuously towards the existing system.

- **Basin 4:** Basin No.4 collects wastewater from both Basins No.5 & 6 along US 97A and carries it south to the Shamel Street Lift Station. The trunkline (Trunk Main 4) consists of 8-inch pipe that also accepts wastewater from a tributary flowing from the west, which serves a residential development. This development also contains a low point in the north that the Stoneridge Lift Station addresses. This lows point was not delineated as its own basin due to its small size and inability to be further developed.

  Basin No.4 is bound by the Columbia River to the east and foothills to the west and is mostly developed. Undeveloped land zoned as Medium Density Residential sits in the southwest of the basin.

- **Basin 5:** sits along the foothills in the northwest of the UGA. It serves the Shadow Ridge housing development and currently undeveloped commercially designated properties. The trunkline of this basin consists of mostly 8-inch pipe and a stretch of 4-inch pipe along US 97A northwest of Lakeview Street. Basin No.5 deposits into the Shadow Ridge Lift Station, which lifts the wastewater along US 97A to Basin No.4. The City's collection system utilizes a sequential pumping plan to move wastewater from distant basins to inner basins before reaching the WWTP. This is necessary to traverse the topography but puts increased load on the inner basin lift stations.

  Undeveloped land in the southern portion of the basin will require new collection system improvements to convey flows to the Shadow Ridge Lift Station.

- **Basin 6:** lies along the Columbia River in the northernmost section of the City's UGA. It serves commercial properties along US 97A and a group of waterfront residences along Lakeshore Drive that are largely developed. This basin's trunkline is a 2-inch low pressure system that flows into Basin No.4 along US 97A.

4.2.2.1 Growth by Sewer Basin

Growth assumptions for each sewer basin are included Section 3. The following table summarized the projected ERUs for each sewer basin. These recommendations and assumptions are used in the collection system hydraulic analysis herein.

Table 4-5: Summary of Growth by Sewer Basin

Basin	Basin Area (Acres)	Zoning	Existing ERU's	Projected ERU's (20-yr)	Projected ERU's (40-yr)
1	478	Residential	153	383	803
2	236	Residential	133	253	473
3	470	Residential / commercial	201	574	1256
4	129	Residential	140	230	395
5	67	Residential / Commercial	56	83	132
6	77	Residential	25	39	65
Total	1,457	n/a	708	1,562	3,124

4.2.3 *Hydraulic Model, Analysis and Methodology:*

The hydraulic model was created using Bentley OpenFlows SewerCAD hydraulic modeling software. The analysis was conducted in a steady-state time frame, focusing on peak flow conditions using both current and projected future flows.

The model was developed based on the following:

- Data sources for collection system layout, pipe diameter, and manhole elevations are from a 2024 Varela Engineering collection system survey for GIS mapping.
- Existing and projected flows are based on criteria documented in Section 3.
- Loading of the existing model is based on ERU estimate in Section 3. Residential ERUs were distributed based on existing number of residential connections/parcels surrounding each manhole/node. Commercial ERU's were evenly applied to manholes throughout the commercial zoned areas.
- Projected ERUs/flows are applied to the collection system hydraulic model within the basin identified in **Table 4-5**.
- Hydraulic parameters utilized Mannings coefficients for gravity pipes and Hazen-Williams method for pressure conditions if/when gravity pipes reached a full flow pipe condition.

The hydraulic analysis models the existing sewer network under both current conditions at peak flow and future conditions at peak flow and was used to identify system deficiencies.

Since Entiat's sewer basins area served by individual lift stations, basin peak flows are calculated separately for each basin and results in higher peak factors as compared to the system wide peak factors included in the Section 3. The following table provides the individual peak factors for each basin used in the hydraulic analysis and in the lift station evaluations.

Table 4-6 Peak Flow for Individual Sewer Basins

Description	Existing			Projected 20-year			Ultimate Buildout		
	ERU's	Peak Factor	gpm	ERU's	Peak Factor	gpm	ERU's	Peak Factor	gpm
Basin 1 to School Street LS	153	4.048	99.3	383	3.835	235.0	803	3.612	463.6
Basin 2 to Lakefront LS	133	4.075	336.7	253	3.940	409.3	473	3.776	535.4
Basin 3 to WWTP	201	3.992	292.9	574	3.720	505.7	1256	3.456	858.1
Basin 4 to Shamel St LS	112	4.065	344.7	202	3.961	415.7	303	3.827	502.6
Basin 4 Stone Ridge LS	28	4.065	18.0	28	3.961	18.0	92	3.827	56.2
Basin 5 to Shadow Ridge LS	56	4.212	33.0	83	4.156	49.0	132	4.076	79
Basin 6 Low Pressure Zone	25	4.302	17.2	39	4.256	26.5	65	4.191	43.5

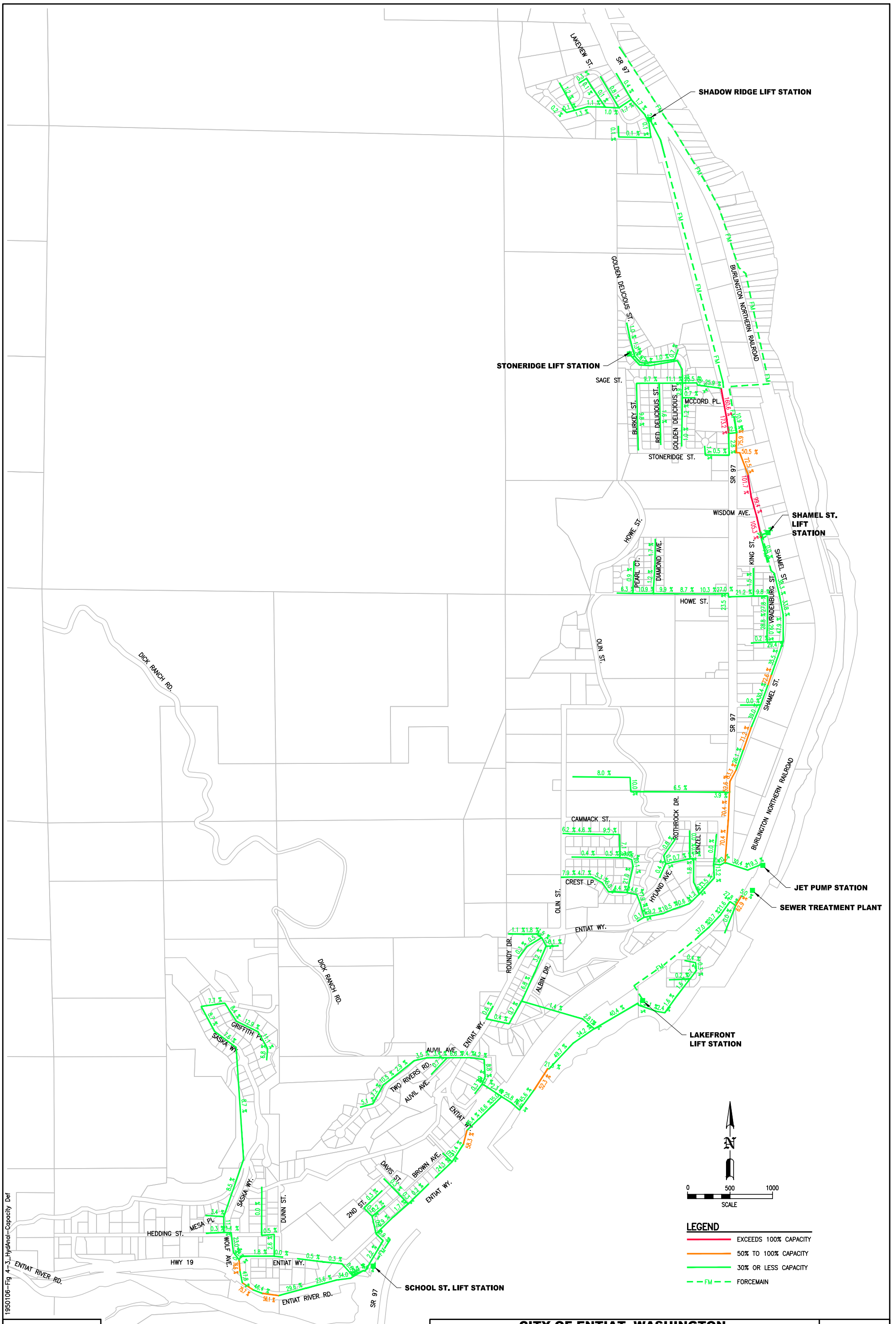
1. *Jet pump LS is assumed to pump directly to treatment plant.*
2. *Where lift station(s) discharges to a basin, the calculated peak flow includes the pumping rate of the lift station discharging to the basin plus the calculated peak flow of the basin.*

4.2.4 *Hydraulic Analysis Results*

The collection system hydraulic model was run using existing, 20-year, and 40-year projected flows. **Table 4-7** summarizes trunk main capacities under existing and projected flows and **Figure 4-3** shows collection system capacity under 20-year projected flows with capacity deficiencies identified.

Following are conclusions from the hydraulic analysis:

- In general, the majority of Entiat's collection system has significant additional capacity for current and projected flows. Under the 20-year projected flows, 85% of the total collection system mains are at less than 50% capacity; and 76% of the total collection system mains are at less than 30% capacity during the 20-year projected flows.
- See **Figure 4-3** – Mains at less than 50% capacity during 20-year peak flows are shown in Green.
- Hydraulic deficiencies occur in Trunk Main 4 under current conditions at two locations:
    1. 8" main in SR97 from Stoneridge St. to Pine Meadows Dr.
    2. 8" main in Shamel St to the Shamel St lift station.



1950106-Fig 4-3_HydAnal-Capacity Def

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HYDRAULIC ANALYSIS - CAPACITY DEFICIENCIES (20 YR)

FIGURE
4-3

See additional discussion and recommendations in following sections.

- Trunk Mains 1 and 3 have segments that are nearing capacity under future conditions. If lift stations are upgraded, parts of the collection system may need to be upgraded to pass the increased flows. See additional discussion and recommendations in following sections.

Table 4-7 Hydraulic Analysis – System Capacity

Description	Existing Capacity	20-Year Capacity	40-Year Capacity
Population	1,785	3,000	6,000
Flows (City Total) [3]			
Average Day (mgd)	0.095	0.259	0.559
Average Day Max Month (mgd)	0.099	0.269	0.581
Maximum Day (mgd)	0.133	0.365	0.788
Peak Hour (mgd)	0.352	0.892	1.772
System Capacity [1]			
Trunk Main 1	23.9%	76.6%	**165.3%**
Trunk Main 2	57.8%	58.3%	63.5%
Trunk Main 3	58.1%	72.6%	**110.1%**
Trunk Main 4 [2]	**146.3%**	**173.2%**	**201.0%**
Trunk Main 5	1.7%	2.7%	4.4%

1. *Capacity output from hydraulic model.*
2. *Capacity shown in the table represents trunk main deficiency on SR97 south of McCord Pl. (see **Figure 4-3**) A second trunk main deficiency also exists (as discussed previously) on Shamel St. south of Stoneridge to the Shamel St. Lift Station. Capacities are: 87.3% (existing), 105.3% (20-year), and 127.2% (40-year).*
3. *Flows shown in this table are City wide flows included for references and are based on City wide peaking factors (per **Section 3**). The hydraulic analysis peaks individual basis based on basin population.*

4.2.4.1 Trunk Main 4 Comments and Recommendations

Trunk Main 4 is located in Shamel St. from the Shamel St. lift station to SR 97, and then extending up Sage St. The western half of Trunk Main 4 from SR 97 up Sage St. does not have capacity issues. At SR 97, Trunk Main 4 receives flow from Basin 5's Shadow Ridge lift station.

Following summarizes Trunk main #4 deficiencies and recommendations:

- See **Figure 4-3**.
- 8" Sewer main along SR 97 from Pine Meadow Dr. to Stoneridge St. approximately 600 LF
    - This section exceeds capacity (146%) under existing peak conditions. Under future flows, the deficiency worsens to (173%) for 20-year flows (as shown on **Figure 4-3**) and 201% during 40-year flows.
    - Under existing conditions, capacity is reached when: 1) flows are at peak conditions, and 2) Shadow Ridge lift station is pumping. This probably only occurs occasionally and for short durations, this likely is causing surcharging during these events but has not reportedly been observed or caused issues. However, as flows increase and if the Shadow Ridge lift

station pumps are upgraded this section will reach capacity under more conditions and the severity of surcharging will increase.

- Recommend: Replace the 8-inch main with a new minimum 12" diameter main.

- 8" Sewer Main along Shamel from Stoneridge St to Shamel St lift station approximately 860 LF
  - This section is at capacity (87%) under existing peak conditions.
  - Under future flows, the section exceeds capacity (105%) with 20-year flows (as shown on **Figure 4-4**) and 127% during 40-year flow.
  - Under 20-year conditions, capacity is reached when: 1) flows are at peak conditions, and 2) Shadow Ridge lift station is pumping. This probably only occurs occasionally and for short durations. as flows increase and if the Shadow Ridge lift station pumps are upgraded this section will reach capacity under more conditions and the severity of surcharging will increase.
  - Recommend: Replace the 8-inch main with a new minimum 12" diameter main.

4.2.4.2 Capacity Improvements Sizing and Estimated Cost

The following Table shows recommended sizing for the two capacity improvements outlined in the preceding sections and the hydraulic improvement for the system.

Table 4-8 Hydraulic Analysis - Capacity Improvements

Basin	Location	20-year Capacity No Improvement		20-year Capacity With Improvement		40-year Capacity No Improvement		40-year Capacity With Improvement	
4	SR 97 between Pine Meadows Dr and Stoneridge St	8"	173.2%	12"	58.7%	8"	201.0%	12"	68.2%
4	Shamel St to lift station	8"	105.3%	10"	58.1%	8"	127.2%	10"	70.2%

See **Figure 4-4** for recommended improvements.

The following tables provide cost estimates for each of the two capacity improvements.

Table 4-9 New 12” Main in SR97 from Meadows Dr. to Stone Ridge St. – Estimated Cost

Improvement Description	Est. Cost
Temporary Traffic Control	$5,000
Temporary Bypass Pumping	$50,000
Mobilization and Administration (8%)	$30,000
Furnish Imported Pipe Bedding – 600 LF @ $20/LF	$12,000
Trench Excavation Safety System	$5,000
Pavement Removal/Replacement– 1,700 SY	$125,000
8" PVC Wastewater Pipe – 600 LF @ $125/LF	$75,000
48-inch Dia. Manhole – 3 EA	$23,000
Subtotal:	$325,000
Sales Tax (8.0%)	$26,000
Contingency (20%)	$65,000
Construction Subtotal:	$416,000
Eng, admin, const mgt, insp (25%)	$104,000
Total:	**$520,000**

Table 4-10 New 12” Main in Shamel St. to the Shamel St. Lift Station – Estimated Cost

Improvement Description	Est. Cost
Temporary Traffic Control	$5,000
Temporary Bypass Pumping	$60,000
Mobilization and Administration (8%)	$40,000
Furnish Imported Pipe Bedding – 860 LF @ $20/LF	$18,000
Trench Excavation Safety System	$5,000
Pavement Removal/Replacement– 1,960 SY	$144,000
8" PVC Wastewater Pipe – 860 LF @ $125/LF	$108,000
48-inch Dia. Manhole – 4 EA	$30,000
Subtotal:	$410,000
Sales Tax (8.0%)	$33,000
Contingency (20%)	$82,000
Construction Subtotal:	$525,000
Eng, admin, const mgt, insp (25%)	$131,000
Total:	**$656,000**

4.2.4.3 Collection System Capacity Improvements Needed Shamel St. Lift Station Pumping Rate is Increased

An evaluation of each of the City’s five lift stations is documented in **Section 4.4**.

The Shamel St lift station pumps to Trunk Main 3 in Shamel St. to SR 97 and eventually to Lakeshore Dr. near the treatment plant. Trunk Main 3 currently passes 360 gpm of flow during peak conditions. That includes flows from the Shamel St. lift station which currently pumps at a rate of 165 gpm. As discussed in the following sections, the lift station is currently at capacity and upgrades are recommended to meet the 20-year projected flows. However, as discussed in the evaluation, additional testing is needed to further determine exiting peak flow condition. Based on testing data, an updated flowrate will be recommended.

Section 4.4 estimates future peak flow based on assumed system attenuation of pumped flows from the other lift station that discharge into Basin 3. Based on this estimates, future peak flow is estimated at 300 gpm. Based on velocity, the Shamel St. lift station force main is limited to about 315 gpm before needing to be upgraded. Therefore, for the purposes of general sewer planning and this capacity analysis, it is assumed the Shamel St. lift station pump are upgraded to the maximum capacity of the force main—i.e. 315 gpm.

With the Shamel St lift station upgraded to 315 gpm, Trunk main 3 will have 530 gpm of flow during peak conditions with the lift station pumping. This results in sections of Trunk main 3 exceeding. Trunk Main 3 is approximately 4,430 LF and with the Shamel St. lift station pumps upsized to 315 gpm, about 1,380 LF of the trunk main exceeds capacity, or 31% of the entire trunk main 3. This will need to be updated after testing is completed and existing pumping operational and flow data is obtained.

Based on the above, it is estimated the cost to upsize 31% of Trunk Main 3 is estimated at about $1 Million.

The evaluation also documented that larger pumps will be needed for two other lift stations after the projected 20-year growth occurs but before the ultimate growth occurs. If lift station pumps are upgraded to increase pump capacity, it affects downstream trunk mains capacity. Whenever a lift station pumping capacity is upgraded, the City should reevaluate capacity of the receiving trunk mains.

4.3 Collection System Condition

4.3.1 *Condition / Reported Issues and Recommendations*

City staff were interviewed regarding the condition of the Entiat's collection system. Following summarizes collection condition and known issues and provides recommendations for improvements needed.

- In general, the City reports that Entiat's collection system is in good condition with few reported problems.

- The collection system age is new enough that the majority of the system piping is within its service life without ongoing condition issues.

- The City has not completed a video inspection of the collection system in recent years and so interior condition of the piping is unknown. However, given the materials used and collection system age, it is anticipated the collection system piping is in satisfactory condition.

- Manholes were inspected during the 2024 Varela Engineering collection system survey for GIS mapping. The majority of the system's manholes are pre-cast concrete and in satisfactory condition. However, some existing manholes are old brick-lined manholes and the City should plan to replace. Timing of the replacements was discussed with the City. Given the low system I/I and that the brick lined manholes are not significantly deteriorated, replacement should be as soon as practical and/or in conjunction with other work. Estimated cost is $7,500 per manhole.

- The City reports there is known root intrusion occurring on Kinzel St. from Entiat Way north (approximately 900 LF); and on Hyland Ave. from Kinzel St. to Rothrock Dr. (approximately 300 LF). Collection system piping in this section is old concrete piping. Recommend this area be cleaned with root removal and video inspected. If the pipe condition is adequate, recommend CIPP lining the existing pipes. If condition is not adequate for CIPP lining, then recommend replacing.

  Estimated cost: Clean/video inspect: $30K

CIPP Line existing concrete mains: $250K

Or if replacement is necessary: $915K

- The City operates an RV waste disposal station located at the Entiat City Park which includes 31 RV sites. The dump station is not metered and discharges directly to the collection system. Given the close proximity to the WWTP, waste entering the RV dump quickly enters the treatment plant. Waste from RV dump stations typically consists of high strength sewage and at times can include formaldehyde and other chemicals which can inhibit and affect treatment. In response to the influent toxicity issues (documented in other TM's), and given the potential for high strength sewage, it is recommended the City upgrade the dump station to include storage and metered discharge to the collection system. There are also a variety of other options that can be designed into the dump station that allow for more sophisticated metering and billing methods and allow for auto sampling and other features. Recommend pre-design be completed to determine the options and costs that the City would like to include.

  Estimated cost: RV Dump Station: $100K to $500K depending on options selected by the City during Pre-design. Costs to be updated after pre-design

4.4 Lift Stations

The City of Entiat operates and maintains five sewage lift stations within the existing collection system. The equipment and operating characteristics of each lift station is shown in the following table.

Table 4-11 Existing Lift Stations Summary

Description	School Street Lift Station	Lakefront Lift Station	Shamel Street Lift Station	Stone Ridge Lift Station	Shadow Ridge Lift Station
Basin Served	1	1 and 2	4, 5 and 6	4 (partial)	5
Lift Station Type	Wet Well / Submersible Pump	Wet Well / Submersible Pump	Wet Well / Submersible Pump	Wet Well / Submersible Pump	Wet Well / Submersible Pump
Constructed	2007	2007	2007	1998, pumps and panels replaced 2024	1998, pumps replaced 2024
Pump Type	(2) non-clog	(2) non-clog	(2) non-clog	(2) non-clog	(2) non-clog
Pump Mfr	Flygt	Flygt	Flygt	Flygt	Flygt
Pump Capacity	250 gpm @ 67' TDH	410 gpm @ 63' TDH	165 gpm @ 36' TDH	100 gpm @ 16' TDH	139 gpm @ 46' TDH
Pump Motor	20 hp, 3ph 460v	15 hp, 3ph 460v	10 hp, 3ph 460v	1.5 hp, single phase, 230v	3 hp, 3ph 460v
Force Main [2]	6" PVC 1,525 lf	6" DI 1,280 lf	4" PVC 575 lf	4" PVC 675 lf	4" PVC 3,200 lf
FORCE MAIN CAPACITY [1]					
Min. @ 2 fps	180 gpm	180 gpm	80 gpm	80 gpm	80 gpm
@ 5 fps	440 gpm	440 gpm	190 gpm	190 gpm	190 gpm
Max. @ 8 fps	705 gpm	705 gpm	315 gpm	315 gpm	315 gpm

1. *General force main capacity range based on velocity using nominal pipe diameters. 2 fps is minimum force main velocity based on ECY criteria for minimum cleaning velocity. Preferred force main velocity range is 5 – 8 fps. Increasing velocity will increase total dynamic head, pump performance, horsepower and electrical power requirements.*
2. *Force main lengths are approximate.*

4.4.1 *Lift Stations Evaluation*

4.4.1.1 School Street Lift Station

Description:

The School Street Lift Station is located at the northwest corner of SR97 and Entiat River Rd. and is the site of the old School treatment plant. The abandoned treatment plant was retrofitted into a lift station and consists of a rectangular wet well with duplex submersible pumps within the existing below grade concrete structure. This lift station serves a single basin, Basin 1, and pumps into Basin 2 which then gravity flows to the Lakefront Lift Station.

Flows:

From **Table 4-6**, existing and projected 20-year and ultimate peak hour flows are as follows:

Existing:	99 gpm
Project 20-year:	235 gpm
Ultimate:	464 gpm

Capacity:

The lift station has two identical pumps, each with a reported pumping capacity of 250 gpm. This capacity is adequate to pump both existing and projected 20-year flows. However, pump capacity will need to be increased to 464 gpm to pump the projected ultimate flows.

Force Main:

Based on the reported pumping rate of 250 gpm results in a velocity of 2.8 fps in the existing 6" force main. This velocity exceeds the minimum ECY criteria of 2 fps but is below the ECY recommended 5 -8 fps

Increasing pump capacity to 464 gpm to pump the projected ultimate flows would increase velocity to 5.3 fps within the ECY recommended 5-8 fps.

Condition:

The lift station was completely rebuilt in 2007. The lift station is equipped with an emergency standby generator. Based on information provided by Mark Botello, Director of Public Works, and from a site visit conducted on 4/9/24, the lift station appears to remain in good operational condition with no known issues.

Recommended Improvements:

- The lift station is not equipped with a standby emergency generator. Recommend the City add a standby emergency generator to increase facility reliability.
- Pump capacity will need to increase after the projected 20-year growth is achieved and prior to basin reaching its ultimate growth.

4.4.1.2 Lakefront Lift Station

Description:

The Lakefront lift station is located on the north side of the Entiat City Park, just off Lakeshore Dr. This lift station serves multiple basins, Basin 2 and wastewater pumped from Basin 1 via the School Street Lift Station. This lift station pumps wastewater to Basin 3 which then gravity flows to the WWTP.

Flows:

From **Table 4-6**, existing and projected 20-year and Ultimate peak hour flows are shown in the following table:

Table 4-12 Projected Flows into Lakefront Lift Station

Lift Station	Existing Peak Hour Flows	Projected 20-yr Peak Hour Flows	Projected Ultimate Peak Hour Flows
Basin 1 [1]	250 gpm	250 gpm	464 gpm
Basin 2	87 gpm	159 gpm	285 gpm
Combined	337 gpm	409 gpm	749 gpm

1. *Flow from Basin 1 via the School Street Lift Station which discharges into Basin 2 and flows into Lakefront LS. Flow for Existing and Projected 20-year based on current pump rate. Flow for Projected Ultimate assumes pump capacity will be increased to match Projected Ultimate Peak Hour flow.*

Capacity:

The lift station has two identical pumps, each with a reported pumping capacity of 410 gpm. This capacity is adequate to pump both existing and projected 20-year flows. Pump capacity will need to be increased to 749 gpm to pump projected ultimate flow.

Force Main:

Based on the reported pumping rate of 410 gpm results in a velocity of 4.7 fps which exceeds the minimum ECY criteria of 2 fps and is near the ECY recommended 5 -8 fps.

Increasing pump capacity to 749 gpm to pump the projected ultimate flows would increase velocity to 8.5 fps which slightly exceeds the ECY recommended 5-8 fps.

Condition:

The lift station was completely rebuilt in 2007. The pumps were rebuilt in 2021. The lift station is equipped with an emergency standby generator. Based on information provided by Mark Botello, Director of Public Works, and from a site visit conducted on 4/9/24, the lift station appears to remain in good operational condition with no known issues.

Recommended Improvements:

- No improvements recommended in the planning period.
- Increase pump capacity after the projected 20-year growth is achieved and prior to basin reaching its ultimate growth.

4.4.1.3 Shamel Street Lift Station

Description:

The Shamel Street lift station is located on the east side of Shamel St., just south of Wisdom Ave. This lift station serves multiple basins, Basin 4 and wastewater pumped from Basin 5 via the Shadow Ridge lift station, and Basin 6 via their low-pressure system. This lift station also receives wastewater flow from the Stone Ridge lift station, located inside Basin 4.

Flows:

Existing and projected 20-year and ultimate peak hour flows for each contributing basin are shown in the following table:

Tabel 4-13 Estimated Flows into Shamel LS

Lift Station	Existing Peak Hour Flows	Projected 20-yr Peak Hour Flows	Projected Ultimate Peak Hour Flows
Basin 4 [1]	173 gpm	228 gpm	285 gpm
Basin 5 [2]	139 gpm	139 gpm	139 gpm
Basin 6	33 gpm	49 gpm	79 gpm
Combined	345 gpm	416 gpm	503 gpm

1. *Includes flows generated within Basin 4 and 100 gpm pumping capacity from Stone Ridge Lift Station, located within Basin 4 and discharging into Basin 4.*
2. *139 gpm pumping capacity from Shadow Ridge Lift Station which serves Basin 5*

Capacity:

The lift station has two identical pumps, each with a reported pumping capacity of 165 gpm. This pump capacity is inadequate to pump the existing, projected 20-year and ultimate peak hour flows if all upstream lift stations pumps are pumping at their full capacity into the Shamel Lift Station.

There are currently no reported issues with the operation of the pump station and there are several factors which contribute to the ability of the existing lift station pumps to adequately convey the estimated flows into the lift station. These include the following:

- Estimated basin flows that discharge directly into the Shamel LS are much lower than the total estimated peak flows shown in the table which includes the discharge from the Stone Ridge and Shadow Ridge lift stations, which discharge into the gravity collection system draining to Shamel LS. This means a significant portion of the peak flow is related to the pumping rates of the contributing lift stations.
- Both the Stone Ridge and Shadow Ridge lift stations pump for short durations and will not always discharge at the same time. Pump run times for Stone Ridge and Shadow Ridge lift stations are estimated at 5 minutes and 7 minutes respectively. Thus since the possibility of both lift stations pumping at the same time is low, it means the peak flow rate for the basin rarely occurs.
- Additionally, flows from the Stone Ridge and Shadow Ridge lift stations do not discharge directly to the Shamel St. lift station. Instead, flows discharge to the collection system and gravity drain to the lift station. These flows are attenuated through the system prior to entering the Shamel LS., thus the peak flow entering the Shamel St. lift station wet well are less than the calculated flows herein.

Based on these factors, estimated peak flow scenarios into the Shamel LS are provided in the following table.

Tabel 4-14 Estimated Existing Peak Flow into Shamel LS

	Description	Basin Flows Both LS's Off	Basin Flows One LS On	Basin Flows Both LS's On	
Inflow	Basin 4	73	73	73	gpm
	Stone Ride PS [1]			60	gpm
	Shadow Ridge PS [1]		83	83	gpm
	Basin 6	33	33	33	gpm
	Peak Hour Flow	106	189	249	gpm
Wet Well Volume	Wet Well Dia.	10	10	10	ft
	Vol./ft	587	587	587	gal
	Pump Depth	2	2	2	ft
	Pump Volume	1,174	1,174	1,174	gal
	Time to Fill	11	6	5	min
Outflow	Pump Rate (single)	165	165	165	gpm
	Time to Empty	20	[4]	[4]	min
	Pump Rate (both) [2]	264	264	264	gpm
	Pump Run Time	[3]	16 [5]	80 [5]	min

1. *Assumes collection system attenuates lift station discharge 40%.*
2. *Assumes both pumps running at 80% capacity of single pump.*
3. *Inflow is less lead pump capacity; lag pump will not be called to start.*

4. *Inflow exceeds lead pump capacity; lag pump will start causing both pumps to run.*
5. *Run time of both pumps will only last for duration of pump run time for contributing lift station,*

Based on the above table, the existing pumps have the capacity to pump the estimated existing flows with both pumps operating on occasion. It is likely both pumps operate frequently for short durations during periods of peak flows. This situation will increase in frequency and duration as growth occurs in the contribution basins.

ECY Criteria for Sewage Works Design states that each pump shall have the capacity to meet peak hour demands. The following is recommended:

- Install a data recorder in the inlet to the lift station to record instantaneous flows into the lift station to confirm the volume, frequency and duration of peak flows entering the lift station.
- Place a data recorder in the pump panel to record the frequency and duration when both pumps are running.
- Perform a pump test on the lift station to confirm pump capacity, both for single pump operation and duplex pump operation.
- Upsize the existing pumps to provide the capacity for a single pump to meet current and estimated 20-year flows.

Force Main:

Based on the reported pumping rate of 165 gpm results in a velocity of 4.2 fps which exceeds the minimum ECY criteria of 2 fps and is near the ECY recommended 5 -8 fps.

As discussed above, it is likely the force main experiences periods when both pumps are operating. Based on the assumption in the previous table of a pump rate of 264 gpm when both pumps are operating, this would result in a velocity of 6.7 fps which is within the ECY recommended 5-8 fps.

If it is necessary to increase the capacity of the existing pumps, the existing force main can flow a maximum of about 315 gpm before exceeding the ECY recommended 8 fps maximum.

To carry the estimated combined peak flows of all contributing basins, including the full pump capacity of each contributing lift station, as shown in **Table 4-13**, it will be necessary to replace the existing 4" force main with a 6" force main. This will result in velocities between 3.9 and 5.7 fps.

Condition:

The lift station was completely rebuilt in 2007. The pumps were serviced in 2023. The lift station is not equipped with an emergency standby generator. Based on information provided by Mark Botello, Director of Public Works, and from a site visit conducted on 4/9/24, the lift station appears to remain in good operational condition with no known issues. See recommendations above.

Recommended Improvements and Estimated Costs:

The following is recommended:

- Record instantaneous influent flow data into the existing lift station to determine:
    - Existing peak flow rate and duration.
    - Frequency and duration of duplex pump operation.

- Update existing flow rate and peak flow estimate and projected peak flow for 20-year condition.
- As needed, increase pump capacity to meet existing peak flows and estimated 20-year flow This may also require upgrades to the electrical power and controls.
    - Depending on updated peak flow rate calculation, this may also require replacing the force main (if peak flow exceed 315 gpm) and replacing portions of the downstream trunk main (see **Section 4.2.4.3**).
    - Based on the calculation in **Table 4-14**, the attenuated existing peak flow lowered from the calculated peak flow of 345 gpm to a peak flow of 249 gpm. Using the same attenuation ratio, the projected 20-year peak flow with system attenuation is estimated at 300 gpm. This needs to be updated based on the testing outlined previously.
    - Assuming 300 gpm (per previous bullet item), it is assumed the down stream force main will not need to be replaced. However, sections of Trunk Main 3 will need to be replaced (see **Section 4.2.4.3**).
- Recommend the City add a standby emergency generator to increase facility reliability.

4.4.1.4 Stone Ridge Lift Station

Description:

The Stone Ridge lift station is located in a residential development at 14044 Golden Delicious St. This lift station serves a portion of Basin 4. This lift station receives wastewater flow from 26 single-family residential homes. The LS discharges into the Basin 4 gravity collection system which then drains to the Shamel LS.

Flows:

From **Table 4-6**, existing and projected 20-year and Ultimate peak hour flows are as follows:

Existing:	18 gpm
Project 20-year:	18 gpm
Ultimate:	56 gpm

Capacity:

The lift station has two identical pumps, each with a reported pumping capacity of 100 gpm. This capacity is adequate to pumps both Existing, Projected 20-year and Ultimate flows.

Force Main:

Based on the reported pumping rate of 100 gpm results in a velocity of 2.6 fps which exceeds the minimum ECY criteria of 2 fps but is below the ECY recommended 5 -8 fps.

Condition:

The lift station was constructed in 1999. The pumps and panels were replaced in 2024. The lift station is not equipped with an emergency standby generator. Based on information provided by Mark Botello, Director of Public Works, and from a site visit conducted on 4/9/24, the lift station appears to remain in good operational condition with no known issues.

Recommended Improvements

The lift station is not equipped with a standby emergency generator. Recommend the City add a standby emergency generator to increase facility reliability.

4.4.1.5 Shadow Ridge Lift Station

Description:

The Shadow Ridge lift station was constructed to serve the 28 lot Shadow Ridge residential development and is located at the southwest corner of US97 and Lakeview St. This lift station serves Basin 5, much of which is undeveloped at this time. This lift station currently receives wastewater flow from 20 single-family residential homes. The LS discharges into the Basin 4 gravity collection system which then drains to the Shamel LS.

Flows:

From **Table 4-6**, Existing, Projected 20-year and Ultimate Peak Hour flows are as follows:

- Existing: 17 gpm
- Project 20-year: 27 gpm
- Ultimate: 44 gpm

Capacity:

The lift station has two identical pumps, each with a reported pumping capacity of 139 gpm. This capacity is adequate to pumps both Existing, Projected 20-year and Ultimate flows.

Force Main:

Based on the reported pumping rate of 139 gpm results in a velocity of 3.6 fps which exceeds the minimum ECY criteria of 2 fps but is below the ECY recommended 5 -8 fps.

Condition:

The lift station was constructed in 1999. The pumps were replaced in 2024. The lift station is not equipped with an emergency standby generator. Based on information provided by Mark Botello, Director of Public Works, and from a site visit conducted on 4/9/24, the lift station appears to remain in good operational condition with no known issues.

Recommended Improvements:

The lift station is not equipped with a standby emergency generator. Recommend the City add a standby emergency generator to increase facility reliability.

4.5 Summary of Improvements and Costs

The following table summarizes the collection system improvements identified herein:

Table 4-15 Summary of Proposed Improvements

Description	Estimated Cost
Existing to 20-Yr Improvements:	
Collection System - Capacity Improvements:	
4.2.4.2 – New 12" Main in SR97 (Trunk Main 4)	Cost: $520K
4.2.4.2 – New 12" Main in Shamel St. (Trunk Main 4)	Cost: $656K
4.2.4.3 – TBD - Upsize Trunk Main 3 [1]	Cost: TBD - $1 Million
Collection System - Condition Improvements:	
4.3.1 – Replace brick lined manholes (9 @ $7,500)	Cost: $67.5K
4.3.1 – CIPP line or Replace 8" Mains on Kinzel and Hyland Ave.	Cost: Clean/Video: $30K CIPP line: $250K Or Replace [2]: $915K
4.3.1 – RV Waste Disposal Station	Cost: $100K to $500K [3]
Lift Stations – Improvements:	
4.4.1.1 – School Street Lift Station – Backup Generator	Cost: $100K
4.4.1.3 – Shamel Street Lift Station – Evaluation/Improvements	Cost: LS Eval/testing: $20K Upsize pumps: $150K Upsize FM: TBD Generator: $100K
4.4.1.4 – Stone Ridge Lift Station – Backup Generator	Cost: $100K
4.4.1.5 – Shadow Ridge Lift Station – Backup Generator	Cost: $100K

4. *Dependent upon updated peak flow estimate. See recommendations in **Section 4.4.1.3** regarding obtaining operational and flow data to update the peak flow estimate. Cost based on 31% replacement of Trunk Main 3.*
5. *See **Section 4.3.1**. Based on video inspection, if CIPP lining is not possible due to pipe condition then full replacement will be required.*
6. *Cost depends on options and sophistication of the RV dump station and thus a cost range is included. See **Section 4.3.1**.*

CAPACITY IMPROVEMENTS – EXISTING TO 20-YEAR

1. NEW 12" MAIN IN SR97
   REPLACE/UPSIZE EXISTING GRAVITY SEWER MAIN TO MINIMUM 12" DIAMETER (600LF +/-)
2. NEW 12" MAIN IN SHAMEL ST. TO LIFT STATION
   REPLACE/UPSIZE EXISTING GRAVITY SEWER MAIN TO SHAMEL ST. LIFT STATION TO MINIMUM 12" DIAMETER (860LF +/-)
3. UPSIZE TRUNK MAIN 3
   TRUNK MAIN 3 MAIN NEED TO BE UPSIZED RESULTING FROM INCREASED PUMPING RATES IN THE SMALE LIFT STATION. INITIAL CALCULATION SHOW APPROXIMATELY 30% OF TRUNK MAIN 3 WILL NEED TO UPSIZED, DEPENDING ON OPERATION AND TESTING DATA TO BE OBTAINED. SEE SECTION 1.3.8
4. REPLACE BRICK LINED MANHOLES (NOT SHOWN)
   REPLACE OLD BRICK LINED MANHOLES (9 LOCATIONS – NOT SHOWN ON THIS EXHIBIT)
5. CIPP LINE OR REPLACE MAINS IN KINZEL AND HYLAND
   CLEAN/VIDEO INSPECT MAINS IN KINZEL AND HYLAND. IF CIPP LINING IS VIABLE BASED ON INSPECTION, THEN CIPP LINE EXISTING CONCRETE MAINS. IF NOT, THEN REPLACE W/ NEW 8" MAINS
6. RV WASTE DISPOSAL STATION
   NEW/UPGRADED WASTE DISPOSAL STATION. OPTIONS/CONFIGURATION TBD DURING PRE-DESIGN
7. INSTALL BACKUP GENERATOR AT SCHOOL ST LIFT STATION
8. EVALUATION AND IMPROVEMENTS FOR SHAMEL ST. LIFT STATION
   OBTAIN OPERATIONAL AND TESTING DATA TO DETERMINE EXISTING PEAK FLOWS; UPDATE 20 YEAR PROJECTED PEAK FLOW (SEE SECTION 1.5.1). INCREASE PUMPING RATE TO ACCOMMODATE HIGHER PEAK FLOW (AS NEEDED). INSTALL EMERGENCY BACKUP GENERATOR.
9. INSTALL BACKUP GENERATOR AT STONE RIDGE LIFT STATION
10. INSTALL BACKUP GENERATOR AT SHADOW RIDGE LIFT STATION

SHADOW RIDGE LIFT STATION 10
TRUNK MAIN 5
STONERIDGE LIFT STATION 9
TRUNK MAIN 4
SHAMEL ST. LIFT STATION 8
TRUNK MAIN 3
JET PUMP STATION
SEWER TREATMENT PLANT
LAKEFRONT LIFT STATION 6
TRUNK MAIN 2
SCHOOL ST. LIFT STATION 7
TRUNK MAIN 1

LAKEVIEW ST. · SR 97 · GOLDEN DELICIOUS ST. · BURLINGTON NORTHERN RAILROAD · SAGE ST. · MCCORD PL. · BURKEY ST. · RED DELICIOUS ST. · GOLDEN DELICIOUS ST. · STONERIDGE ST. · WISDOM AVE. · HOWE ST. · PEARL CT. · DIAMOND AVE. · KING ST. · VRADENBURG ST. · SHAMEL ST. · OLIN ST. · DICK RANCH RD. · CAMMACK ST. · ROTHROCK DR. · KINZEL ST. · CREST LP. · HYLAND AVE. · ENTIAT WY. · ROUNDY DR. · ALBIN DR. · AUVIL AVE. · TWO RIVERS RD. · GRIFFITH PL. · SASKA WY. · MESA PL. · DUNN ST. · HEDDING ST. · WOLF AVE. · HWY 19 · ENTIAT RIVER RD. · DAVIS ST. · 2ND ST. · BROWN AVE.

LEGEND
- CITY LIMITS
- UGA
- 8"PVC — EXISTING SEWER
- 4"FM PVC — EXISTING FORCEMAIN
- EXISTING LIFT STATION
- TRUNK MAIN
- IMPROVEMENTS

N
0 500 1000
SCALE

1950106-Fig 4-1, 4-2, 4-4

SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-01-06
DATE:	2/13/25

VARELA
Engineering & Management

CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

SUMMARY OF COLLECTION SYSTEM IMPROVEMENTS

FIGURE
4-4

5.0 Collection System I/I Evaluation

5.1 Introduction

This memorandum summarizes the methods and results used to identify the individual components of wastewater flow entering the wastewater treatment facility (WWTF). Individual flow components include:

- Sanitary Base Flow: flow from the private and public facilities such as residences, commercial facilities, and schools.
- Infiltration: groundwater entering the sewer through poor service connections, cracked or broken pipes and manhole walls.
- Inflow: water introduced into the system through area drains, roof drains, foundation drains, sump pumps, storm drains or direct flow through manhole lids. Inflow is directly related to storm (precipitation) events. Snowmelt can also contribute to inflow as well as infiltration. Inflow can be separated into direct and rainfall induced inflow (RDI/I). RDI/I is related to short term increased groundwater elevations due to precipitation.

The infiltration/inflow (I/I) results determine if the collection system has excess I/I that can impact influent flows and capacity and operation of the WWTF.

5.2 Data and Methods

Influent flows into the WWTF were obtained from discharge monitoring reports (DMR's). DMR's from November 1, 2022, through December 31, 2023, are available on ECY's PARIS website. Weather records for the same period are from the WSU AGNET Orondo site (https://weather.wsu.edu).

The following methods were used to estimate I/I.

5.2.1 *Method 1: Annual I/I Report – ECY Information Manual for Treatment Plant Operators, Appendix I*

The Annual I/I Report is prepared by treatment plants as part of their annual wastewater documentation. The purpose of the Annual I/I Report is to track potential I/I issues. If large increases are noted, ECY requires an explanation and a plan for corrective action.

This I/I method assumes that the difference between the highest and lowest month average influent flow provides a reasonable estimate of I/I.

5.2.2 *Method 2: EPA Guide for Estimating Infiltration and Inflow, Region 1, June 2014,*

The 2014 EPA Guide provides guidance for estimating I/I. The guidance is based on EPA's 1991 Sewer System Infrastructure Analysis and Rehabilitation and the 1985 Infiltration/Inflow – I/I Analysis and Project Certification documents.

Step 1: Estimate Base Sanitary Flow (BSF)

The sanitary portion of the wastewater flow can be estimated through two methods, which can be used to 'check' each other – influent flow data and winter domestic water consumption.

The first method analyzes influent wastewater flow at the WWTF during dry weather periods lasting 7 to 14 days. Influent flow data during this period is used to calculate average daily flow for dry weather periods. Base sanitary flow (BSF) is estimated by subtracting groundwater infiltration (GWI) flow from the average daily dry weather wastewater (ADF) flow.

The second method uses winter (non-irrigation) water usage records to estimate base sanitary flow. During winter, wastewater from residential areas is assumed to be approximately the same as the billed water use. Groundwater infiltration is estimated as the difference between the monitored wastewater flow and the billed water use.

Step2: Estimate Infiltration (GWI)

Groundwater infiltration (GWI) can be estimated from influent flow data collected during dry weather when groundwater is high. Dry weather is defined as when there has been at least three days without a rain event. During dry weather, inflow is expected to be zero. In most cases, the GWI rate will approximate the maximum weekly infiltration.

The infiltration rate can also be estimated by averaging nighttime flows (midnight to 6 am) over several days, during dry weather conditions. The nighttime flows can be assumed to be mostly groundwater (after subtracting significant industrial or commercial nighttime flows). **Note that night time flows were not evaluated at this time.**

Step3: Estimate Inflow

Inflow is calculated by subtracting sanitary and infiltration flows when the system has been influenced by rain. Flows during a significant storm event can be compared to the dry weather flows immediately preceding the storm when groundwater conditions are similar.

Workflow

The calculations in this memo use “R: A language and environment for statistical computing” and various analytical packages. The workflow includes:

1. Gather Data
    - Download DMR data from the ECY PARIS website
    - Download weather data from the WSUAGNET site
    - Estimate sewer service area populations for the study period
2. Plot, review and clean data to remove outliers
3. Calculate ECY annual I/I (Method 1)
    - Calculate influent monthly average flows. determine/select the annual maximum and minimum month influent flows.
    - GWI is estimated as the difference between maximum and minimum month flows. Add annual precipitation and population to the table.
    - Divide the annual flows and the GWI estimate by population to estimate flow per capita.

- Compare flows to EPA and ECY guidelines for excess I/I (120 gpcd is considered excessive).

4. Estimate EPA dry weather BSF and GWI flow.

   - Calculate weekly, monthly, and annual flows. Evaluate for outliers and for seasonal trends.
   - Calculate weekly, monthly, and annual precipitation. Evaluate for outliers and for seasonal trends.
   - Merge weekly influent flows and precipitation into a table, Do the same for the daily data.
   - Estimate BSF and GWI by filtering weekly average flows to include only non-precipitation dates. High WWTF influent weeks during the dry periods are assumed to equal base flow plus infiltration from high groundwater. Low WWTF influent weeks are assumed to equal base wastewater flow. Note that even during low WWTF influent months a portion of the flow can be GWI and commercial flows.
   - In practice, identifying the annual low and high weekly flows during non precipitation periods provides a reasonable estimate of BSF and GWI. BSF is then checked with water use records.

5. Estimate EPA Inflow.

   - Inflow is estimated using weekly and daily precipitation and flow records filtered for precipitation days. The data was further filtered by using a minimum rainfall to approximate more sustained rainfall events. The annual maximum week and maximum day influent are assumed to provide a reasonable approximation of potential inflow.
   - The correlation between precipitation and influent flow is checked to determine if there is a noticeable relationship.
   - Inflow is considered excessive when wastewater flows are greater than 275 gpm.

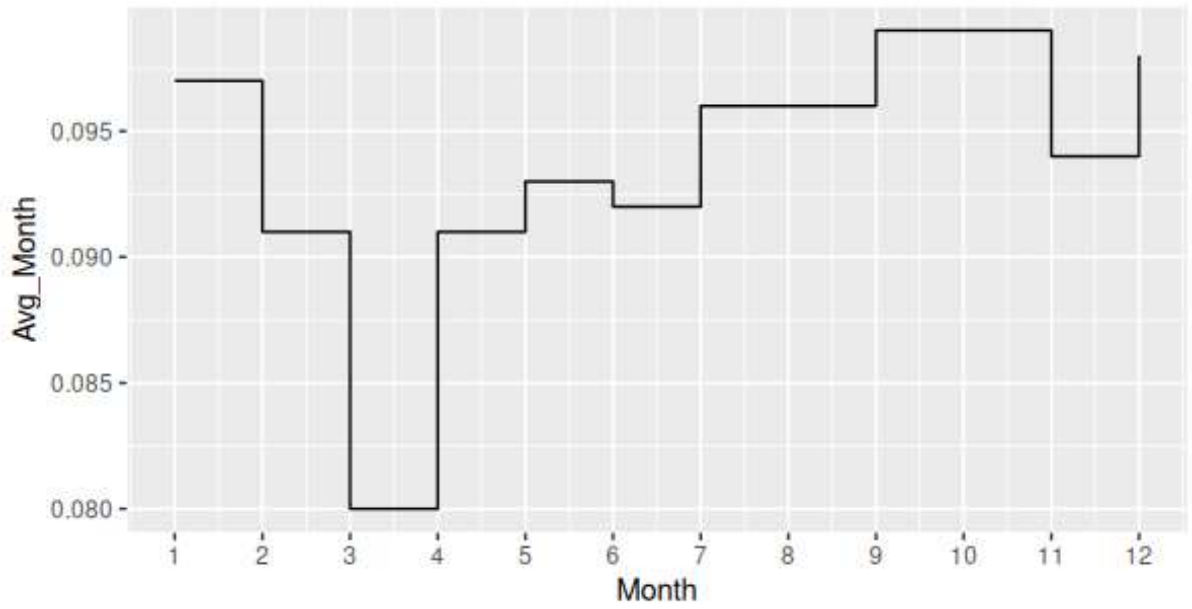
5.3 Background Information

5.3.1 *Influent Wastewater Flow*

Influent wastewater flow in million gallons per day (MGD) is measured at the WWTF. **Exhibit 5-1** shows monthly seasonal average flows. As can be seen on the figure, influent flows are steady throughout the year, gradually increasing through the autumn months.

The flow period shown on the graph is limited, between 2022-11-1 and 2023-12-31. The influent flow meter was replaced in September 2022. Influent flows after the meter was replaced were almost double those measured with the old meter. The earlier influent flows were not used in this evaluation.

Exhibit 5-1 Influent Monthly Flows (MGD)

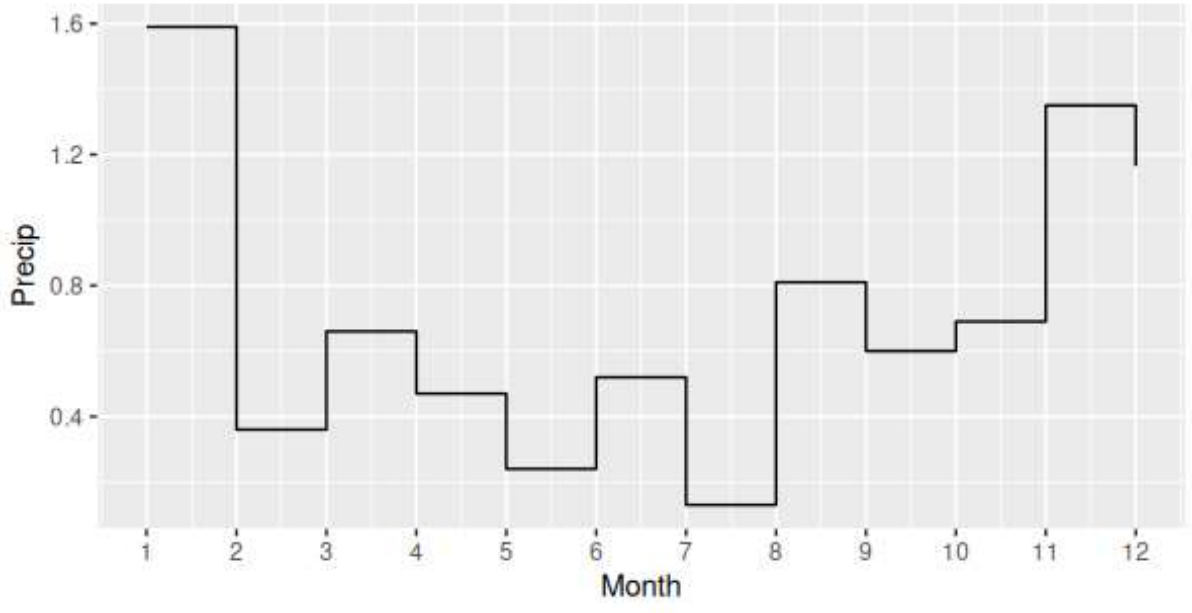


5.3.2 *Precipitation*

Winter precipitation is highest from November through January, spring and fall precipitation is moderate with the typical eastern Washington dry period for summer and early fall as shown on **Exhibit 5-2**.

The precipitation data is for the same limited period as described for the influent flow.

Exhibit 5-2 Seasonal Precipitation (in)



5.4 I/I Calculations

5.4.1 *Annual I/I WWTF Report Method*

This section provides the calculations used to determine total I/I as described in Method 1, above. This method is typically used for screening and to easily estimate if I/I is significant. WWTF influent flows from 2022-11-1 through 2023-12-31 were used. As described above, only one and a half years of data was used for this evaluation. The results of the calculations are shown in **Table 5-1**.

Table 5-1 Annual I/I Report Calculation

Desc.	2022	2023
Population	1,355	1,360
Annual Precip (in)	3.18	7.92
Annual Influent (MGD)	36.5	32.9
Max Month Flow	0.1	0.1
Avg Month Flow	0.1	0.09
Min Month Flow	0.09	0.08
Infiltration (max-min)	0.01	0.02
I/I per Capita	7	15
ADF per Capita	74	66
Percent I/I	10	22

Based on this information, excess flows from I/I contribute on average between 10 and 20 percent of annual influent flow. The average daily flow per capita of 70 is lower than the EPA guideline of 120 gpcd for excessive infiltration.

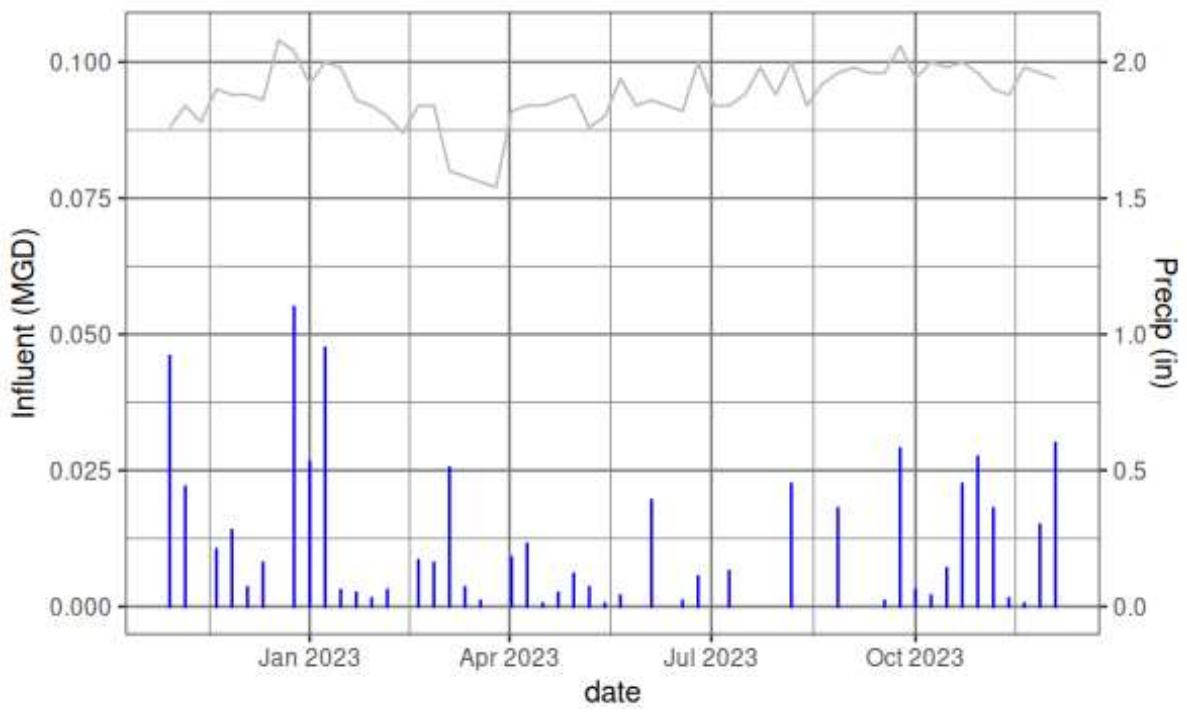
5.4.2 *EPA Guide for Estimating Infiltration and Inflow*

5.4.2.1 Estimated Sanitary Baseflow and Infiltration

Wastewater influent flows can provide an estimate of base sanitary flow (BSF) and groundwater infiltration (GWI). Average weekly influent flows and precipitation were calculated for the study period. Flow data was divided into weeks when there was no precipitation and weeks when precipitation occurred. For the weeks of no precipitation, weekly influent flows for the average and minimum year, month, and week were calculated to estimate BSF and GWI flows. The data used the entire years data, the data was not divided into wet and dry seasons.

The following exhibit shows weekly average influent flow and precipitation.

Exhibit 5-3 Weekly Influent vs. Precipitation



Dry weather flow information was evaluated. Dry weather week was considered as having no rainfall during the week. The minimum dry weather week flow each year was used to approximate BSF while the difference between the dry weather maximum and minimum week flows was used to approximate GWI as shown in **Table 5-2**.

Table 5-2 Estimated Sanitary Base Flow and Groundwater Infiltration

Year	Max_Week	Min_Week	Population	Est_GWI	BSF_Cap	GWI_Cap	ADF_Cap
2022	0.104	0.089	1,355	0.015	65.7	11.1	76.8
2023	0.099	0.077	1,360	0.022	56.6	16.2	72.8
Avg	**0.102**	**0.083**	**1,358**	**0.019**	**61.2**	**13.7**	**74.8**

These calculations indicate that the calculated sanitary base flow is at the low end of the range of typical textbook values of 60 to 90 gpcd for small communities (including the commercial component but not including I/I). A typical average is 75 gpcd.

Combining estimated sanitary base flow and GWI results in average daily influent flows per capita of 75 gpcd. This is well below the EPA guideline of 120 gpcd for excessive infiltration. This dry weather evaluation indicates that GWI is not excessive.

5.4.2.2 Estimate Base Flow with Water Use Records

Winter water use records provided by the city were also used to estimate sewer base sanitary sewer flow.

In 2022, winter water use (Jan-May; Nov & Dec) averaged 149 gallons per day per residential account. Assuming 2.52 persons per residence (see **Section 3**), base sanitary flow is estimated at 59 gpcd.

In 2023, winter water use (Jan-April; Nov & Dec) averaged 156 gallons per day per residential account. Assuming 2.2 persons per residence, base sanitary flow is estimated at 62 gpcd.

Base wastewater flow estimated by the water use records are close to the estimate made using the EPA method above.

5.4.2.3 Estimated Inflow

Inflow is estimated using both daily and weekly precipitation and flow data. For both the weekly and daily data, days and weeks with no precipitation were removed. Only precipitation events with a daily rainfall greater than 0.25 inches to approximate larger, more sustained rainfall events during the entire year was used to estimate inflow.

A first pass compared average weekly influent flows to average weekly precipitation shown as **Table 5-3**. There is no clear relationship between weekly precipitation and influent flows (r value of 0.14.)

A second pass using daily data was made to determine that relationship shown as **Table 5-4**. Daily precipitation has no correlation to influent flows (r = 0.04). Tables are shown for both cases below.

The EPA suggests that a wet weather flow greater than 275 gpcd can be considered excessive. This evaluation (Max Week/Cap) shows that wet weather flow is below this value. This evaluation shows that inflow is not an issue in the sewer system.

Table 5-3 Estimated Inflow Based on Weekly Influent Averages

Year	Population	Max Week	Max Week/Cap	ADF/Cap	Inflow/Cap (Max-ADF)
2022	1,355	0.102	75.3	74	1.3
2023	1,360	0.103	75.7	66	9.7
Avg	**1,358**	**0.103**	**75.5**	**70**	**5.5**

Table 5-4 Estimated Inflow Based on Daily Influent Flows

Year	Population	Max Day	Max Day/Cap	ADF/Cap	Inflow/Cap (Max-ADF)
2022	1,355	0.106	78.2	74	4.2
2023	1,360	0.107	78.7	66	12.7
Avg	**1,358**	**0.107**	**78.5**	**70**	**8.5**

5.5 Previous Investigations Discussion

5.5.1 *2004 Wastewater Facility Plan and PMAC*

The 2004 "Wastewater Treatment Plant Facilities Plan and Plan to Maintain Adequate Capacity" was prepared by Hammond Collier Wade Livingstone, Project No. 04-80-013. The following information is from the 2004 report.

The city was relocated 1958 due to construction of the Rocky Reach Dam. Two independent collection systems were constructed when the city was relocated. The Central Business District (CBD) sewer, about 3,040 linear feet, was constructed in 1958 and was not replaced during the 1977/1978 collection system construction. The 1977/1978 work extended the collection system to the rest of the city. The sewer pipe installed was PVC SDR 35. The original treatment plant was completed in 1978 at the lagoon site used to treat sewage from the CBD.

The 2004 report stated that infiltration and inflow into the collection system is not excessive due to the sandy gravelly soils in the area and the absence of a high groundwater table. The report noted that no components of the collection system are located below the groundwater table, which is approximately at the level of the Columbia River. Very little evidence of infiltration was observed. Some inflow was reported caused by ponding near manholes.

5.5.2 *2010 NPDES Fact Sheet*

The 2010 NPDES Fact Sheet provides additional information on the collections system. The following is a summary of the information contained in the Fact Sheet.

The City submitted a Comprehensive Sewer Plan (CSP), which was approved by the Department in January 1998. A Facilities Plan was completed and approved by the Department in January 2006 which identified recommended alternatives to upgrade the wastewater treatment plant.

The assessment of the collection system conducted for the CSP found the piping installed in 1977 to be "in good condition. Infiltration is negligible, slopes are sufficient to maintain adequate velocities, and maintenance has been minimal." As part of the 1977 upgrade, the older piping in the Central Basin was cleaned and inspected utilizing remote TV. The piping was found to be serviceable and incorporated into the new system. However, in recent years, this portion of the system has become a maintenance problem with root intrusion and flow restrictions. Replacement of this pipe may soon be necessary. The CSP recommended the city re-inspect the concrete piping portion with remote TV and that failing portions of the system be replaced.

The 1997 CSP also included an assessment of pump stations and found them to be generally in compliance with the Department's requirements. However, the School station was determined to have inadequate backup wet well capacity in the event of a power failure and the Lakefront station was found to have inadequate pumping capacity.

5.5.3 *2023 WWTP and Collection Systems Needs Assessment Memo*

A WWTP and collection system needs assessment was prepared in 2023 by RH2. The needs assessment addressed both the collection system and potential improvements to the treatment plant. The following information is from the 2023 memo.

The collection system consists of approximately 61,000 linear feet (lf) of gravity main and 12,000 lf of pressure main. Much of the gravity system (49,000 lf of the total 61,000 lf) is 8-inch polyvinyl chloride (PVC) pipe.

The City's gravity collection system is mostly 8-inch PVC pipe. Currently, there is not a survey of the City's collection system. It is advised that the city survey its collection system and perform detailed design review on all future developments to ensure that there are not specific geographical constraints to the collection system.

The city is currently experiencing substantial development interest. It is difficult to accurately gauge the capacity of the collection system based on the limited available documentation for this system. At a minimum, it is recommended that the City complete a General Sewer Plan in accordance with WAC 173-240-050, which would be formally adopted by the City for the purposes of providing collection system planning over a defined timeline, such 20 years. In order properly complete a General Sewer Plan, additional information on the collection system and lift station would need to be obtained through the original contract documents or as-builts, a collection system survey, and/or camera and visual observation.

5.6 Summary Discussion and Recommendations

The 2022/2023 influent flow data show that the combined sanitary base flows, groundwater infiltration, and inflow are low and do not exceed the EPA guidelines for excessive infiltration or excessive inflow. This information confirms the earlier findings of low I/I in the collection system.

Recommendations made in the 2023 Needs Assessment to more closely evaluate potential future flows and to provide a detailed, accurate collection system hydraulic model should be considered. The accurate collection system model can be valuable if substantial city growth is projected.

6.0 Existing Wastewater Treatment System

6.1 Introduction

This section provides a review of Entiat's existing wastewater treatment plant and includes the following:

1. Description and design parameters of the existing treatment system
2. NPDES permit discharge requirements and receiving water (Columbia River) issues
3. An evaluation of wastewater treatment between 2020 and 2024 (Jan-Feb) that includes:
    a) influent flows and loadings
    b) effluent discharge parameters
    c) treatment performance
4. Discussion of the ability to meet current and projected flows and loadings
5. Summary discussion and considerations

Chapter 7 provides evaluation of the existing treatment plant components for projected future flows and to provide alternatives, recommendations, and costs.

6.2 History of Treatment System

The City of Entiat's wastewater treatment plant (WWTP) was originally constructed in 1977. Much of the current collection system was also constructed in 1977 and 1978. The City's original extended aeration treatment plant consisted of a headworks, oxidation ditch, secondary clarifier, chlorine contact chamber, sludge drying beds, and outfall structure.

In 1997 the City submitted a Comprehensive Sewer Plan (CSP), to Ecology for review and approval. The CSP was prepared in response to State Growth Management Act requirements. The CSP addressed the condition of the sanitary sewer system, determined future needs, and developed a schedule and financial plan for upgrades.

The 2005 Facilities Plan evaluated potential growth in the service area and identified several WWTP components in need of replacement or upgrade.

In 2007 the City began a major WWTP upgrade that was brought online in 2009. The upgrade included the following elements:

- Influent piping and flow metering upgrades.
- Headworks improvements, including the installation of a mechanical bar screen and grit removal system.
- Installation of two sequencing batch reactors (SBR) and associated blower building.
- UV disinfection system and associated building.
- Plant water tank and associated building.
- Central building improvements.
- Solids Handling Structure.
- Site piping, pumps, vaults, and pavement.
- Stormwater facilities.

6.3 Description of Existing Treatment System

6.3.1 *Location and Design Parameters*

Entiat's WWTP is located at 1947 Lakeshore Drive Entiat, WA 98822. Treated effluent discharges to the Columbia River at River Mile 485.0. The discharge location is at: Latitude: 47.6668 N Longitude: -120.2033 W. **Exhibit 6-1** shows the location of the WWTP. **Table 6-1** shows design information from the 2001 Wastewater Treatment Plant Upgrade design plans.

Exhibit 6-1 Location Map



Table 6-1 WWTP Design Parameters

Wastewater Flow / Loading	Flow (MGD)	BOD (lb/day)	TSS (lb/day)
Average Daily (AD)	0.12	250[1] / 302[2] (240mg/l)	250[1] / 331[2] (265mg/l)
Maximum Month (MM)	0.15		
Maximum Daily (MD)	0.20	--	--
Peak Hourly (PH)	0.48 (333 gpm)	--	--

1. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276). The permit does not indicate if the limit is based on average or maximum load; however, it is assumed it signifies the permitted average annual influent load. Table 2 in the 2010 NPDES Fact Sheet uses the design max month[2] to calculate percent of treatment capacity.*
2. *Design maximum month from Facility Design Criteria in the 2007 WWTP Construction Drawings.*

6.3.2 *Physical Layout and Components*

The 2009 WWTP upgrade added a mechanical bar screen and grit removal at the headworks, two sequencing batch reactors (SBRs), a UV disinfection system, and other facility improvements. The old secondary clarifier was removed and the oxidation ditch was converted to an aerobic digester for solids handling. The chlorine disinfection system was replaced with a UV disinfection system.

Flow from the collection system is measured at a Parshall flume in a metering manhole. Flow then enters the headworks, where it passes through a mechanical bar screen and vortex grit remover. A gravity flow splitter

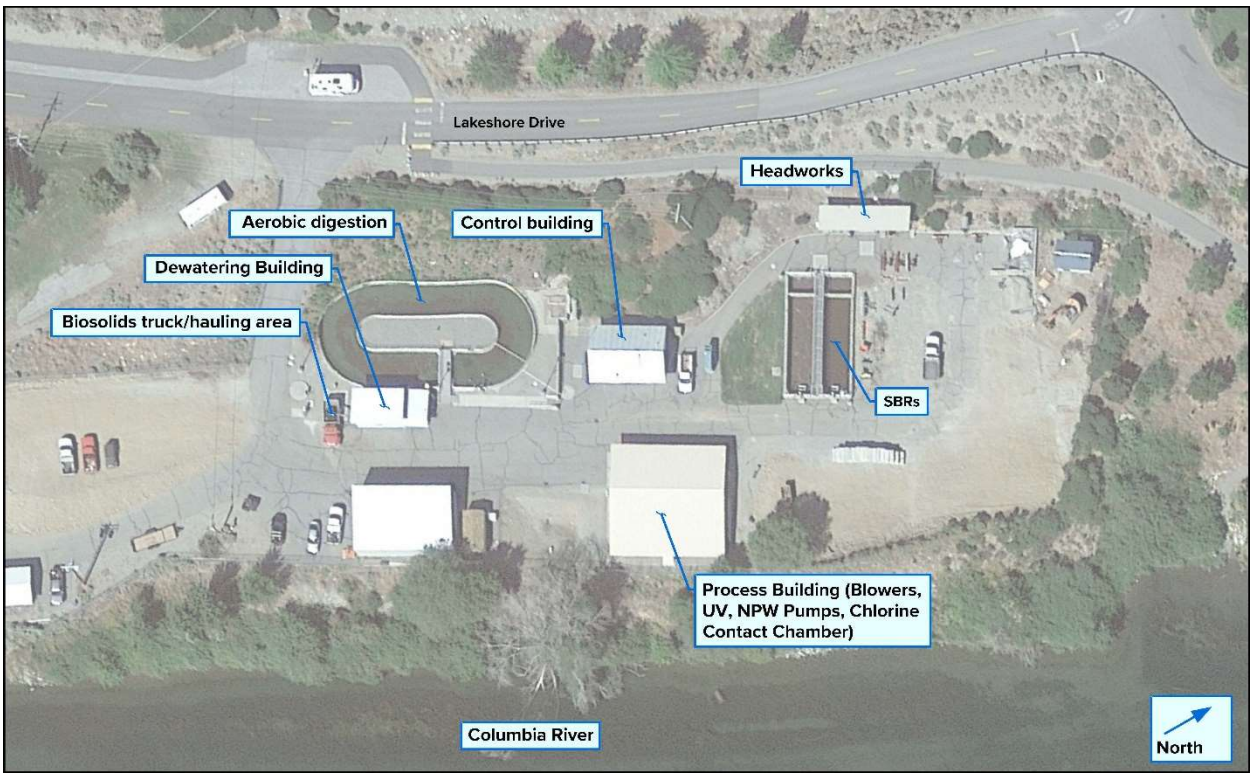
divides flow between the two continuous inflow SBRs. The SBR's provide secondary treatment of the wastewater. Decanted supernatant flows by gravity to the UV disinfection system which discharges to the two C2 Plant Water storage basins. Excess treated effluent is conveyed through an enclosed pipe to a single-port diffuser anchored to the streambed approximately 300 feet off-shore and 75 feet below water level at low-flow conditions.

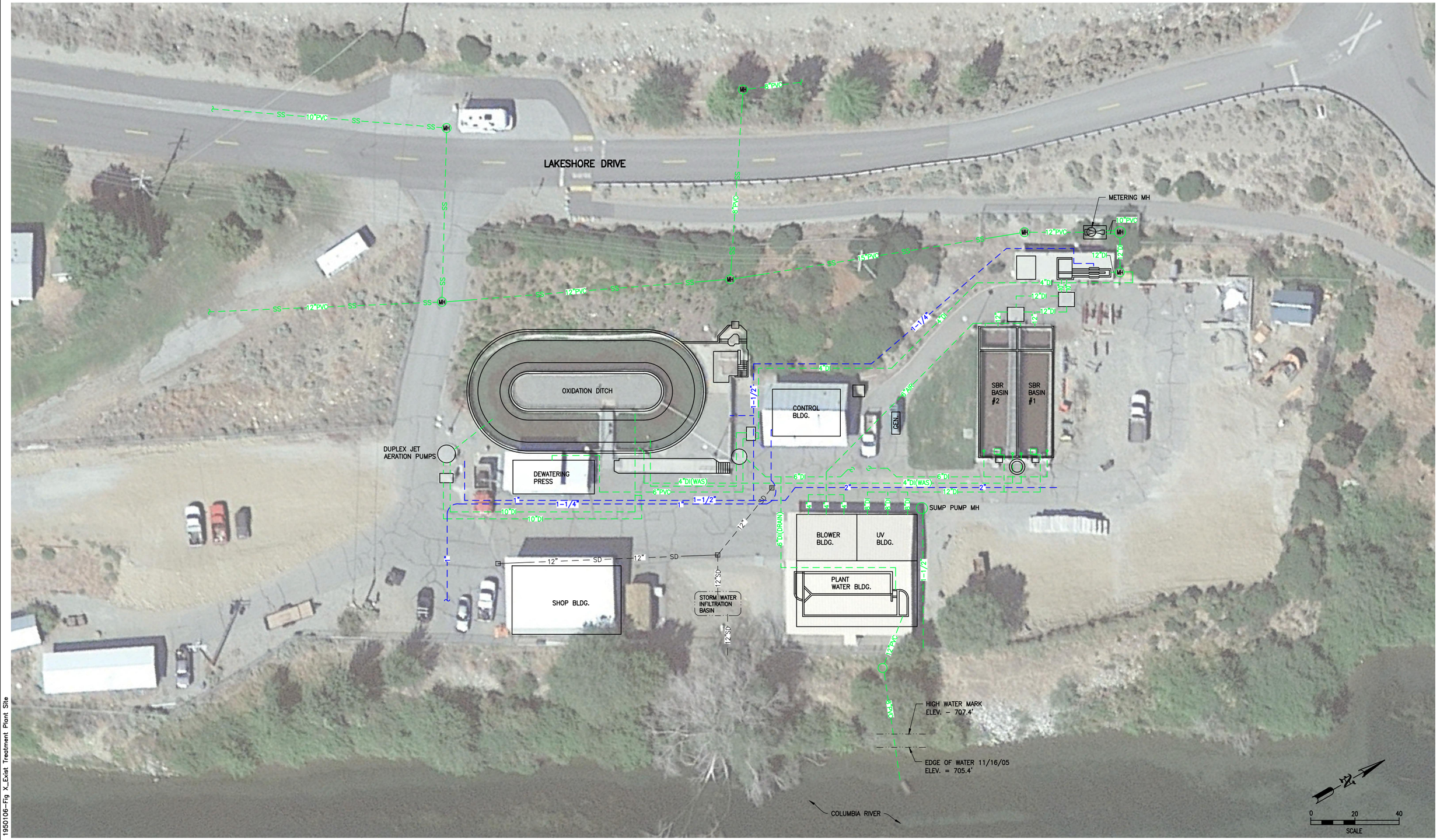
The treatment facility removes solids during the treatment of the wastewater at the headworks and from the aerobic digester. At the headworks, a screen is used to collect rags and other debris which gathers on the screen. The material is washed and compacted prior to being discharged to a dumpster. Grit is collected in a grit chamber and removed from the influent stream into a dumpster. The compacted screenings and grit are disposed of at the Chelan/Douglas County Landfill.

Sludge from the process is digested in an aerobic digester. After digestion, the bio-solids are dewatered by a belt-filter press. In 2009, the city began a composting program of the dewatered biosolids as an alternative to disposing of them at the Chelan/Douglas County Landfill. The intent was to use the material for parks and/or sell/give the Class A biosolids to citizens. Prior to composting, the dewatered sludge was stockpiled at the City's pilot composting area. In 2024 due to complaints about odors and insects from residences near the City composting facility, the City chose to discontinue the current Class A process and begin transporting dewatered biosolids to the Boulder Park Facility in Mansfield Washington for beneficial use at their facility.

Exhibit 6-2 provides an aerial overview of the WWTP. Also attached are **Figures 6-1** to **6-3** that show the treatment plant site, hydraulic profile, and process schematic.

Exhibit 6-2 Layout of the WWTP





1950106-Fig X_Exist Treatment Plant Site

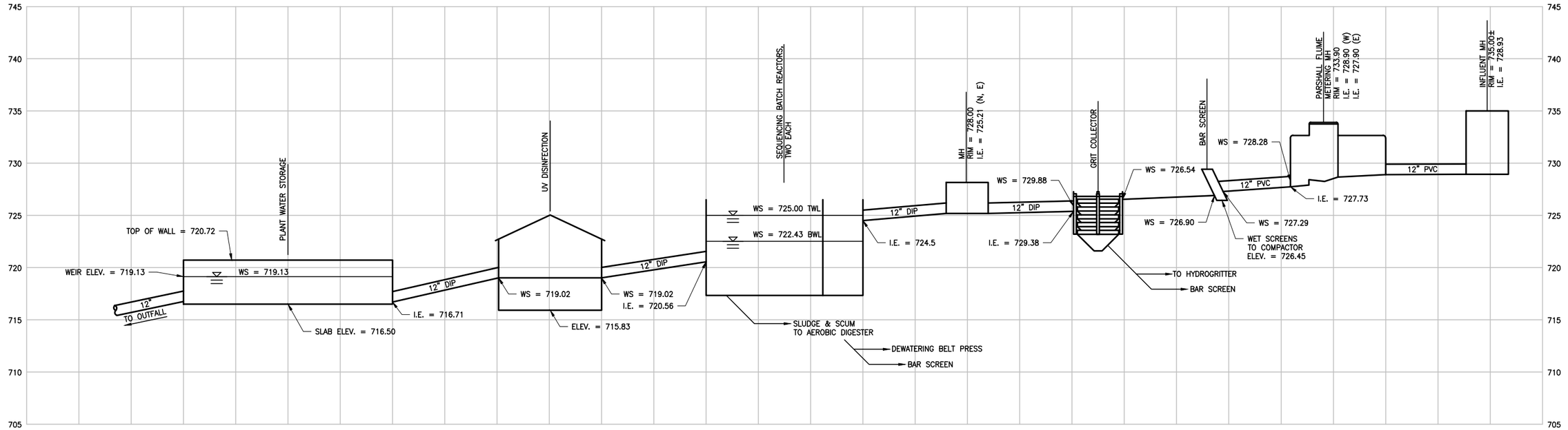
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WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

EXISTING WASTEWATER TREATMENT FACILITY

FIGURE **6-1**



SCALE

HORIZONTAL: NOT TO SCALE
VERTICAL: 1"=5'

1950106-Fig X_Hydraulic Prof

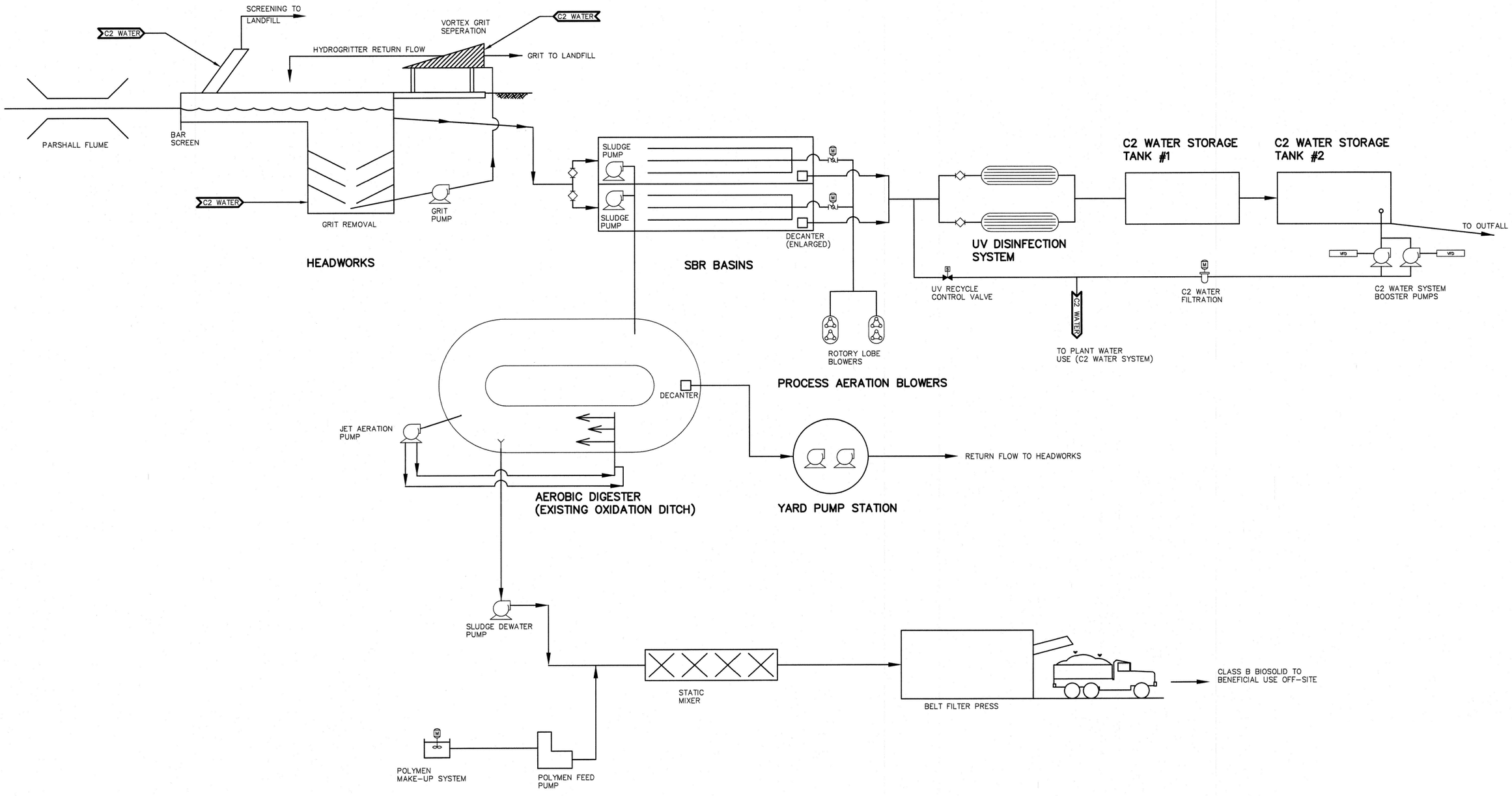
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HYDRAULIC PROFILE

FIGURE
6-2



1950106-Fig 6-1, 6-3

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PROCESS SCHEMATIC

FIGURE **6-3**

6.4 NPDES Permit Conditions

6.4.1 *Columbia River Receiving Water*

The City of Entiat's WWTP discharges to the Columbia River at River Mile (RM) 485. This section of the Columbia River is impounded by the Rocky Reach Dam located at RM 473.7, about 11.3 miles downstream of Entiat.

Characteristic uses of this water body from WAC 173-201A include the following: Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

The NPDES permit limits are set to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters. WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standard that protects the beneficial uses of the surface waters of the State.

6.4.2 *NPDES Permit Discharge Limits*

Discharge of treated wastewater from the facility to the Columbia River occurs under NPDES Permit WA-0020559. The most recent NPDES permit was received by the City in February 2015. The NPDES permit was administratively extended in March 4, 2020. Current effluent limits are shown in **Table 6-2**.

Table 6-2 NPDES Permit Effluent Limits

Parameter	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day / BOD5)	30 milligrams/liter (mg/L) 38 (lbs/day) 85% BOD5 removal	45 mg/L 56 lbs/day
Total Suspended Solids (TSS)	30 milligrams/liter (mg/L) 38 (lbs/day) 85% BOD5 removal	45 mg/L 56 lbs/day
Parameter	Monthly Geometric Mean	Weekly Geometric Mean
Fecal Coliform Bacteria (final limit)	100/100 milliliter (mL)	200/100 mL
pH	Daily Minimum is equal to or greater than 6.5 and the Daily Maximum is less than or equal to 9.0	

6.4.3 *TMDL's*

Two TMDL's apply to this section of the Columbia River.

Total Dissolved Gas TMDL (2004)

According to the State's current Water Quality Assessment GIS layer this segment of the river is identified as water quality-impaired for total dissolved gas (Category 4A) and for Non-native aquatic vegetation (Category 4C). Category 4A means that a TMDL has been prepared and is being implemented. Category 4C means that the impairment is not due to a pollutant. The "Total Maximum Daily Load for Total Dissolved

Gas in the Mid-Columbia River and Lake Roosevelt" was prepared by ECY in June 2004. This TMDL does not directly impact discharges from Entiat's WWTP.

EPA Temperature TMDL (2021)
The US Environmental Protection Agency (EPA) prepared the "Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load", August 13, 2021 TMDL. This TMDL is may prompt the addition of heat load limits to a future NPDES permit. Heat load is derived from the following equation:

$$\text{Heat Load (kcal/day)} = \text{Flow (MGD)} \times \text{Temperature (°C)} \times 3.78\text{x}10^{6}$$

The TMDL states that "… given the modeling assumptions, permit writers may translate waste load allocations to monthly average permit limits." Based on this information, it is expected that a future NDPES permit revision will limit the WWTP effluent heat load to 1.47E+07 kcal/day on a monthly average, which equates to an average discharge of 0.15 MGD at 26 degrees Celsius. In recent years, WWTP effluent temperatures have averaged up to 25 degrees Celsius for the month of August. [1]

6.5 Existing Treatment System Performance

6.5.1 *Influent Flows and Loadings*

In 2009 the treatment system was upgraded to its current configuration. In September 2022 a new influent meter was installed. Influent flows and mass loadings prior to November 2022 are incorrect. Section 3 provides additional information on the inaccurate influent meter. This section uses the information between November 2022 and February 2024 to evaluate influent flows. Effluent parameters use DMR data from January 2020 through February 2024. Note that concentration based parameters are considered accurate while mass based parameters prior to November 2022 are considered inaccurate but are shown to indicate effluent trends.

Annual average and maximum month flows and BOD loads are shown in **Table 6-3** and **Exhibit 6-3** and **Exhibit 6-4** provide a graph of the monthly averages. The DMR data from September 2022 through February 2024 shows that influent flow and BOD5 loading has not exceeded the original design parameters although influent flow and BOD loading is getting close to the time when a plan to maintain adequate capacity (PMAC) will be required by the NPDES permit.

[1] *City of Entiat WWTP and Collection System Needs Assessment, RH2 Engineering, August 25, 2023*

Table 6-3 Annual Average Influent Flow Characteristics [1]

Year	Avg Month Flow (MGD)	Max Month Flow (MGD)	Max Day Flow (MGD)	Avg Month BOD (lbs/d)	Max Month BOD (lbs/d)
2022 (Nov-Dec)	0.095	0.098	0.119	156	192
2023	0.094	0.099	0.147	189	260
2024 (Jan-Feb)	0.105	0.109	0.137	182	190
Average	**0.098**	**0.102**	**0.134**	**176**	**214**
Maximum	**0.105**	**0.109**	**0.158**	**189**	**260**
Design	**0.12**	**0.15**	**0.20**	**250 / 302 [4]**	**250 / 302 [4]**
% Capacity	**82**	**73 [3]**	**79 [2]**	**70 [5]**	**86 [5]**

1. *The values in this table include the first 2 months of 2024 and thus vary somewhat from reported capacities in Section 3 which utilizes data through the end of 2023.*
2. *Based on the maximum day during the entire reviewed measurement period, not the average of the annual daily maximums.*
3. *Based on the maximum month during the entire reviewed measurement period, not the average of the annual monthly maximums.*
4. *The permitted design capacity for both BOD and TSS are lower than the WWTP design capacity indicated on the 2007 construction drawings and noted in the ECY fact sheet. Both capacities (permitted and design) are shown in the table. The permit does not indicate if the limit is based on average or maximum load; however, it is assumed it is based on max month. This is consistent with the RH2 2023 system evaluation technical memorandum.*
5. *Based on assumed permitted capacity of 250 lbs/day. See footnote 4.*

Exhibit 6-3 Monthly Influent (MGD)

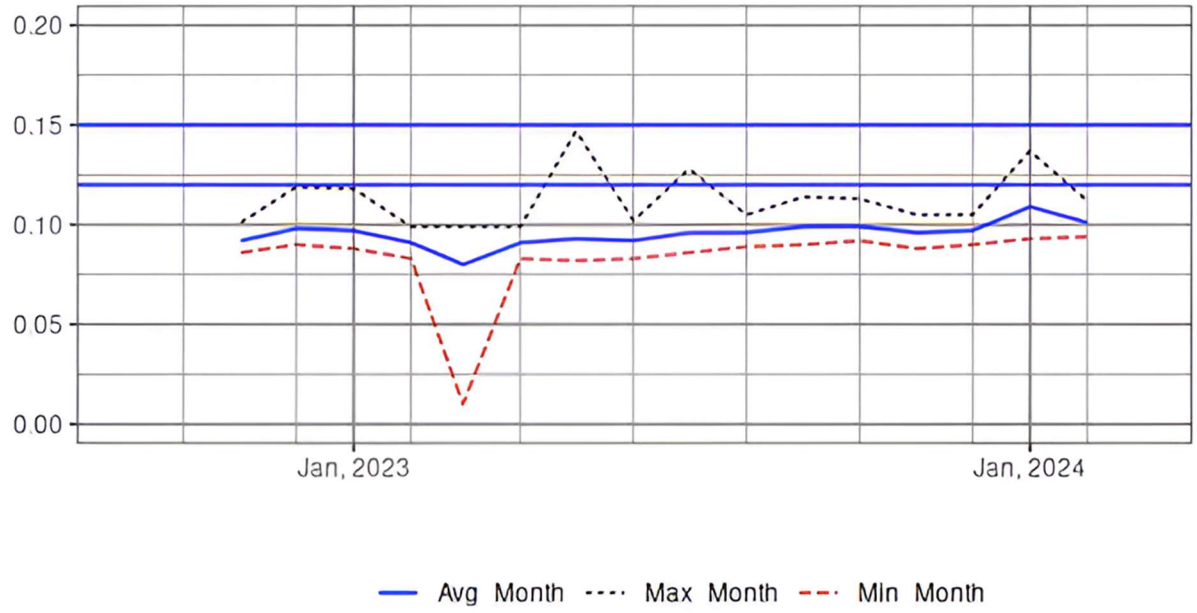
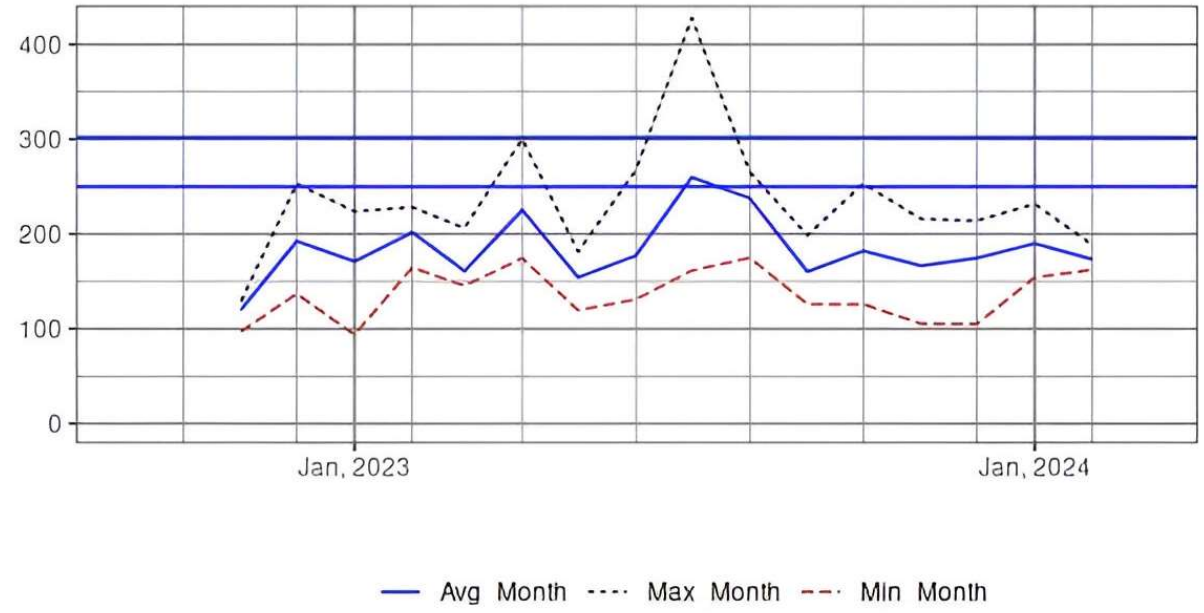


Exhibit 6-4 Monthly Influent BOD (lbs/day)



6.5.2 *Effluent Characteristics*

Effluent discharged from the treatment plant is regulated by NPDES permit limits. Most effluent parameters have both monthly and weekly limits. The current 2017 NPDES permit (WA0051276) requires that the city report:

- BOD5 - weekly/monthly concentration and mass, monthly percent removal (based on mg/l)
- TSS - weekly/monthly concentration and mass, monthly percent removal (based on mg/l)
- pH - 5/week
- Fecal Coliform – weekly and monthly geometric mean

Ammonia, temperature and dissolved oxygen are reported but do not have discharge limits.

- Total Ammonia – concentration 2x/month, mass monthly
- Temperature and Dissolved Oxygen – weekly average

6.5.2.1 Effluent BOD

Table 6-4 and **Exhibit 6-5** to **Exhibit 6-8** show monthly and weekly effluent BOD characteristics.

Table 6-4 Monthly Average BOD Effluent Characteristics

Year	Avg Month BOD (mg/l)	Max Month BOD (mg/l)	Avg Month BOD (lbs/day)	Max Month BOD (lbs/day)	Avg Month BOD (% removal)	Max Month BOD (% removal)
2020	9	15	3	5	97	99
2021	6	12	2	4	98	99
2022	6	13	3	8	97	99
2023	14	20	11	15	94	97
2024	10	11	9	9	95	96
Permit Limit	**30 mg/L**		**38 (lbs/day)**		**85% Removal (Minimum)**	

Exhibit 6-5 Effluent Monthly BOD (lbs/day)

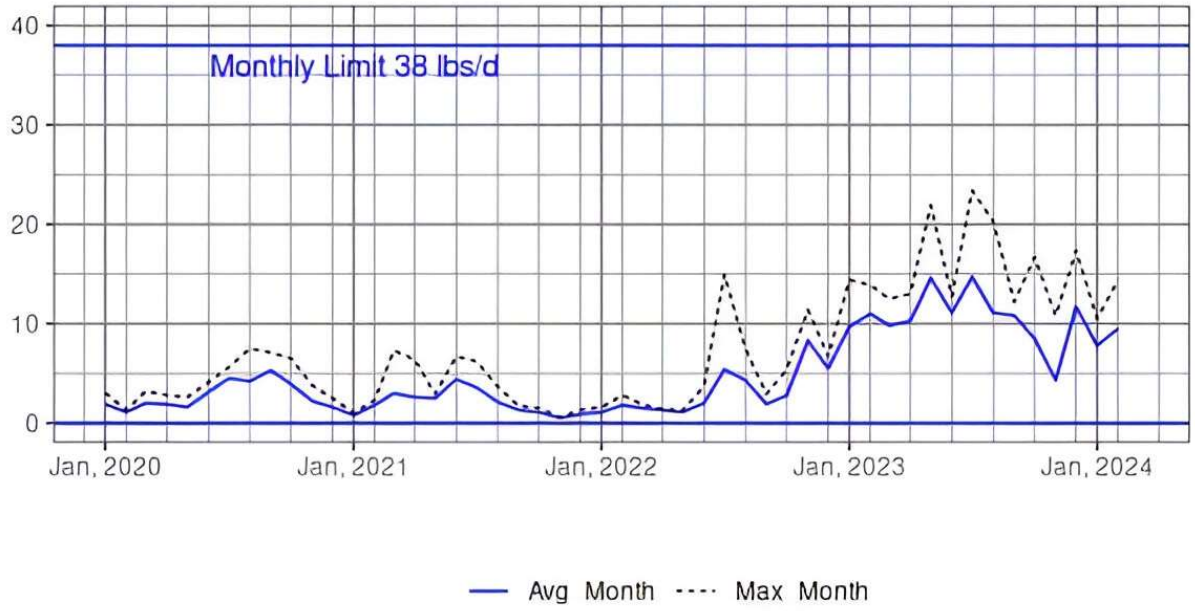


Exhibit 6-6 Effluent Monthly BOD (mg/L)

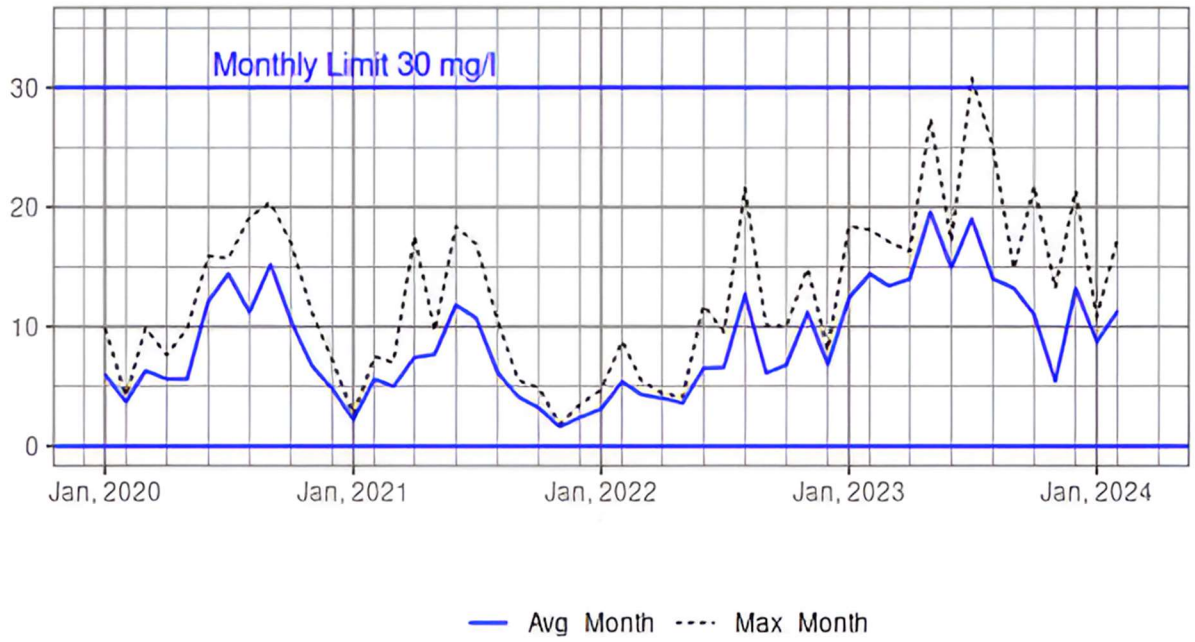


Exhibit 6-7 Effluent Weekly BOD (lbs/day)

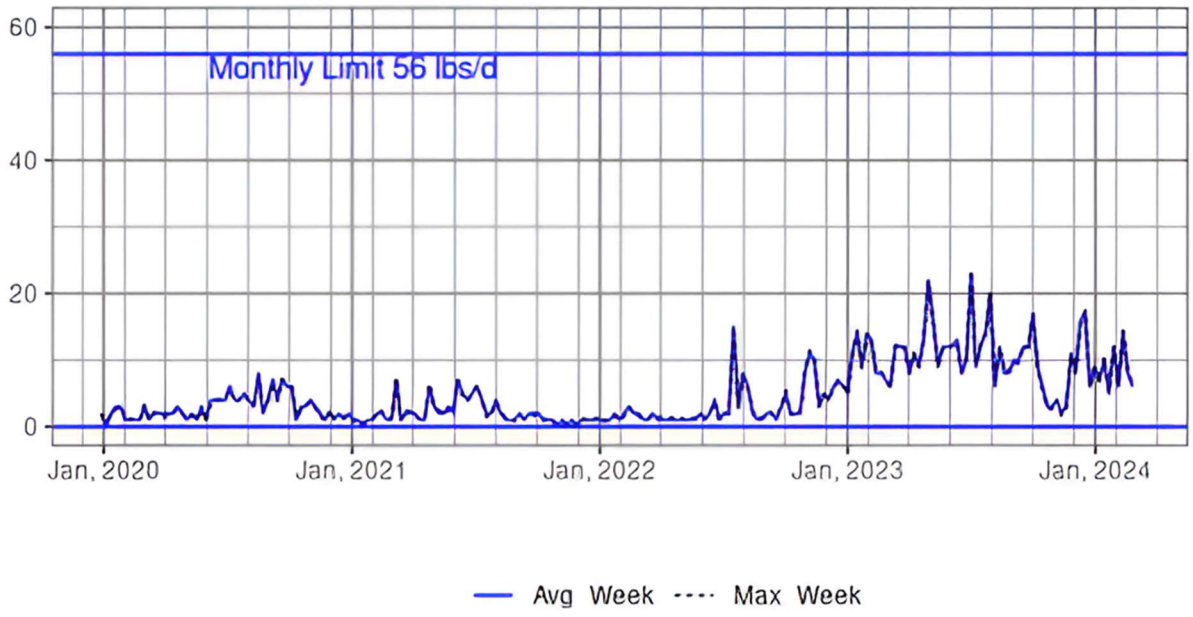
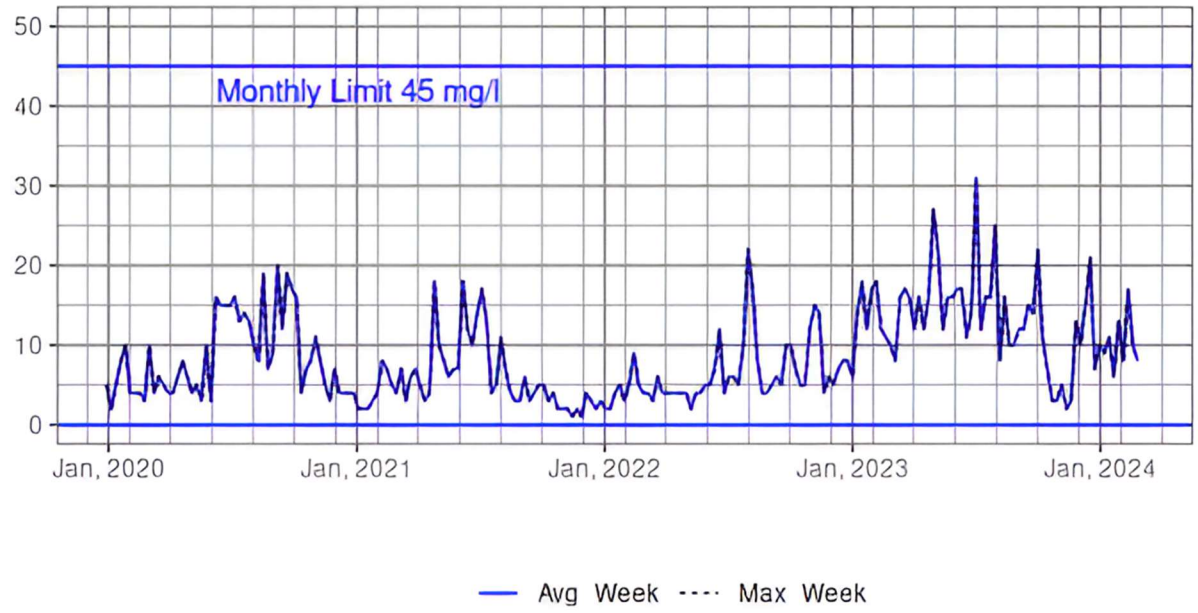


Exhibit 6-8 Effluent Weekly BOD (mg/L)



6.5.2.2 Effluent TSS

Table 6-5 and **Exhibit 6-9** to **Exhibit 6-12** show the annual, monthly, and weekly effluent TSS characteristics.

Table 6-5 Monthly Average TSS Effluent Characteristics

Year	Avg Month TSS (mg/l)	Max Month TSS (mg/l)	Avg Month TSS (lbs/day)	Max Month TSS (lbs/day)	Avg Month TSS (% removal)	Max Month TSS (% removal)
2020	6	19	2	5	98	100
2021	5	8	2	4	97	100
2022	3	14	2	7	98	100
2023	13	34	10	28	94	97
2024	7	8	6	7	94	94
Permit Limit	**30 mg/L**		**38 lbs/day**		**85% Removal (Minimum)**	

Exhibit 6-9 Effluent Monthly TSS (lb/day)

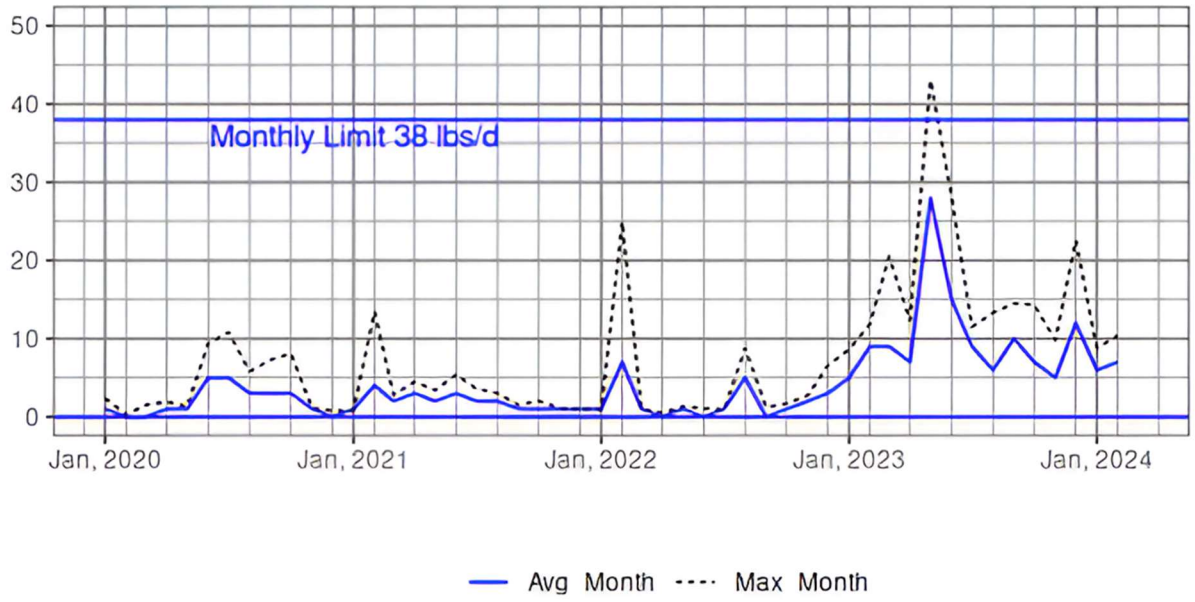


Exhibit 6-10 Effluent Monthly TSS (mg/L)

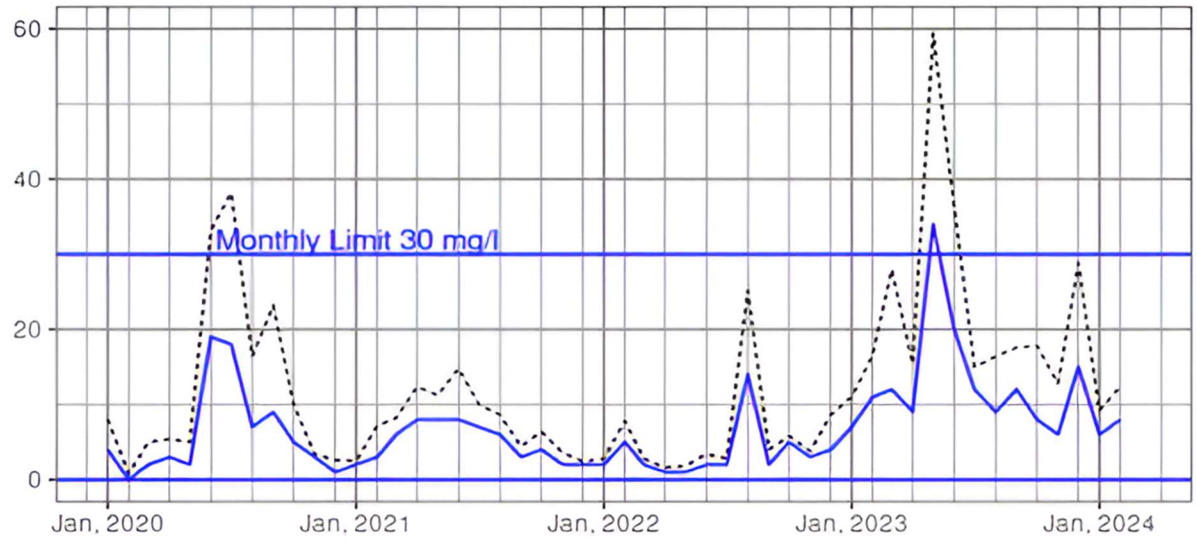


Exhibit 6-11 Effluent Weekly TSS (lbs/day)

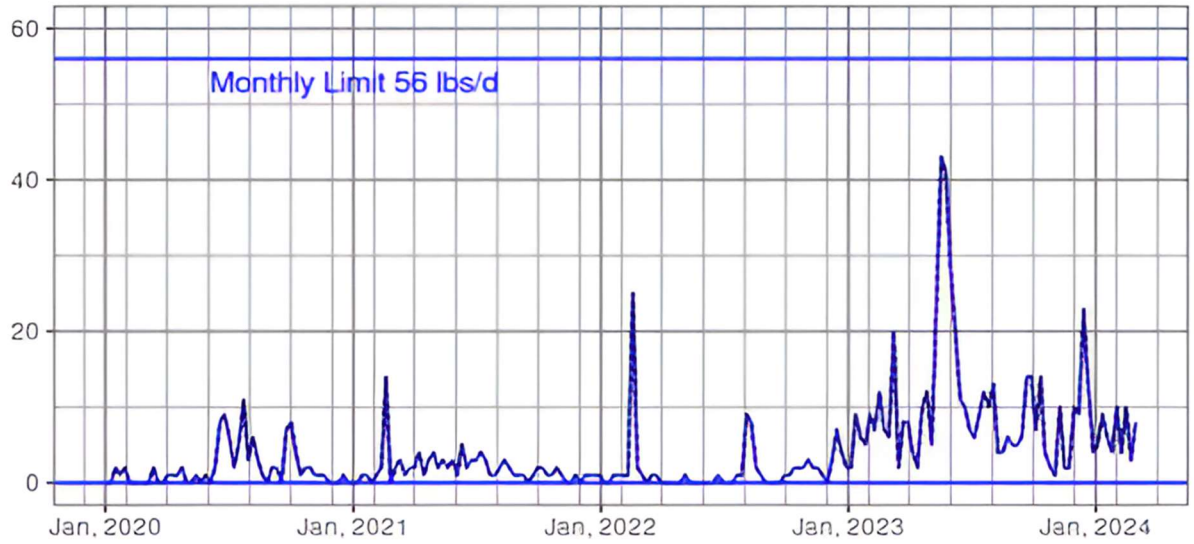
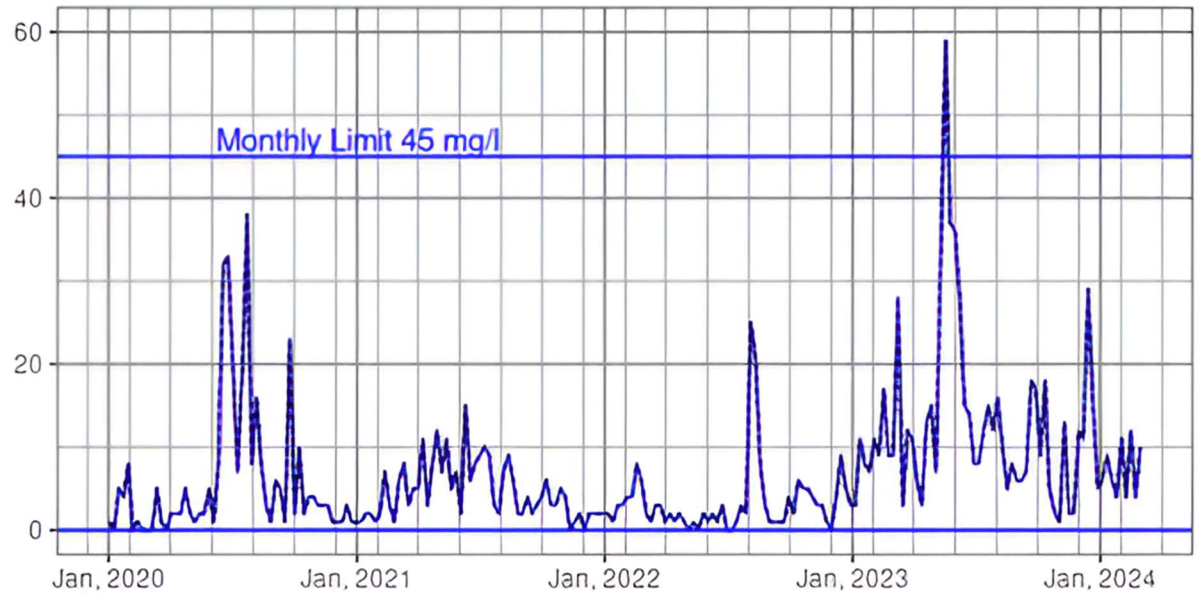


Exhibit 6-12 Effluent Weekly TSS (mg/L)



6.5.2.3 Effluent pH and Fecal Coliforms

In addition to the BOD and TSS effluent limits shown above, the NPDES permit includes limits for effluent pH and fecal coliforms. Daily pH limits are between 6.5 and 9.0 s.u. and effluent fecal coliform limits are 100 colonies/100/ml for a monthly average and 200 colonies/ 100 ml for weekly average.

Exhibit 6-13 Effluent pH (s.u.)



Exhibit 6-14 Monthly Geomean Effluent Fecal Coliforms (#/100mL)

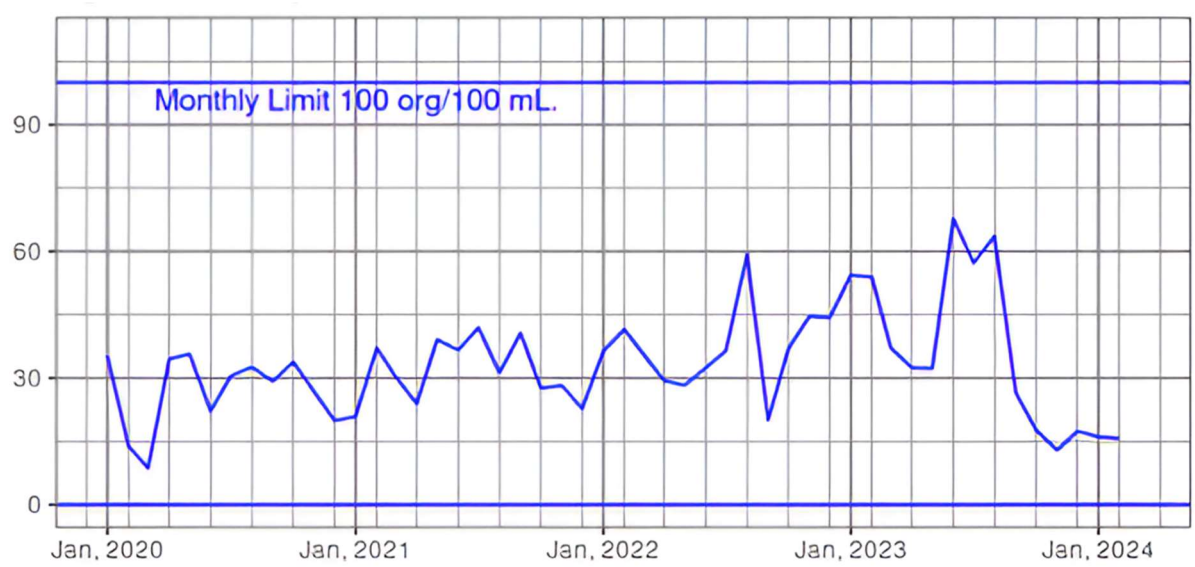
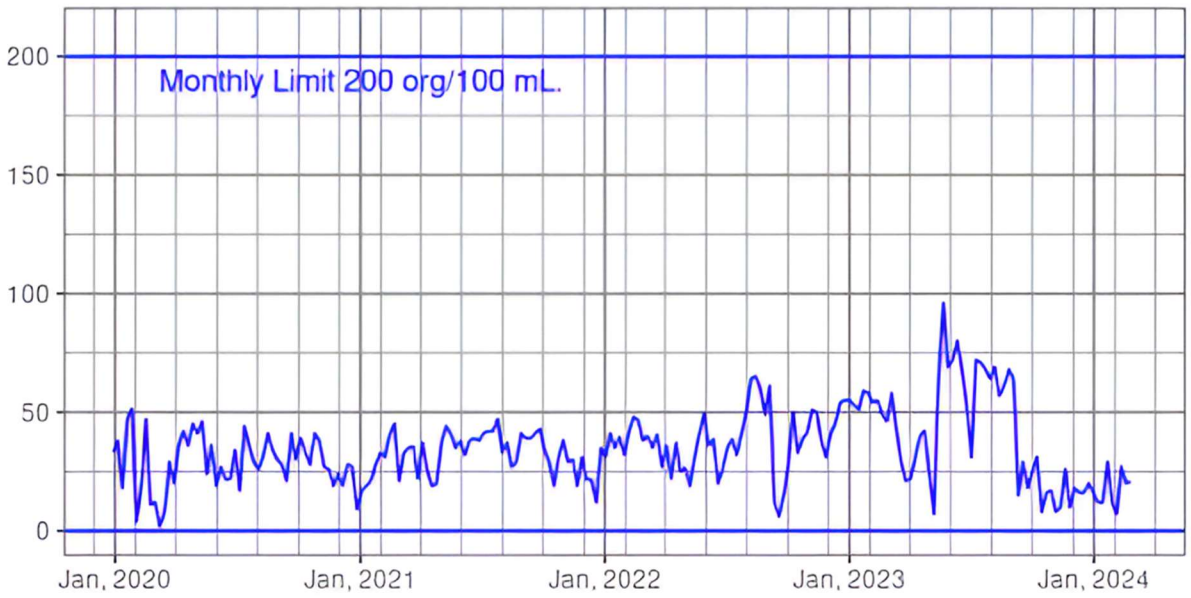


Exhibit 6-15 Weekly Geomean Effluent Fecal Coliforms (#/100mL)



6.5.2.4 Total Ammonia, Temperature and Dissolved Oxygen

Effluent total ammonia, temperature and dissolved oxygen are measured and reported on the DMR's. Currently there is no permit limit on these parameters. However, these measurements are useful to understand how the treatment process is working and to plan for potential future permit limits. The 2017 Fact Sheet identifies high effluent ammonia concentrations as an issue. The 2023 Needs Assessment discusses potential temperature limits. See following sections for additional discussion.

Exhibit 6-16 Effluent Ammonia Monthly Average (lb/day)

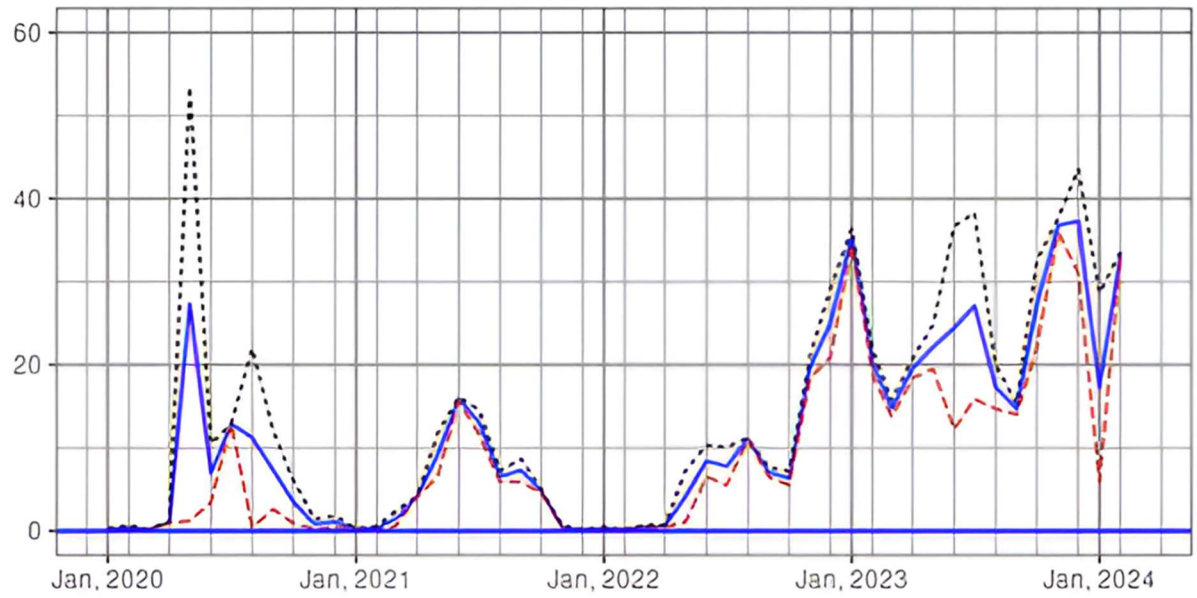


Exhibit 6-17 Effluent Ammonia Monthly Average (mg/L)

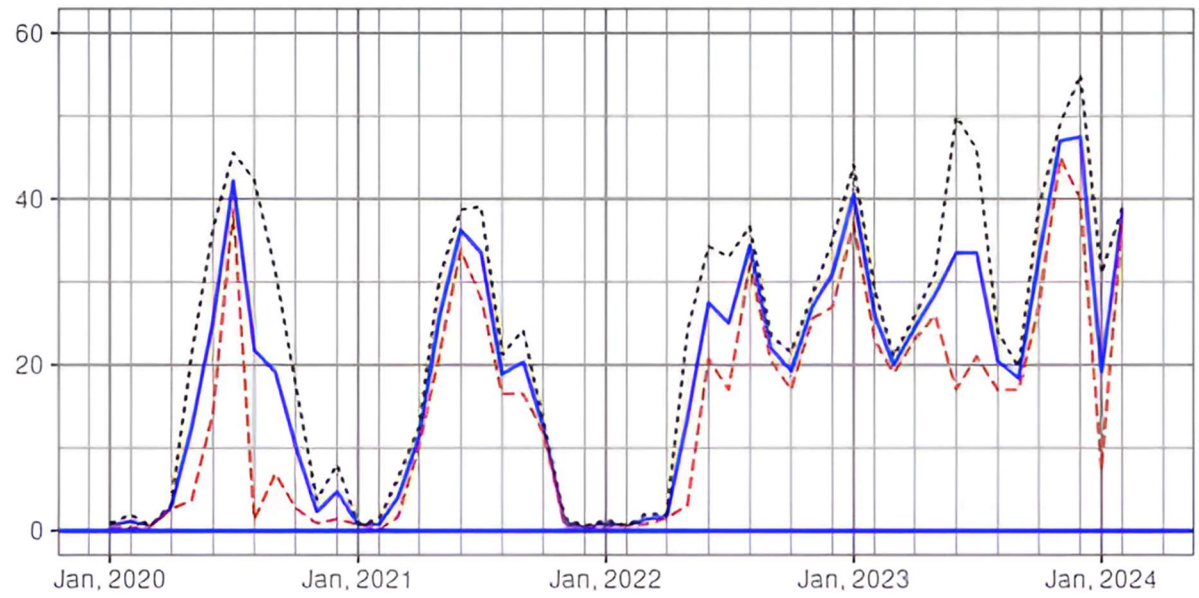


Exhibit 6-18 Effluent Temperature Max Week (C)

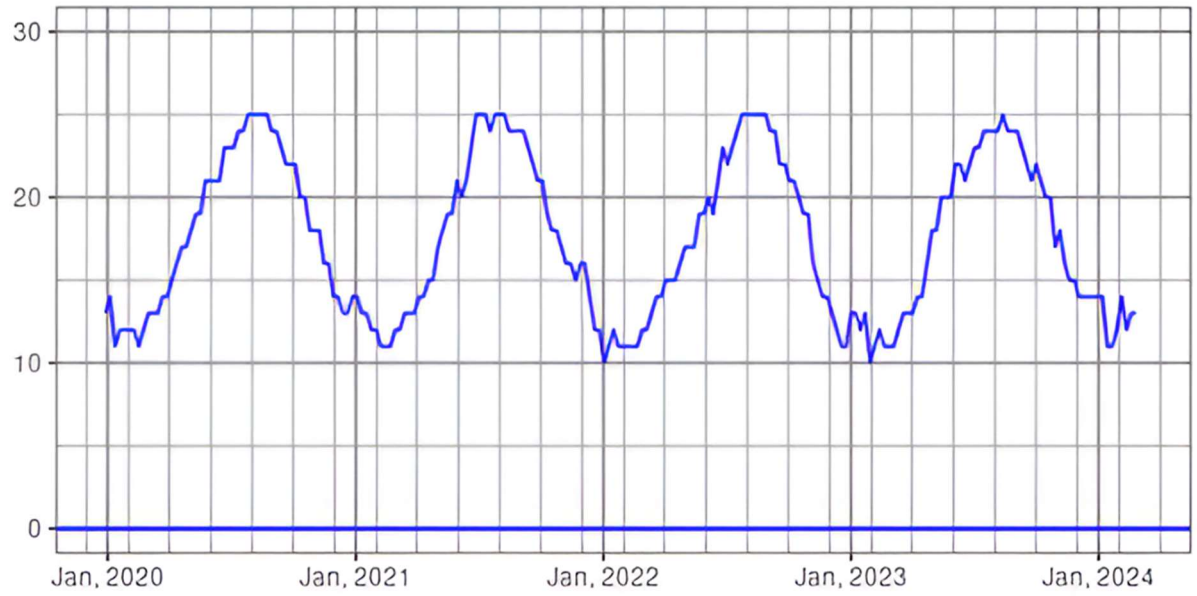
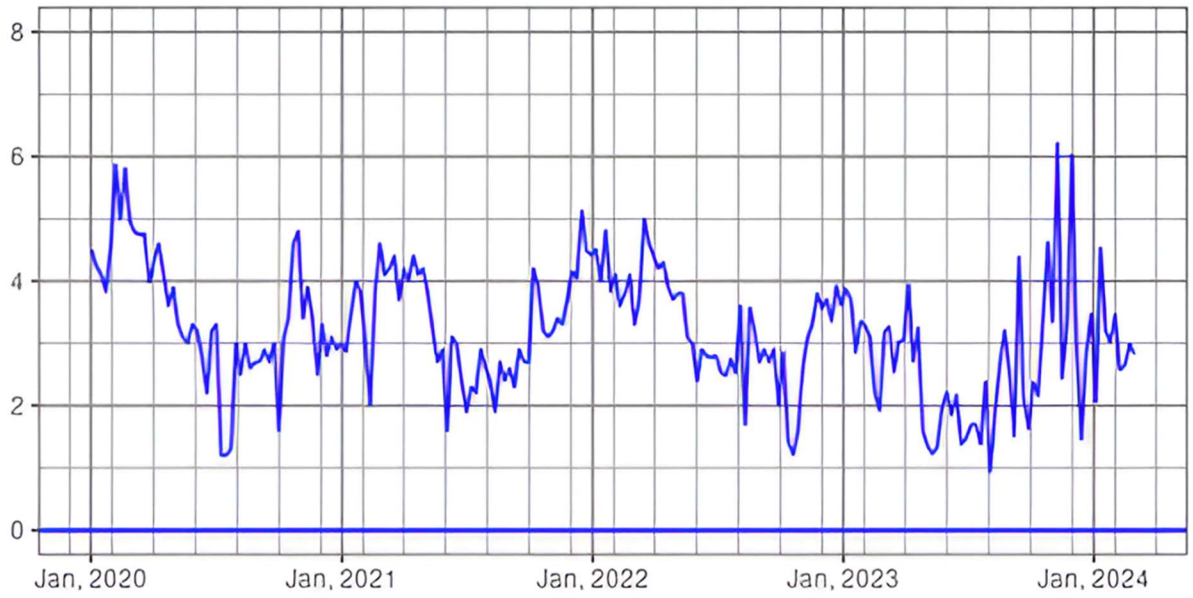


Exhibit 6-19 Effluent Dissolved Oxygen Weekly (mg/L)



6.6 Treatment Observations

Using the January 2020 through February 2024 DMR data presented above the following observations are made regarding the City's treatment facility.

Using the January 2020 through February 2024 DMR data presented above the following observations are made regarding the City's treatment facility.

6.6.1 *Influent Flows*

Average annual influent flows (0.1 MGD) are 82% of the plant's design flow rate of 0.12 MGD. Average annual BOD loading of 176 lbs/d is 70% of the plant's design capacity of 250 lbs/d; and maximum month BOD load of 214 lbs/d is 86% of the plant's design capacity of 250 lbs/d. Annual TSS loading of 90 lbs/d or 35% of the 250 lbs/day design capacity. The WWTP is nearing its current treatment capacity.

Annual I/I is estimated at about 0.01 MGD or about 10% of influent flow during wet weather. Collection system I/I is not a major issue and does not significantly impact treatment capacity at the WWTP.

Influent flow does not appear to vary significantly through the year.

6.6.2 *Effluent Characteristics*

The performance of the treatment plant is regulated on a number of effluent parameters. The parameters of interest include:

- BOD
- TSS
- Fecal Coliform
- pH

6.6.2.1 BOD Removal

Organic removal, measured as BOD is a primary function of the treatment system. The discharge permit regulates effluent BOD as a mass discharge, measured in lbs/day; a concentration, measured in mg/l, and as a percent removal. Both the mass discharge and the concentration are regulated as monthly and weekly averages. The percent removal is an average monthly value.

Average monthly BOD discharged from the treatment system is low (6-14 mg/l and 2-11 lbs/d). Maximum month effluent flows are slightly higher (11-20 mg/l and 4-15 lbs/d). Percent BOD removal is consistently above 95%. Weekly measurements are slightly higher but well under the permitted effluent limits indicating that that treatment system is functioning well.

6.6.2.2 TSS Removal

Removal of Total Suspended Solids (TSS) is a primary function of wastewater treatment. The discharge permit regulates effluent TSS as a mass discharge, measured in lbs/day; a concentration, measured in mg/l, and as a percent removal. Both the mass discharge and the concentration are regulated as monthly and weekly averages. The percent removal is an average monthly value.

Average monthly TSS discharged from the treatment system is low (3-13 mg/l and 2-10 lbs/d). Maximum month effluent flows are higher (8-34 mg/l and 4-28 lbs/d); the higher effluent values occur during the May

and June. Percent TSS removal is always above 95%. Weekly measurements are slightly higher but well under the permitted effluent limits indicating that that treatment system is functioning well.

6.6.2.3 Effluent pH and Fecal Coliforms

Fecal Coliforms

UV disinfection is used to disinfect treated effluent. Fecal coliforms are the measurement used for disinfection efficiency. Both monthly (typical value under 10 org/100 ml) and weekly (typical range of 150 org/100 ml to 0) fecal coliform concentrations are well below permitted limits.

Effluent pH

Annually effluent pH averages about 7.0-7.2 standard units (s.u.). This is within the permitted limits.

6.7 Plant Design Capacity and Projected Flows/Loadings

The following table compares the existing plant design capacity to projected future flows and influent loads.

Table 6-6 Existing vs Projected Flows/Loadings

Flow or Loading	Existing (2024) [1]	Projected (2044) [1]	Existing WWTP Design Capacity
Service Area Population	1,360	3,000	---
Avg Annual Flow (mgd)	0.095	0.259	0.120
Max. Month Flow (mgd)	0.099	0.269	0.150
Max. Day Flow (mgd)	0.133	0.365	0.200
Avg Month BOD Load (lbs/d)	173	501	250 / 302 [2]
Max Month BOD Load (lbs/d)	226	603	250 / 302 [2]

1. *Note, this table is based on flows/loads summarized in Section 3 which utilize data through 2023. The summarized flows have minor variations from flows/loads shown in **Table 6-3** herein which includes two additional months in 2024 (January and February). For consistency, existing flows are based on influent flows summarized in Section 3 which includes data through 2023.*
2. *The permitted design capacity for both BOD and TSS are lower than the WWTP design capacity indicated on the 2007 construction drawings. Both capacities (permitted and design) are shown in the table. The permit does not indicate if the limit is based on average or maximum load.*

6.8 Summary Discussion

This WWTP review is based on the Daily Monitoring Reports [DMR's] between January 2020 and February 2024. The data shows that the treatment plant is generally meeting it's NPDES permit requirements but is nearing the time that upgrades will be needed (see also operational recommendations in following sections).

ECY reported eight DMR violations in 2023. Two were for late submittal of DMR's, two were for effluent violations (effluent TSS in May 2023), and four were an 85% exceedance of design criteria, three for influent BOD and one for influent TSS. Note that if design criteria is exceeded for three consecutive months, an engineering report (PMAC) is required to plan for treatment upgrades.

This information herein shows that the WWTP is nearing its current treatment capacity and upgrades will be needed to treat the projected flows and loads.

6.9 Remaining Plant Capacity and Plant Optimization

Since Entiat's treatment plant is nearing capacity, the City has issued a moratorium to prevent growth from exceeding the remaining treatment plant capacity until improvements can be constructed. However, since the improvements will take time to implement, the City has requested an estimate of remaining treatment plant capacity to determine if some limited additional connections can be granted before the upgrades are brought online.

6.9.1 *Calculated Remaining Capacity*

The following Table compares existing flows/loads (see **Section 3**) to both the WWTP design capacity and the NPDES permit capacity.

Table 6-7 Existing Flows/Loads vs Design and Permitted Capacity

Flow Parameter	Existing Flows / Loads (2024) [1]	WWTP Design Capacity [2]	NPDES Permit Capacity	% of Design Capacity [3]	% of Permit Capacity [3]
Population	1360	-	-	-	-
Annual Flow	0.095	-	-	-	-
Max Month	0.099	0.150	0.150	66%	66%
Max Day	0.133	0.200	-	67%	-
Peak Hour	0.352	0.480	-	73%	-
Ave Month BOD	173	-	-	-	-
Max Month BOD	226	302	250	75%	90%
Ave Month TSS	137	-	-	-	-
Max Month TSS	186	331	250	56%	75%

1. *See **Section 3**.*
2. *From the 2007 City of Entiat Wastewater Treatment Plant design drawings Sheet G5.*
3. *Represents existing capacity of the treatment plant based on the flow/load parameter indicated and the WWTP design criteria or NPDES permitted criteria (as noted). Calculated by dividing existing flows/loads by the corresponding design capacity.*

Based on the preceding summary, the following table provides the calculated remaining WWTP capacity based on several different criteria. At the City's request, the remaining capacity is represented in additional system ERUs.

Table 6-8 Calculated Remaining Capacity

Parameter	Remaining Capacity Based on Current Operational Conditions [1] (ERUs)	Calculated Remaining Capacity: [2] (ERUs)		
		To 100% of Design Criteria [3]	To 85% of Design Capacity	To 100% of Permitted Capacity [4]
Flow	**0** [1]	203	114	203
BOD		**151**	**61**	**48**
TSS		289	190	127

1. *See following section regarding operational issues which the City is working to resolve.*
2. *Calculated using **Table 6-7** by taking the difference of the design or permitted capacity and existing flows/loads and then dividing it by the ERU consumption calculated in **Section 3**.*
3. *For reference only. It is not recommended the City allow the WWTP to reach 100% capacity without some safety factor for flow/load variations.*
4. *Recommend discussing w/ Ecology and requesting the permitted capacity be revised to match the actual WWTP design capacity.*

6.9.2 *Existing Operational Conditions and Plant Optimization*

While the WWTP is generally meeting the effluent requirements in the City's NPDES permit (see previous TM's) and the plant has some limited additional remaining capacity, the current treatment plant operational conditions are not ideal and need be corrected prior to granting additional connections.

Following summarizes existing plant operational conditions/issues:

- The MLSS concentration in the SBR basin is significantly higher than recommended by the SBR manufacturer. There appears to be some incorrect information in the treatment plant O&M manual indicating the SBR basin should be maintaining a much higher mixed liquor concentration than recommended by the manufacturer (i.e. in the 4,900 mg/L range). Updated calculations by the manufacturer based on current influent flows/loads recommend a mixed liquor concentration of 1,600 mg/L.
- Dissolved oxygen (DO) in the SBR basin is too low for effective nitrification. DO level should ideally be 2 mg/L with typical operating range between 1.5 to 2.5 mg/L. The vast majority of the SBR basin DO data shows levels significantly lower than this; and often times this is despite the aeration system providing maximum dosage. The low DO level is likely due to the high mixed liquor concentration.
- Periodically, nitrification is being inhibited resulting in spikes in effluent ammonia. The City suspects influent toxicity may be partly responsible (see following section that discuss effluent ammonia and suspected influent toxicity). However, it is likely this is partly (or completely) due to the high mixed liquor concentration and low DO levels in the SBR basin which may also be exacerbated by high strength recycle flow from the dewatering process and/or other influent sources. In the summer when biological degradation of the biosolids increases in the aerobic digester due to increasing temperature, this increases the release of ammonia-N into the supernatant and BFP reject flow. This recycle stream may contribute to the reduction of the DO in the SBR.

Following are plant optimization recommendations:

- Solids should be wasted from the treatment system to lower the MLSS concentration to the SBR manufacturer's recommended level (based on existing influent characteristics, temperature, etc.). The manufacturer provided a calculation tool to the City which allows the WWTP operators to determine the ideal operating mixed liquor concentration. The manufacturer also offered the City training for this tool. We recommend the City complete the training. Note, it typically takes two sludge ages for the biology to change as these adjustments are made; so, some time will be required to make these changes and see the effect on DO level.
- Install new DO monitors in each SBR basin. The treatment plant operators feel they do not have reliable DO testing (due to the current method of testing) and they worry the DO data may not be completely reliable. Since DO is a key process component for nitrification and treatment, it is recommended the City install new DO monitors. The SBR manufacturer recommends Xylem IQ SensorNet FDO optical dissolved oxygen sensors. The manufacture can also provide recommendations for integration of the sensors into the existing control equipment.
- Since the return stream from the dewatering process is high strength, we recommend the return flow/volume and concentration be monitored. Also, we recommend DO in the SBR be monitored during the dewatering process and, if necessary, adjustments to the flow stream made to maintain DO in the SBR basin.
- One concern the SBR manufacturer has is confirming the aeration system is supplying adequate DO to the SBR system. The manufacturer recommends the diffusers/manifolds/piping/appurtenances be inspected and replaced as necessary. Since the City recently replaced the diffusers and inspected the aeration system (summer 2024), it is likely they are functioning as designed. However, the blowers have not been tested. We recommend the blowers be tested to confirm they are supplying the rated SCFM/pressure.
- Based on the existing influent flows/loads, the existing blowers should provide adequate aeration capacity without adding an additional blower, provided the existing blowers are operating within the manufacturers published performance criteria. In the event the existing blowers are not providing adequate aeration capacity, we recommend the existing blowers be rebuilt/replaced and/or a third blower be installed.

6.9.3 *Remaining Capacity Recommendation*

Based on the preceding sections, we have the following comments/recommendations regarding remaining plant capacity:

- In its current condition the treatment plant is operating at its maximum practical capacity. After the optimization recommendations (noted previously) are implemented, depending on the stabilized conditions, the system will likely be able to accommodate some limited additional connections.
- Theoretical remaining capacity is estimated in **Tables 6-7** and **6-8**.
- We recommend these tables be updated after the operational recommendations have been completed and plant conditions have stabilized.
- Biological load (BOD) appears to be the limiting constituent.
- WWTP influent conditions are variable and plants commonly see excursions above the anticipated flows/loads. We recommend the City leave a reasonable amount of spare plant capacity (i.e. safety factor) to accommodate variations in flows/loads. Note, typically plant upgrades are initiated when systems reach 75% to 85% of the design criteria depending on anticipated growth, flow/load variations, etc.
- Since the City's NPDES permitted capacity is less than the actual design capacity of the WWTP, we recommend the City request Ecology revise the permitted capacity to match the actual design

capacity. Also, since the system is approaching 85% capacity (regulatory action level for planning facility upgrades), it is recommended plant capacity and additional connections be discussed with Ecology. The Facility Planning document should meet the City's permit obligation to begin facility planning when the system reaches 85% capacity.

6.10 Effluent Ammonia Limits

The 2016 NPDES Fact Sheet discussed potential effluent ammonia limits. The Fact Sheet stated that effluent ammonia concentrations have gone up significantly since the start-up of the new process equipment in April of 2009 and that operational or process modifications are needed to consistently lower effluent ammonia levels. An average monthly ammonia limit of 1.5 mg/L and a maximum daily limit of 28 mg/L were calculated as the required performance based limits based on the Freshwater un-ionized ammonia criteria calculation sheet. No limit was added to the permit since the reasonable potential calculation did not show a potential impact to the receiving stream.

Varela reviewed the NPDES Permit and Fact Sheet. A comment by the design engineer (HCWL) indicated that that current plant (SBR system) was not designed to nitrify. The comment implied that nitrification was not expected. ECY responded that the SMP treatment is expected to reduce or at least maintain the previous effluent ammonia limits which were generally under 1 mg/l NH3-N. ECY reported that annual average in 2009 was 9.2 mg/l and in 2010 18.3 mg/l. In 2023 and 2024 effluent ammonia increased to about 30 mg/l. It is expected that an activated sludge plant operated at the design parameters on the design sheet (ie SRT of 26 days) should produce a low effluent ammonia.

See plant optimization recommendations in previous section. The SBR manufacturer has reviewed the ammonia data and also recommends additional monitoring be completed to better understand and evaluate how the plant is being operated and if any additional operational improvement should be made; including monitoring influent nitrogen so influent vs. effluent nitrogen can be compared. In July of 2024 the City added influent nitrogen to their monitoring. We also recommend monitoring SRT (sludge retention age), pH, and air entering the treatment process. As additional data is obtained, the plant operating conditions should be provided to the SBR manufacturer to confirm it is operating within the design parameters..

The City also suspects there may be some periodic influent toxicity that maybe additionally inhibiting notification. The City should be actively finding and eliminating any known sources of influent toxicity. This should include a review of the industrial contributors and their wasting schedules to see if correlations exist between their discharge schedules and the effluent ammonia spikes.

The City has also indicated they noticed what may be changes in ammonia levels corresponding to a change in the testing laboratory. We recommend the City utilize two laboratories for a period of time to compare results and determine if laboratory testing issues could be in part responsible.

6.11 Effluent Temperature and Mixing Zone Discussion

This section provides a review of potential effluent temperature and mixing zone requirements initially noted in the 2016 NPDES Permit WA-0020559 Fact Sheet and discussed in the 2023 Needs Assessment by RH2.

6.11.1 *Mixing Zone*

The RH2 2023 Needs Assessment said that a Mixing Zone Study may be needed in the next NPDES permit because the 2016 NPDES Permit Fact Sheet included that statement. The City's engineer (HCWL)

questioned this requirement and Ecology (ECY) responded that "the requirement to perform a mixing zone analysis has been removed from the permit." The following paragraphs provide information from the Fact Sheet, comments, and ECY responses.

Ecology prepared a simplified CORMIX mixing zone model of Entiat's submerged outfall in the 2016 Fact Sheet. The ECY CORMIX model set the allowable mixing zone dilution factors used to determine effluent discharge parameters. The setup and results of the CORMIX model is described below.

> *At this time, Ecology believes it is appropriate to base the dilution factor on a flow rate of 0.10 mgd instead of the plant rating of 0.15 mgd. This is based on the fact that the current daily high [flows] are typically less than 0.07 mgd and the occasion when the flow[s] have been recorded near 0.10 mgd were due to equipment malfunction or unusual event in the collection system that are not representative. However, the installation of a diffuser(s) on the end of the existing outfall pipe will likely be needed in the future as flows increase. Therefore, Ecology believes a study to evaluate the outfall and potential mixing zone improvements should be performed within the next permit cycle and the cost of these improvements scheduled in the Cities capital improvement program to improve the outfall and mixing zone characteristics based on the anticipated growth of the community.*[2]

ECY's response to the design engineers (HCWL) comment about ECY changing the dilution factors in the Fact Sheet stated that the requirement to perform a mixing zone analysis has been removed from the permit. ECY stated that if dilution factors need to be increased then ECY's mixing zone (MZ) analysis tool (spreadsheet) can suggest modest improvements to the outfall.

An evaluation of mixing zone dilution factors for the projected effluent flows is presented in a following section. In summary, the mixing zone dilution factors were estimated using EPA's new PLUMES 2 mixing zone model. The projected dilution factors were used in the ECY Reasonable Potential Worksheet to determine if there was a reasonable potential for various parameters in Entiat's effluent to exceed water quality outside the allowed mixing zone. This evaluation indicated that there was no reasonable potential for the effluent parameters studied to exceed water quality criteria.

Based upon the projected dilution factors and ECY's 2016 response it appears that no changes will be needed to the existing outfall to meet water quality standards for the projected effluent flows.

6.11.2 *Effluent Temperature*

The State Department of Ecology is adding effluent temperature limits to treatment plants to meet Water Quality limits (WAC 173-201A -200) or State TMDL waste load allocations. The US EPA published the "Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load" (TMDL) in 2021. This TMDL set suggested effluent temperature requirements for many dischargers on the Columbia River, including Entiat.

WAC 173-201A sets a seven-day average of the daily maximum temperatures (7-DADMax) of 17.50° C on this reach of the Columbia River. ECY provides a spreadsheet, part of their Reasonable Potential documentation, to calculate if an effluent temperature limit is needed to meet water quality requirements.

[2]2016 NPDES Fact Sheet

The results of the Temperature Reasonable Potential calculation show that the future projected flows will meet state water quality criteria.

However, the EPA's TMDL effluent temperature waste load allocation (WLA) for Entiat is more restrictive than the State's water quality standards. If the state adopts the waste load allocations published in the TMDL, effluent cooling or a reduction in discharge will be needed for Entiat's effluent discharge.

ECY is beginning to implement the recommendations made in the EPA Temperature TMDL. The first meeting was in January 2021, the second kick-off meeting is scheduled for March 17, 2024. The March 17, 2024 will provide an overview of the history of the work and outline ECY's strategies for developing an implementation plan. The earlier meeting, on January 28, 2021 provides guidance in what to expect from ECY (link below):

> *https://fortress.wa.gov/ecy/ezshare/wq/WaterQualityImprovement/Jan28_StakeholderInformationMeeting.pdf*

The January 28, 2021 information says that ECY will not change the EPA standards, they will focus on implementing them. For point sources, ECY said:

- Washington is implementing WLAs as Average Monthly Limits for Heat Load in permits upon permit expiration and re-issuance.
- Allocations should be more than sufficient for existing operations.
- Process for reissued permits:
    - Application and permit development
    - Two-week facility review of draft permits (fact check)
    - 30-day comment period
    - Final permit with compliance schedules if needed (probably not)

It is recommended that the city participate in the temperature TMDL implementation process and work closely with your permit manager. It is expected that effluent cooling will be needed in the future. The schedule and impact to the city wastewater operations is unknown. Since the first draft of TM's used to prepare this Facility Plan, it has come to our attention that ECY is including temperature limits in new NPDES permits while going through the implementation process described above.

A review and evaluation of potential effluent temperature limits is discussed in the following sections.

6.12 Outfall Description

Entiat's WWTP is located at 1947 Lakeshore Drive Entiat, WA 98822. Treated effluent discharges to the Columbia River at River Mile 485.0. The discharge location is at: Latitude: 47.6668 N Longitude: -120.2033 W. This section of the Columbia River is impounded by the Rocky Reach Dam located at RM 473.7, about 11.3 miles downstream of Entiat. The outfall is a single-port diffuser anchored to the streambed approximately 300 feet off-shore and 75 feet below water level at low-flow conditions.

Exhibit 6-1 shows the location of the WWTP. **Table 6-1** includes existing and projected flow and loading information. Projected flows provide an estimate of the discharge flow used in the temperature and mixing zone calculations. Future effluent temperature is assumed similar to existing measured effluent temperatures.

6.13 Mixing Zone Evaluation

Section S1.B. of the 2016 NPDES Permit authorizes a chronic and an acute mixing zone for the WWTP's outfall. The dilution factors were calculated by ECY for the 2016 NPDES Permit. The Fact Sheet includes a discussion of the approach used. The previous permit authorized a larger chronic dilution factor of 405. The authorized mixing zone characteristics are shown in **Table 6-9**.

Table 6-9 Authorized Mixing Zone

Mixing Zone	Dilution Factor	Length (ft)	Width (ft)	Depth
Acute	48	30 (down) 3 (up)	11.5	Full depth
Chronic	217	300 (down) 30 (up) [1]	97.8	Full depth

1. The NPDES permit has the upstream and downstream dimensions reversed.

As discussed in the 2016 NPDES Fact Sheet increasing effluent flow will change the dilution factors which may change the allowable discharge of certain constituents. ECY used a maximum day effluent flow of 0.10 MGD to calculate the dilution factors in the 2016 NPDES permit and shown in **Table 6-9** above. Future maximum day flow is projected to be substantially higher at 0.365 MGD. Due to the large increase mixing dilution factors are calculated for projected effluent flows. The new dilution factors can be used in ECY's Reasonable Potential Spreadsheet to determine if water quality-based limits will be needed for several constituents including temperature, ammonia, zinc, and copper that the Fact Sheet indicates are present in the effluent.

EPA recently updated an open-source mixing zone model called PLUMES 2, published in December 2024. It is an update to the VISUAL PLUMES model that is accepted by ECY in their Permit Writers Handbook. The calculation method is different than the CORMIX model used by ECY. An attempt was made to match the CORMIX results for the 0.1 MGD flow in PLUMES 2 by using the same effluent flow and ambient river conditions but changing various model factors, like diffuser depth for near field and eddy coefficient for far field calculations. When the model results were reasonably close an estimate of the dilution factors for the 0.365 MGD future flows was made. The updated dilution factors were than used with the Reasonable Potential Spreadsheet to determine if reduced dilution factors will change effluent discharge limits. If it appears that discharge limits may be impacted by the higher effluent flow it is recommended that river characteristics be refined by sampling for temperature, salinity, and velocity at various water depths for the PLUMES 2 model. **Table 6-9** shows the results of the PLUME 2 model.

Table 6-9 PLUME 2 Model Results

Mixing Zone	Dilution Factor	Plume Width (ft)
Effluent Flow = 0.1 MGD		
Acute (30 ft)	42	4.1
Chronic (300 ft)	201	23
Future Flow = 0.365 MGD		
Acute (30 ft)	52	8.7
Chronic (300 ft)	183	33.9

6.14 Reasonable Potential Evaluation

The issue with the decreasing dilution factors is the possibility that current effluent standards may exceed water quality limits. The ECY Reasonable Potential Spreadsheet was used to evaluate ammonia, copper, and zinc, noted in the NPDES Fact Sheet. Effluent data used was from the DMR's between January 2014 through October 2024 and the dilution factors determined in the previous section. The results were that there was no reasonable potential to exceed receiving water quality for effluent ammonia, copper, and zinc with the new dilution factors. The Reasonable Potential spreadsheet is attached to this report as well as the Ambient River Data used for the 2016 Fact Sheet calculations.

6.15 Effluent temperature Evaluation

6.15.1 *State Water Quality Standards*

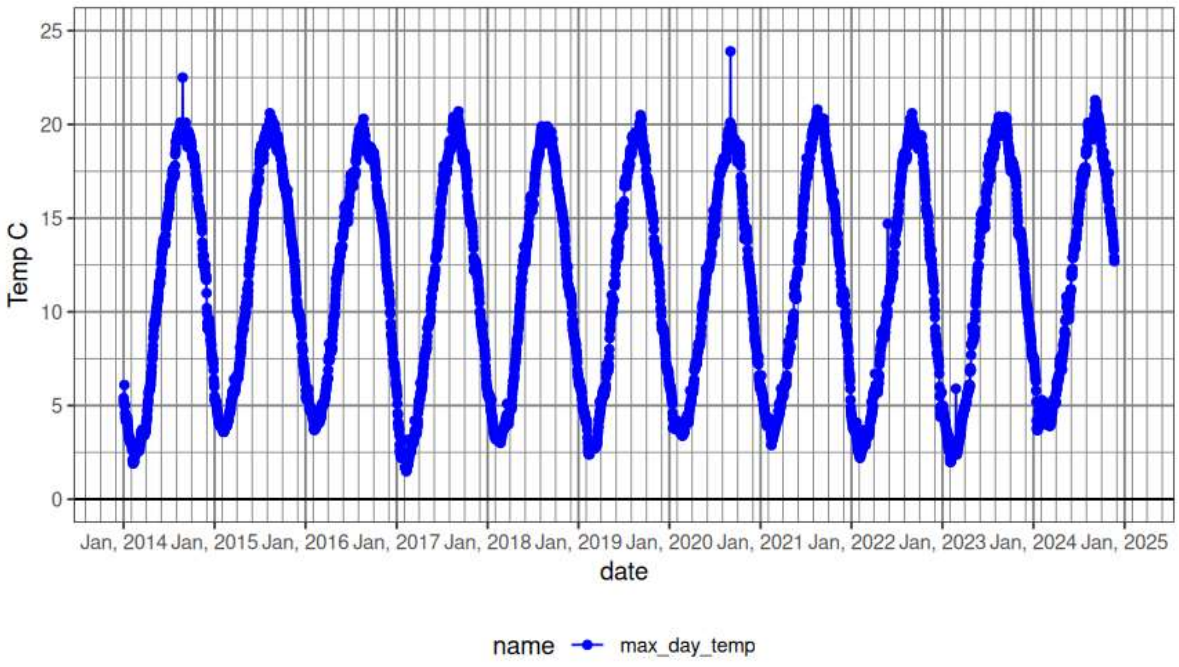
This section of the Columbia River is designated as for Salmonid Spawning and Rearing. Temperature shall not exceed a seven-day average of the daily maximum temperatures (7-DADMax) of 17.5 o C due to human activities. When a water body's temperature is warmer than the criteria in and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C.

Columbia River (receiving water) temperature is measured every hour at the Rocky Flats Dam Forebay. **Table 6-10** shows the maximum day temperature for each year from 2019 through 2024. The 90 percent recurrence interval for this data is 22.5 C. The 90% recurrence is used in the ECY Reasonable Potential Spreadsheet as the receiving water background temperature. If the two possible outliers are removed (2014 and 2020) as shown on **Exhibit 6-20,** the 90% recurrence is 20.9 C.

Table 6-10 Columbia River Maximum Daily Temperature

Year	Max Day Temp (C)
2014	22.5
2015	20.6
2016	20.3
2017	20.7
2018	19.9
2019	20.5
2020	23.9
2021	20.8
2022	20.6
2023	20.4
2024	21.3

Exhibit 6-20 Columbia River Daily Temperature



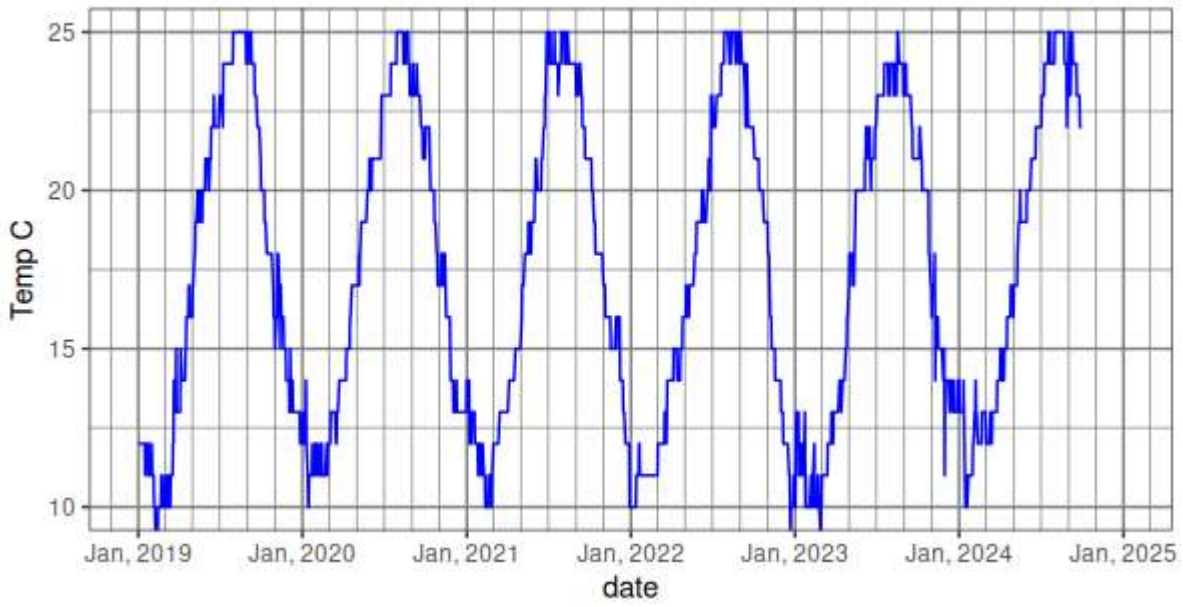
The treatment plant measures effluent temperature daily. The temperature measurement is considered the average day temperature, not the daily maximum. **Table 6-11** shows the highest daily effluent temperature for the study period. **Exhibit 6-21** shows the daily effluent temperature.

Table 6-11 Treatment Plant Effluent Temperature

Year	Max Day Temp (C) [1]
2019	25
2020	25
2021	25
2022	25
2023	25
2024	25

1. *Max day temperature is the highest measured temperature for each year based on the daily average. No adjustment has been made to estimate maximum daily temperatures.*

Exhibit 6-21 Daily Effluent Temperature



The ECY Reasonable Potential spreadsheet was used to determine if a temperature limit is needed. The ECY spreadsheet indicates that there is no impact to the ambient river temperature from Entiat's effluent and no temperature limit is needed to meet water quality standards. The spreadsheet is attached.

6.15.2 *EPA Temperature TMDL*

A TMDL provides a Waste Load Allocation (WLA) for the various dischargers. The WLA supersedes the state water quality criteria. The US Environmental Protection Agency (EPA) prepared the "Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load", August 13, 2021. The EPA study does not impose any requirements, but says that it may be useful to the State for developing permit conditions. The

TMDL states that "… given the modeling assumptions, permit writers may translate waste load allocations to monthly average permit limits."

ECY is beginning to implement the EPA Temperature TMDL, the first meeting was in January 2021, the second kick-off meeting is scheduled for March 17, 2024. Assuming that the state will impose the WLA published in the EPA TMDL, the following temperature limit is calculated.

Table 6-12 of the EPA study provides a WLA for Entiat of 1.47E+07 kcal/day. This matches the current effluent conditions, equivalent to 0.15 MGD at 26°C. The heat load is derived from the following equation:

$$\text{Heat Load (kcal/day)} = \text{Flow (MGD)} \times \text{Temperature (°C)} \times 3.78\text{x}10^{6}$$

The projected maximum future heat load from the treatment plant effluent for a monthly permit limit is:

$$0.269 \text{ MGD} \times 25°\text{C} \times 3.78\text{x}10^{6} = 2.54\text{x}10^{7}$$

Reduction in heat load needed to comply with the WLA is calculated as: Projected heat load – WLA:

$$2.54\text{x}10^{7} - 1.47\text{x}10^{7} = 1.07\text{x}10^{7} \text{ kcal/day}$$

In terms of allowable effluent temperature:

$$1.07\text{x}10^{7} / (3.78\text{x}10^{6} \times 0.269 \text{ MGD}) = 14.5°\text{C}$$

A significant reduction in effluent temperature from 25°C to 14.5°C is needed to meet the EPA WLA for Entiat's projected effluent flow. The heat load to be removed is:

Heat Load = Flow(cfs) * Water_density(lb/cf) * Specific Heat Capacity (BTU/lb.F) * (Tempin(F) - Tempout(F))

This calculates as:

0.42 cfs * 62.4lb/cf * 1 BTU/lb.F * (77 F – 58.1 F) = 495 BTU/sec

= 1,783,192 BTU/hr = 150 tons of refrigeration = 525 kwh = 700 hp

Based on these calculations, effluent cooling may be needed when effluent temperature is above 15° C. **Exhibit 6-21** shows that effluent temperature exceeds 15° C for about 6 months each year. As shown on **Exhibit 6-20** river temperatures are generally cooler, exceeding the 17.5° C water quality criteria for about three months each year. How a temperature TMDL is implemented in an NPDES permit will be important to the city, possibly the difference between cooling for 2-3 months versus six months.

Based on the effluent temperature evaluation, we recommend the City reserve room on the site near the outfall to allow for heat reduction measures when required by a future NPDES permit. Initial review of potential options include: covering the aerators, blending with a cooler water, heat tower, or mechanical chillers. We also recommend the City participate in TMDL implementation discussions ECY, your permit manager, and the other nearby municipalities impacted by the TMDL.

7.0 Treatment System Evaluation and Improvements

7.1 Introduction

This section provides an evaluation and recommendations for the individual components of Entiat's existing wastewater treatment plant (WWTP) including a condition assessment of each component and ability to meet the design criteria. This section also includes the alternatives and recommendations for the secondary treatment system and the solids handling recommendations.

7.2 Background

The treatment facility history is discussed in **Section 6**. In general, the facility has operated well since its construction in 2009; and is in satisfactory condition despite some operational optimization that needs to occur (as discussed in the previous chapter). However, Entiat is growing at a quicker rate than anticipated and the WWTP is nearing treatment capacity. Capacity improvements are needed to meet future flows/loadings and design criteria outlined in **Section** 3.

Recommendations herein are based on a document review, interviews with City staff, and site visit conducted on April 9, 2024.

7.3 Component Analysis, Identification of Deficiencies, and Recommendations

The major components of the treatment plant are briefly described followed by observations/issues and recommended improvements and costs.

The attached **Figures 7-1** to **7-6** show locations of the various treatment components evaluated and summarize the improvements recommended herein.

7.3.1 *Influent metering*

Description:

The treatment plant influent meter is a 6" FRP Parshall Flume (model: 3X6NESTPFPM60-4) manufactured by Plasti-Fab and located in a 4' diameter concrete manhole vault approximately 10' west of the existing headworks channels. The metering structure was constructed with the 2009 improvements.

The Parshall Flume has a 3" insert installed in the 6" flume which lowers measurement flow range from 25 – 1750 gpm (without the insert) to 15 – 830 gpm range (with the insert installed). Level control is via Endress & Hauser FMU90/FDU90 ultrasonic level transmitter and sensor replaced in September 2022.

Influent pipe is 12" diameter PVC. Discharge is via two (2) 10" diameter pipes; and then via 12" diameter pipe to the plant headworks.

Observations and Issues / Recommendations:

Overall, the influent meter and vault appear to be working and in satisfactory condition. Following are observations and recommendations:

- In 2022 it was discovered the influent meter was reading erroneous flows. Blue Logix and City staff diagnosed the problem and found several issues including a failing level transmitter/sensor and grit/sediment collecting in the throat of the flume. The level transmitter was at times registering a lower water level than actual and the sediment collection was causing at times an artificially high water level in the flume. This means at times flows were registering too low, and other times too high. In response, the City replaced both the flow meter ultrasonic level transmitter and sensor; and the flow meter calibration was checked. An additional subsequent calibration occurred in October 2023. Calibration indicated the meter is now working within 5%+/- tolerance. Flows prior to September 2022 are erroneous and not representative (see **Section 3.10.2**)

- Grit/sediment buildup in the upstream throat of the flume requires ongoing maintenance. It's possible removing the 3" insert may help reduce potential for sediment buildup; however, this should only be done if City's flows are adequate for 6" flow meter flow range. Based on a review of the existing flows, it appears this could be done now. This will also require the transmitter to be recalibrated and programmed for the 6" flume.

- The vault and Parshall Flume are showing signs of deterioration (some rust on the support members, etc.); however, the structures likely have service life remaining that exceed the 20 year planning period. Since the ultrasonic level transducer and associated electrical have recently been replaced, they will likely have a service life sufficient for the 20 year planning period.

- The capacity of the influent meter is adequate to meet 20-year projected design flows (for a population of 3,000) if the 3" insert is removed. To meet the expansion goals (for a future population of 6,000) the meter would need to be upgraded to a larger Parshall Flume. It appears adequate room exists to install a larger meter at the existing location.

- While the capacity of the existing influent meter meets the design flows, given the recommended headworks improvements (see following section), it is recommended the City consider including a new influent metering in the proposed headworks improvements. Locating the meter in the new headworks channels will improve access and ease of maintenance for the meter.

Costs:

The cost for influent metering improvements is included in the headworks improvements. See next section.

7.3.2 *Headworks / Preliminary Treatment*

Description:

Influent wastewater flows into the headworks facility by gravity. The headworks is open-air and covered by a roof structure over partially below-grade 1' wide by 3' deep cast-in-place concrete channels. The headworks mechanical equipment includes insulation and heat tracing required to maintain operation during the winter months.

Screening consists of a single mechanical bar screen manufactured by Smith & Loveless, Inc. (Model: SCHLOSS Mark IX-A) installed in the north channel during the 2007 improvements. The channel is widened at the screen location to 18" to accommodate the screen. Peak flow capacity for the screen is 1.3 MGD. The second channel serves as a bypass channel with no screen installed.

Screened influent flows into a single degritter basin. Settled grit is removed from this basin by a recessed impeller grit pump housed in a below-grade vault adjacent to the basin which allows for a flooded pump suction. The pump discharges to a single grit classifier (WEMCO 1000C 12" Hydrogritter).

Observations / Issues / Recommendations:

Following are observations and recommendations for the headworks facility:

Influent Piping:

- Influent piping consists of 12" and 15" diameter piping installed at varying slopes; w/ (2) 10" pipes outlets from the Parshall flume. Capacity of the existing influent piping is likely sufficiently to meet the 20-yr design flow, but only with minimal excess capacity. However, existing influent pipe capacity is not adequate to meet ultimate flows (for population of 6,000). It is recommended that comprehensive headworks improvements accommodate influent piping upsizing to a minimum 18" diameter (depending on final location/configuration of the headworks and available pipe slope, etc.) to convey the projected ultimate influent flows.

Concrete channels and screening equipment:

- The existing headworks concrete structure and roof system are approximately 15 years old and in satisfactory condition. Concrete appears to be in good condition with little deterioration.

- The operator reports the headworks mechanical and electrical equipment is worn and showing serious signs of deterioration. It is assumed the equipment will need to be replaced within the planning period. Existing condition is typical for headworks equipment which has a typical service life in the 20+/- year range.

- The existing mechanical bar screen is expected to exceed its useful life between 2025 and 2030 and the City should plan to replace. The *2023 WWTP and Collection System Needs Assessment* indicated the existing bars have ½-inch spacing. However, the manufacturer indicates the screen was supplied with a 3/8-inch spacing. This should be confirmed by the City as soon as possible. If the screened opening is greater than 3/8-inch, it does not meet the state's beneficial reuse requirements for WWTP biosolids and needs to be replaced.

- The screen manufacturer reports the existing screen has a peak capacity of 1.3 MGD which can accommodate the 20-year design flow, but not the ultimate flow (for a population of 6,000). Either a larger screen or 2 screens will be required, neither of which can be accommodated by the existing headworks structure without significant modifications.

- The existing headworks includes an emergency bypass channel which is not equipped with a screen. It is recommended a manual screen with 3/8-inch spacing be installed.

Grit removal:

- Background: Grit removal is the removal of sand, gravels, or other heavy solid material that are "heavier" than the organic solids removed with initial screening. Grits and sands are introduced to the collection system through various means: heavy sanding of roads in icy winter conditions, upgradient eroding gravel roads, or failing collection system piping. These inorganic solids can be unnecessarily abrasive on downstream mechanical equipment, such as pumps, and will accumulate in areas of basins with slower velocities: corners of aerations basins and clarifiers for example. The disadvantages of grit removal systems include: high capital cost, head loss through

the system, additional O&M on the grit removal equipment, and can be a challenge to fit in tight sites.

- The WWTP's as-built drawings indicate the design capacity for the existing grit removal system is: 95% grit removal at a peak flow of 0.48 MGD. This capacity is below the projected 20-year peak flow. Thus, the existing grit removal system will have reduced grit removal efficiency as flows increase above the design capacity. It is also expected that the useful life of the existing grit pump and classifier will end during the planning period.

- The City reports that the existing grit removal system is not very effective and removes only a minimal amount of grit each week.

- During maintenance of the SBR aeration diffusers in May of 2024, the treatment basins were drained and the City encountered several inches of grit lining the bottom of the basins. It did not appear the grit was affecting the SBR system, other than reducing some available volume of the treatment basin. The City is unsure when the treatment basins were last cleaned, but indicated it was likely in the 7 to 10 year range; and it's possible they may never have been cleaned out since their original installation. While this indicates grit passes the existing grit removal system, overall accumulation in the treatment system is relatively insignificant and not noticeably affecting treatment.

- While Entiat's existing WWTP grit removal system provides some benefit, it may not be needed or cost effective to include grit removal for the proposed improvements for the following reasons:

    - Entiat does not appear to have documented I&I issues and the City reports grit appears to be minimal.

    - Gravity systems, those that don't need to repump effluent have minimum mechanical equipment which would be impacted by increased grit.

    - City desires the new headworks structure be enclosed. Thus, the capital costs for adding grit removal is significant, and requires additional area on the existing tight treatment site.

- While grit removal may not be cost effective, we recommend providing space for a future grit removal system in the event grit removal becomes necessary in the future.

Operations and Influent Sampler:

- The City reports that the existing open-air headworks structure has been problematic since its construction. It is prone to freezing, difficult to maintain, and inadequate protection from the elements. The City has installed heat trace wire to prevent freezing and other stop gap solutions. Overall, the City is unhappy with the open-air headworks and would like the future headworks to be completely enclosed. This requires compliance with the National Fire Protection Association (NFPA) 820 electrical and fire protection requirements.

- The City reports inadequate lighting surrounding the headworks which makes it difficult for ongoing operations and maintenance. It is recommended additional lighting be provided. An enclosed headworks would provide improved lighting and operational ease.

- The existing influent sampler pulls influent samples from the grit chamber. The existing sampler appears to be functioning; however, it is in poor condition and should be replaced.

Recommended Improvements and Costs

- Given the City's existing operational issues and desire for an enclosed headworks, as well as the existing headwork's capacity issues (i.e. channels and mechanical equipment do not meet the 20-year design criteria), we recommend a new enclosed headworks be constructed that includes the following:

    - Construct new fully enclosed headworks facility located adjacent to the existing headworks. This allow the influent piping to be routed to the new facility with little effect on the plant hydraulic grade line and available head. This also allows the existing headworks to stay in operation during construction of the new facility. After construction is complete, flows will be diverted to the new facility and demolition of the existing headworks can occur.

    - Provide screening room w/ dual channel system—one channel for the mechanical screen and to serve as an emergency bypass w/ a manual bar screen. Channels should be sized to accommodate ultimate flows. Screening room should meet the National Fire Protection Association (NFPA) 820 electrical and fire protection requirements.

    - Install new mechanical screen sized for future peak flow with opening size that meets beneficial reuse requirements for WWTP biosolids.

    - Note, influent channels and screening should be sized in consideration of ultimate future flow (for population 6,000). Accommodating the ultimate flow could be accomplished by installing a second screen in the bypass channel or by oversizing the channels to accommodate a larger screen. If oversized channels are used w/ a smaller screen in the near term, temporary channel walls may be needed to reduce channel width at the screen.

    - Install Parshall flume influent flow meter in a single channel downstream of the screening channels. Flow meter range needs to accommodate existing low flows to future peak flows (including ultimate flows). This may require a meter insert in the near term.

    - Provide means to install a future grit removal system. This can be accomplished by adding a channel section after the Parshall flume for future use that could route flows to a future grit removal system installed south of the new facility.

    - Provide screening discharge area/room to facilitate removal/disposal of the screenings. Room should include rollup door (if possible) for ease of maintenance. Given the existing influent piping elevations and the plant hydraulic grade line, the new influent channels will be elevated several feet above existing grade of the site (similar to the existing headworks channels. The screening discharge room/area should be several feet lower than the channel room elevation and at grade with the site to help facilitate removal/disposal of the screenings.

    - Layout of the channels, equipment, and discharge area should provide adequate access room for routine operation and maintenance.

    - Provide separate electrical/mechanical room isolated from the screening room environment. This room should also be sized to serve as a new plant electrical room for the upgraded WWTP components. See following section regarding WWTP electrical recommendations. A new electrical room allows for construction of the improvements without interrupting operations of the existing treatment plant.

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-1 Headworks Improvements - Estimated Capital Cost

Headworks Improvements	Est. Cost
Reroute influent piping (310 LF of 18" diameter pipe)	$67,000
New Building - CMU construction: 50' x 22' headworks and screenings room w/ 20' x 22' plant electrical room	$540,000
Concrete channels and interior concrete	$60,000
Mechanical screen	$260,000
Mechanical screen install	$50,000
Parshall flume	$35,000
Bypass screen, gates, and misc. items and appurtenances	$40,000
Influent sampler	$10,000
Electrical and controls	$50,000
Total:	**$1,112,000**

7.3.3 *Secondary Treatment System*

Description:

Wastewater flows from the treatment plant headworks to the secondary treatment system which consists of two identical SBR treatment basins in parallel. The SBR process design and equipment is manufactured by Sanitaire (currently a Xylem brand) and is their ICEAS process.

The secondary treatment system is designed for the following parameters:

Table 7-2 Existing SBR Design Criteria and Characteristics

Secondary Treatment System – SBR Design Criteria and Characteristics	
Influent Design Criteria:	Value
Flow:	
Annual Average Flow	0.12 MGD
Design (Ave. for Max Month) Flow	0.15 MGD
Design Peak Day Flow	0.20 MGD
Design Peak Hour Flow	0.48 MGD (333 gpm)
Minimum Ave Month Flow (Startup)	0.05 MGD
Loadings:	
BOD	302 lb/day (240 mg/L)
TSS	331 lb/day (265 mg/L)
NH3-H	n/a
TKN	80 lb/day (48 mg/L)
Phosphorus	5.45 mg/L
Alkalinity	332 mg/L
Min/Max Temp	10/20 deg-C

Effluent Design Criteria:	Value
BOD (Ave. Weekly)	45 mg/L
TSS (Ave. Weekly)	45 mg/L
BOD (Ave. Monthly)	30 mg/L
TSS (Ave. Monthly)	30 mg/L
NH3-H	No requirement

Table 7-3 Existing SBR Process Criteria

Secondary Treatment System – SBR Process Criteria	
Process Criteria:	Value
F/M	0.049 lb BOD5/lb MLSS/ Day
SVI (after 60 min settling)	150 mg/L
MLSS at bottom of water level	4,923 mg/L
WAS Produced	197 lb/
Volume sludge @ (approx. 0.85%)	2,779 gpd
Normal decant rate	351 gpm
Peak decant rate	500 gpm
Hydraulic retention time	1.13 days
Sludge age	26.36 days
SBR Basin Characteristics	Value
Number of ICEAS SBR Basins	2
Basin width	15.0 ft
Basin length	59.0 ft
Basin height	17.0 ft
Basin bottom elev.	Elev = 711.00
TWL	Elev = 725.00
BWL	Elev = 722.43

Observations / Issues / Recommendations:

Treatment system performance and ability to meet the City's NPDES permit requirements are discussed in detail in **Section 06**. In general, the system meets the effluent limit requirements as outlined in the City's NPDES permit.

Following are observations and recommendations for the secondary treatment system:

- The City's 2023 WWTP needs assessment noted the following: "After startup of the SBR system, Ecology noted that nitrification could not be achieved as reliably as it had been with the previous oxidation ditch. This is noted in the NPDES permit fact sheet addendum. However, it appears that in the years following the SBR upgrade, nitrification was achieved more reliably, likely by increasing the solids retention time in the SBR system by operating at elevated mixed liquor levels. However, in recent years, operators noted that nitrification appears to be periodically inhibited. It appears that this often occurs during the warm months when nitrification would be expected to be easier to achieve. **Section 6** also provides updated data and graphs of effluent ammonia levels which show the cyclical increases during warmer summer months. See plant optimization

recommendations in **Section 6.9.2** and ammonia limit discussion in **Section 6.10**. We recommend the plant optimization measures be implemented immediately, and City investigate and remove any potential sources of influent toxicity.

- The manufacturer also reviewed the effluent ammonia data and provided the following comments.

    - *Although the system is not designed for effluent ammonia, the system should nitrify (depending on temperature) as long as flow and loads are within the [design] limits. The system will have 6 cycles per day based on 4 hour NIT cycle. It is possible the system is not operating at optimum SRT (based on nitrification) or may not have enough aeration/blower capacity to maintain 2mg/l DO when air is ON or may have lower basin pH which inhibits nitrification. The influent may have some toxicity depending on industrial contributions.*

    It is recommended:

    - Find and address/eliminate any influent toxicity sources. Trace up stream as needed. This appears to be the most likely cause of the elevated effluent ammonia levels. This should also include:

    - Provide toxicity testing and review industrial customers discharge schedule and constituents to determine if any correlation exists between ammonia spikes and industrial discharge schedule(s) and constituent(s).

    - Monitor influent nitrogen and other influent/effluent operating data (see recommendations in **Section 6.9.2** and **6.10**) needed for the manufacturer to confirm the system is operating within its design parameters; and to help determine what might be affecting nitrification.

    - Send duplicate effluent ammonia samples to two different labs to rule out a potential lab testing issue (see **Section 6.10**).

- The continuous flow configuration relies on passive flow splitting of the influent between both SBRs via a distribution control structure with manual gates. Operators noted that it is difficult and problematic to split flows accurately between the two SBRs. Thus, mixed liquor concentration and settleability differences are common between the two reactors. This makes process control challenging and ultimately can reduce the realistic capacity of the system.

- The SBR control system and equipment is proprietary to Xylem; and modifications to the control system often require assistance from the manufacturer. While the City is not against a proprietary control system, in the future, a non-proprietary system is considered desirable.

- The manufacturer indicated they offer newer control systems for their SBR that increases ease of monitoring (including remote monitoring options which are not possible now) as well as improved process control. Given the age of the control system and the technological improvements that have occurred since it was installed, it is recommended the control system be upgraded/modernized.

- The City is concerned with the long-term reliability of the two existing rotary lobe aeration blowers. These should be replaced as part of a larger secondary treatment system project.

- The SBRs utilize a fixed diffuser grid of EPDM (ethylene propylene diene monomer) discs, which require the treatment basins to be drained for maintenance. In spring of 2024 the City replaced the

diffusers in both basins. While the City was able to operate off a single basin for a short period of time needed to replace the diffusers, as growth occurs, this will not be possible. The manufacturer recommended a method of acid cleaning which does not require draining the basins; however, replacement of the diffusers will still be needed periodically. Continued use of the tanks (via future expansion of the SRB system) should include consideration of options/methods to replace the diffusers without draining the basins.

Recommended Improvements and Costs

While the existing system currently meets the effluent requirements of the City's NPDES permit, the system is near capacity—see **Section 6** for discussion regarding existing capacity. Significant upgrades to the treatment system are needed to meet anticipated near-term growth, as well as the 20-year design criteria.

Upgrade alternatives for the secondary treatment system are explored in a subsequent Sections.

One of the alternatives to meet projected future flows is to expand the existing SBR system (evaluated in subsequent sections). The age and condition of the existing SBR system was evaluated and discussed with the manufacturer. If the SBR expansion alternative is selected and the existing treatment system continues to be utilized, we recommend improvements be completed to renew the treatment system's service life and improve its operations. In addition to the system optimization recommendations included in **Section 6.9.2**, the following improvements are recommended:

- Construct new distribution box to provide more accurate flow splitting. This is needed for the existing basins; but will also be needed for the expanded basins.

- Replace/clean diffusers at regular intervals. Typically, diffuser service life is in the 10 to 12 year range. Since the City replaced the diffusers recently, nothing further is recommended at this time. However, within the service life of the treatment system the diffusers will need to be replaced and/or cleaned at regular intervals. Signs the diffusers need to be cleaned/replaced include: DO levels decreasing, backpressure of the blowers increasing, increasing energy costs, unable to produce enough air for treatment, etc.

- Typically, blower bearings should be replaced every 10 years; thus, it is recommended, at a minimum, the blower bearings be replaced. However, the City has indicated maintenance on the blowers is increasing and the units will likely need to be rebuilt or replaced in the near term. We recommend the City plan to replace the existing blowers.

- Replace existing control system with manufactures modernized control system. See discussion above.

- Replace misc. piping, valving, manifolds, etc. The manufacturer indicated that while it's likely much of this won't need replacing, the City should inspect closely and plan to replace some portions. A budget allowance is included in the following cost estimate for replacing some misc. piping, valving, manifolds, etc.

- Assume the existing decanter system can be reused and thus no improvement is included.

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering) for upgrades to the existing SBR to renew service life and allow continued for the planning period are as follows. Note, these

do not include capacity increases to meet projected future flows which are explored in subsequent sections.

Table 7-4 Existing SBR Service Life Upgrades - Estimated Capital Cost

Existing SBR Basins – Service Life Upgrades	Est. Cost
Replace blowers	$70,000
Budget for replacing misc. valves, piping, manifolds, etc.	$30,000
Replace control system	$50,000
Total:	**$150,000**

7.3.4 *Effluent Disinfection (UV)*

Description:

Wastewater leaves the SBR system through below-grade piping to the plant disinfection system located in the lower floor of the existing plant process building. Disinfected effluent discharges to the existing chlorine contact chamber and then conveyed to the outfall pipe. The chlorine contact chamber is no longer needed or used for chlorine disinfection. The chamber serves as a location for pumping of effluent utilized by the non-potable water system.

The UV disinfection system consists of two (2) identical enclosed UV reactors manufactured by Seimens Water Technologies Corp. (now Evoqua) model SUN-10E-A300 installed during the 2007 treatment plant upgrades. Piping is present to allow for a third unit to be installed.

Each unit is sized for a peak flow of 351 gpm per reactor and a UV dose of 30 MJ/CM2 with a single unit in operation.

Observations / Issues / Recommendations:

Following are observations and recommendations for the UV disinfection system:

- UV systems require component replacement as part of ongoing routine operation and maintenance (bulbs, etc.). The UV system is still supported by the manufacturer and replacement components are still available.
- While parts are available, the units were originally sold as Siemens which was purchased by Evoqua. It's likely parts will become increasingly more difficult to purchase. The City complains that parts are increasing in costs and seem to be high compared to other UV systems.
- The existing UV room size and lamp configuration makes bulb and sleeve removal/replacement challenging. The City notes it is common for bulbs/sleeves to be broken during replacement due to inadequate clear space. In the future, reconfiguring or relocating the UV system if desired by the City is recommended. Using medium pressure UV reactors (in lieu of the low-pressure system currently installed) would reduce bulb/reactor length providing additional clear space, and smaller replacement parts will improve ease of maintenance.
- The UV room includes a non-potable water filter that periodically clogs causing flooding of the UV room. The filter should be relocated to the existing chlorine contact chamber room, adjacent to the

non-potable water (NPW) pumps, to allow any filter flushing water to return to the chlorine contact chamber.

Recommended Improvements / Costs

- Recommend UV reactors be replaced with new medium pressure high output units. New units should be sized to disinfect future peak flows from the secondary system; and are typically sized to treat maximum daily influent flow with one unit out of service. Recommend units be capable of flow pacing to reduce energy consumption.

- Future flows for ultimate population of 6,000 can be accommodated via adding a third reactor. The future reactor could be sized at a larger capacity than the other two units, however, it may be simpler to control the system if all three units are identical. This would mean the two new reactors installed for the 20-year flows would need to be sized also to accommodate flows from the future ultimate secondary treatment system and the ultimate max daily influent flow with one of the three units out of service.

- The existing UV room appears to have adequate space to accommodate the upgraded UV system provided medium pressure units are utilized and piping is reconfigured to provide more clear space for operation and maintenance.

- It is assumed piping from the secondary treatment basin to the UV system will need to be upsized to accommodate future flows. Final sizing of the disinfection system will depend on the final secondary system alternative selected and the final configuration. SBR systems typically have higher discharge rates to the disinfection system than some other secondary treatment systems (due to the batching process). For the purposes of Facility Planning, it is assumed piping will increase in diameter at least one size. Site piping replacement and building modifications needed to accommodate this are included in the cost estimate.

- A low flow recirculation system will be needed to accommodate low flows. It's recommended the existing system and problematic filter be replaced with a new circulation system coordinated with the new reactors which will likely have different low flow requirements than the existing system.

- The UV control system should be upgraded to the manufacturer's control system supplied with the new reactors. It is recommended the operational characteristics and set points for the system be controlled by the UV system manufacturer supplied controls without reliance on remote SCADA control. SCADA monitoring and ability to change set points remotely should be provided.

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-5 UV System Upgrades - Estimated Capital Cost

UV System Upgrades	Est. Cost
Demolition	$15,000
Temporary UV disinfection system during construction (utilizing new and/or existing UV reactors)	$30,000
Site piping upgrades	$40,000
Piping/pluming and valves	$80,000
Enclosed vessel UV reactors (2 EA)	$350,000
UV system install; testing, etc.	$40,000
Low flow recirculation pumping system	$10,000
Electrical and controls	$150,000
Total:	**$715,000**

7.3.5 *Solids Handling*

Biosolids dewatering and handling is addressed in **Section 7.6**.

7.3.6 *Plant (Yard) Lift Station*

Description:

The treatment plant includes a plant (yard) lift station located west south of the operations building and north of the aerated sludge storage basin (repurposed oxidation ditch) which receives flows from various treatment plant sources (misc. process/basin drains, BFP pressate drain line, floor drains, etc.) and pumps via a 4" diameter force main to an influent manhole directly upstream of the headworks channels, and downstream of the influent meter.

The plant lift station was upgraded during the 2007 upgrades. The original 72" diameter concrete wet well structure remained. All other parts of the lift station were upgraded including new wetwell top, valve vault, piping/valves/etc., duplex submersible pump system, and associated appurtenances.

Lift station pumps are 5 HP Flygt submersible pumps; Model NP-3102, 1750 RMP 3-PH. Each pump is rated for 260 GPM @ 33'TDH.

Pump controls are via level transducer w/ high/low float switches. Pump controls are operated as lead/lag and the control panel is mounted on the south east corner of the operations building.

Observations / Issues / Recommendations:

Following are observations and recommendations for the plant lift station:

- In general, the plant lift station is operating satisfactory. The City does not have immediate concerns related to the plant lift station.
- The plant lift station was recently reconstructed and is in good condition with a long remaining service life.

- The existing pumps produce a velocity in the 4" force main of 6.6 ft/sec. In the event higher capacities are desired, the pumping rate will produce excessive velocities and likely need a larger force main.

Recommended Improvements / Costs

- Recommend the plant lift station instrumentation and controls be upgraded at the time the treatment plant is upgraded to renew their service life. It is also recommended the lift station controls be tied into the new plant SCADA system.

- Recommend a mag flow meter be installed. The valve vault does not have room for a meter so this can be accomplished by installing a new meter vault downstream of the valve vault.

- The City may also wish to purchase a spare pump to have on hand.

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-6 Plant Lift Station Upgrades - Estimated Capital Cost

Plant Lift Station Upgrades	Est. Cost
Instrumentation and controls equipment upgrade / tie into new plant SCADA	$25,000
New vault and mag meter	$25,000
Spare pump	$10,000
Total:	**$60,000**

7.3.7 *Electrical system and Generator*

Description:

The existing electrical system was upgraded during the 2007 treatment plant upgrade. The City does not report any specific issues or abnormalities with the existing electrical equipment which has capacity for roughly double the current load and is less than halfway through the typical lifespan.

The existing 250 KVA backup generator was also installed in 2007. The generator is sized for the existing plant load with limited additional spare capacity.

The City's existing SCADA system was installed as part of the SBR system package.

Observations / Issues / Recommendations:

- There are no improvements recommended for the existing electrical distribution unless specific problems are encountered NETA-MTS circuit breaker testing is recommended if it has not been performed within the recommended maintenance interval of 3 to 6 years to ensure that the existing MCC and main circuit breaker are operating correctly.

- The existing equipment located in the southwest corner room of the plant building has a limited amount of spare buckets; thus for significant upgrades and additional MCC or other control equipment would be needed for the new treatment equipment.

- The existing electrical room includes the SBR aeration system blowers which can generate significant heat load to the room. The operator indicates room temperatures are very high during the hot summer months. Given the electrical equipment/controls equipment currently included and planned for this room, it is recommend an A/C unit be installed to moderate ambient temperature.

- For future upgrades, recommend a 30 day peak demand load study to further evaluate generator capacity but anticipate that either an additional generator will be needed or the existing generator replaced with a larger unit depending on final load added. Cost estimate herein assumes a single additional generator sized similar to the existing.

- For future upgrades, it may be prudent to consider changing out the existing VFDs to match new ones for uniformity of controls, operation, and maintenance. There have been some improvements to VFD's since the original installation date.

- If the original lighting is still fluorescent as specified in the original plans, we would recommend a complete replacement. This will reduce maintenance and energy costs, and will free up some capacity for the generator and electrical distribution system.

- The existing control system was installed in 2007 but is outdated and replacement is recommended. The RUG9 unit shown in the electrical plans is fairly robust and typically has few problems but has become difficult to support with age. If a plant expansion wasn't occurring it may be fine to leave as-is; however, given the planned upgrades, the control system should be changed out with the upgrades.

- A separate electrical room will be installed in the new headworks building for the upgraded WWTP components. This will allow for construction of the improvements without interrupting operations of the existing treatment plant. It is assumed new electrical components will be installed in either the new electrical room or the existing electrical room. Costs for construction of the electrical room is included in the headworks building upgrades.

Recommended Improvements / Costs

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-7 Plant Electrical/Controls Upgrades - Estimated Capital Cost

Plant Electric / Controls Upgrades: *Note, electrical upgrades for individual plant components are included in the associated cost estimates. This estimate is for overall plant electrical/SCADA only*	**Est. Cost**
New generator and ATS; concrete pad; installation and testing	$200,000
New plant MCC and misc. electrical	$200,000
New plant PLC and controls budget	$75,000
SCADA programming	$150,000
Total:	**$625,000**

7.3.8 *Old Chlorine Contract Chamber, NPW Storage, and Outfall*

Description:

Prior to the 2007 treatment plant upgrades, effluent was disinfected using a chloring contact chamber just prior to the outfall. During the 2007 upgrades, UV disinfection was installed (as discussed previously) and chlorine disinfection was eliminated. However, the chlorine contact chamber was not removed from service. Effluent continues to be routed through the chlorine contact chamber which functions essentially as effluent storage / channel system. Additionally, during the 2007 improvements a non-potable water (NPW) tank chamber was constructed adjacent to the chlorine contract chamber (see following section regarding the non-potable plant water system). And the new plant process building was constructed to house these chambers in a 54' x 29' room on the east side of the building.

Disinfected effluent enters the new NPW storage tank at northwest end of the chamber. A notch is cut into the reuse water chamber southeast wall which routes water from the new portion of the basin into the old chlorine contact chamber which conveys effluent to the outfall piping.

Treated effluent is then conveyed through an enclosed pipe to a single port diffuser anchored to the streambed approximately 300 feet offshore and 75 feet below water level at low-flow conditions.

Observations / Issues / Recommendations:

Following are observations regarding the old chlorine contact chamber and outfall:

- The City reports that the old chlorine contact chamber collects settleable solids from the effluent and requires routine cleaning via vactoring. The City is also concerned that the storage and resulting hydraulic residence time of the chambers promotes regrowth in the effluent.
- The existing effluent chambers provide a significant amount of storage. While storage is useful for the effluent repump/reuse system, the City reports that more storage is provided than needed given how the repump water system is currently utilized.
- It is desirable to the City to remove the chlorine contact chamber and allow a more direct discharge pathway from the UV system to the outfall, and will alleviate the labor associated with periodically cleaning of the chlorine contact chamber. Some volume storage will still be needed for the non-potable water repump system. It is recommended this not be less than 5,000 gallons.
- See Section 6 regarding mixing zone study.

Recommended improvements / Costs

While the chlorine contact chamber likely provides some benefit in terms of effluent storage and attenuation of effluent peaks, the operational demands and the risk of regrowth make decommissioning the effluent channels desirable to the City. It is recommended the treatment plant upgrades include modifications to the treatment plant effluent piping to bypass the chlorine contract chamber for a direct discharge to the outfall. This can be accomplished by teeing into the discharge manifold in the UV room and coring a new discharge main out the north wall of the building and tying into the existing effluent main. Modifications are also needed to allow storage for the non-potable water system when the effluent is discharging directly to the outfall. This could be accomplished utilizing the existing piping from the UV system effluent storage / chlorine contract chamber. Addition of an interior wall(s) and gate will also be needed and allow for storage volumes which are less than the entire existing basin.

Evaluation and recommendations for the non-potable water pump system are outlined in the following section.

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-8 Effluent Channels and Outfall Upgrades - Estimated Capital Cost

Effluent Channels and Outfall	Est. Cost
New piping bypass from UV discharge manifold to the outfall	$30,000
Modifications to existing effluent channel storage to accommodate non-potable water system	$20,000
Total:	**$50,000**

7.3.9 *Non-Potable Plant Water (NPW) / Repump System*

Description:

Non-potable plant water (NPW) is supplied to the treatment plant via a duplex package pump station located in the east room of the existing process building. The pump station draws disinfected effluent from the existing effluent storage/channels (i.e. the plant's old chlorine contact chamber—see previous section).

The NPW system consists of a package duplex Grundfos booter pump system with vertical pumps operated on variable frequency drives (VFDs) which provide pressure/flow control. Each pump is 15 HP and rated for 111 gpm at 319'. Controls for the pump station are mounted adjacent to the pump system.

Plant water is pumped to a 2" Amid "TAF" auto filter located in the UV room and discharged to the treatment plant reuse water distribution system which consists of 2" diameter piping teeing into a 1.5" pipe to the dewatering building and a 1.25" pipe to the headworks. Process water also supplies various yard hydrants throughout the treatment plant site.

Observations / Issues / Recommendations:

Following are observations for the plant water repump system:

- In general, the plant water repump system is operating satisfactorily. The City does not have immediate concerns related to the plant lift station.
- Service life for the existing system should extend through the 20-year planning period.
- City has reported some problems w/ the plant water effluent filter. Recommend it be replaced.

Recommended Improvements / Costs

Recommend the following:

- Replace the effluent filter.
- Estimate cost of $1,500

7.3.10 *Potable Water System*

Description:

Water is supplied to the WWTP via a 2" water service entering the site at the southeast corner. During the 2007 upgrades a new 1" galvanized steel water service housed in a carrier pipe was installed from the 2" service entry to the dewatering building where it tees and serves the dewatering building and then to the plant lab building. The City indicated they do not believe potable water is currently served any other locations in the WWTP.

The 2007 construction drawings include a detail for a reduced pressure backflow preventer sized for a 1" water service, however, the operator indicated he is not aware of an existing backflow preventor for the potable water service; and thus, it does not appear the backflow preventer was installed.

Observations / Issues / Recommendations:

Following are observations regarding the existing potable system:

- The City reports that the existing water service has operated sufficiently. The potable water service is not large (1" diameter service line), however, given the NPW system, this has not been an issue. Future upgrades that need additional water will need to be designed utilizing the NPW system and/or upsizing the existing water service line.

- The WWTP does not meet current cross connection control (CCC) requirements:

    - The 2007 treatment plant design plans show a reduced pressure backflow preventor (RPBP) for the 1" water service. However, it does not appear the RPBP was installed (see previous sections). Premise isolation should be provided immediately for the 1" service. This can be accomplished by installing a RPBP for the 1" service at the location it enters the treatment plant site. Recommend this be located where the 1" service enters the treatment plant portion of the City owned site; i.e. south of the existing shop building in the landscape area south side the paved parking.

    - During design of future improvements, if a larger potable water service is desirable, a larger RPBP should be installed to accommodate. Recommend any future potable water service lines within the treatment plant site be cased similar to the existing 1" service.

    - Currently the treatment plant uses potable water at two locations: 1) the operations building, and 2) dewatering building. Department of Health (DOH) provides guidance on requirements for cross connection control for wastewater treatment plants. DOH guidance considers wastewater treatment plants "high severity". This means treatment plants are typically required to provide complete hydraulic separation from the City's potable water supply which is done using a RPBP where the water service enters the site with an additional air gap / repump system for complete process isolation. Since the City is utilizing potable water in the dewater building, it is assumed this is currently required for Entiat's WWTP. The City should confirm this with the City's CCC specialist.

    - One option to reduce costs would be if future upgrades limit potable water to suppling the lab/operations building only. Then CCC requirements could be met by installing an approved backflow preventor at the lab/operations building (in addition to the site RPBP) without requiring a full repump system. This would save in the range of $200K to $300K. This would also require a new NPW service to the dewatering building and removal of the

wash sinks. However, despite the potential cost savings, a repump system that allows water from the City's potable system to be utilized in the WWTP is desirable. Some reasons include:

- Allows for sinks and washdown areas in the treatment buildings—headworks, dewatering, etc.; and for heated water to be available for spray down of the headworks screen and for other areas where greases may accumulate.
- Allows for eye wash stations to be installed at locations through the plant.
- Allows for a water fill line to the NPW system tankage as an emergency backup measure to ensure adequate water is available to the pumps if effluent flows are low (e.g. during the nighttime) and when the disinfected UV is routed directly to the outfall.

Given these advantages and the comprehensive improvement the City will be constructing, it is recommend a potable water airgap / repump system be installed to allow City potable water to be used throughout the plant.

- The air gap system should be sized to accommodate anticipated current and future water demands and should include duplex pumps with flow pacing via VFD / pressure tank combination. Controls for the system should be integrated into the treatment plant SCADA system.
- Recommend the air gap system be housed in the same room as the non-potable water system. Recommend the air gap / repump system be installed on structural slab above the chlorine contract basin on the south side of the existing room.

- The treatment plant site does not have a dedicated fire hydrant. The nearest fire hydrant is located approximately 200' south of the treatment plant entrance on Lakeshore Drive. We recommend the City consult with the fire department during design of the proposed upgrades and install hydrant(s) as required by the fire department for the proposed structures.

<u>Recommended Improvements / Costs</u>

Recommend the following:

- Confirm CCC requirements herein with the City's cross connection control specialist.
- Install RPBP at the water service entry to the site. And install RPBP at the lab/operations building.
- In the short term, remove existing potable water service to the dewatering building. Install new NPW service to the dewatering building.
- In the long term, install an airgap / potable water repump system to allow the City's potable water to be used through the plant and provide complete hydraulic separation from the City system.

<u>Costs:</u>

Recommended capital improvements and costs (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-9 Cross Connection Control System Upgrades – Estimated Capital Cost

Cross Connection Control System Description	Est. Cost
Reduced pressure backflow assembly for premise isolation—2 locations; at site entry and in lab/operations building	$30,000
NPW service to dewatering building	$10,000
1" cased water service to the existing plant building	$10,000
Structural slab above old chlorine contact chamber	$15,000
Skid mount cross connection control repump system	$175,000
CCC system installation	$50,000
Budget for site piping revisions to accommodate new CCC system	$20,000
Electrical/controls/SCADA for CCC system	$40,000
Total:	**$350,000**

7.3.11 *Laboratory/Operations Building and Site/Miscellaneous*

Description:

The treatment plant laboratory / operations building is located at the center of the site, south of the SBR basins and north of the old oxidation ditch that has been converted to aerated sludge storage. Some upgrades to the laboratory were completed during the 2007 upgrades, however, largely the building predates the previous upgrades.

The laboratory building is approximately 640 SF with roughly 200 SF of dedicated lab space. The building includes: lab area, bathroom, main floor storage, basement storage, and two rooms with exterior access. One of the exterior rooms is currently being used as a chlorine makeup room.

The existing treatment plant site is generally in good condition; and consists of asphalt access and parking area with the north side of the site surrounding the SBR basins surfaced with gravel. The site borders the Columbia River, and the perimeter is enclosed in a 6' chain-link fence in satisfactory condition. The site includes a drainage swale for stormwater treatment and the City reports no existing drainage issues.

Observations / Issues / Recommendations:

Following are observations and recommendations:

- The laboratory and equipment, while functional, are far into their service life and should be updated.
- Overall, the lab square footage is small given the plant size and staff. The ECY Orange Book provides requirements based on the 1973 EPA publication, "Estimating Laboratory Needs for Municipal Wastewater Treatment Facilities". This requires 150 to 300 square feet per analyst depending on the number and type of tests performed; and 12 to 25 lineal feet of bench space per analyst working in the lab at any given time. Based on these requirements, the existing lab is too small for future needs; and is likely too small for the existing staff. An expansion to the laboratory is recommended.

- The existing building footprint is likely adequate to meet the laboratory requirements if a retrofit is completed. This would be less costly compared to relocating and/or constructing a new laboratory/operations budling.

- Retrofitting the existing laboratory/operations building should include the following:

    - Removal of interior walls and hallways as needed to increase usable square footage. Possibly move basement access outside to provide more interior square footage and reduce the bathroom square footage.

    - Remove/relocate the two exterior access storage rooms currently located in the northeast corner of the site to the building basement and/or other buildings (e.g. chlorine contact chamber room and/or a new shed style storage north of the operations building). Utilize this square footage as lab/operations space.

    - Remove all unused piping, equipment, pump bases from the basement. Retrofit as needed to make this space usable for plant operations.

    - Update/modernize the building. Update lab furniture/cabinets/equipment/etc.

- The Treatment plant site overall is in good repair. The City does not report any specific needs at this time. It is recommended, however, that a budget of $50K be included to accommodate repair and improvement of existing site features and to allow for a new treatment plant entry sign.

Recommended Improvements / Costs

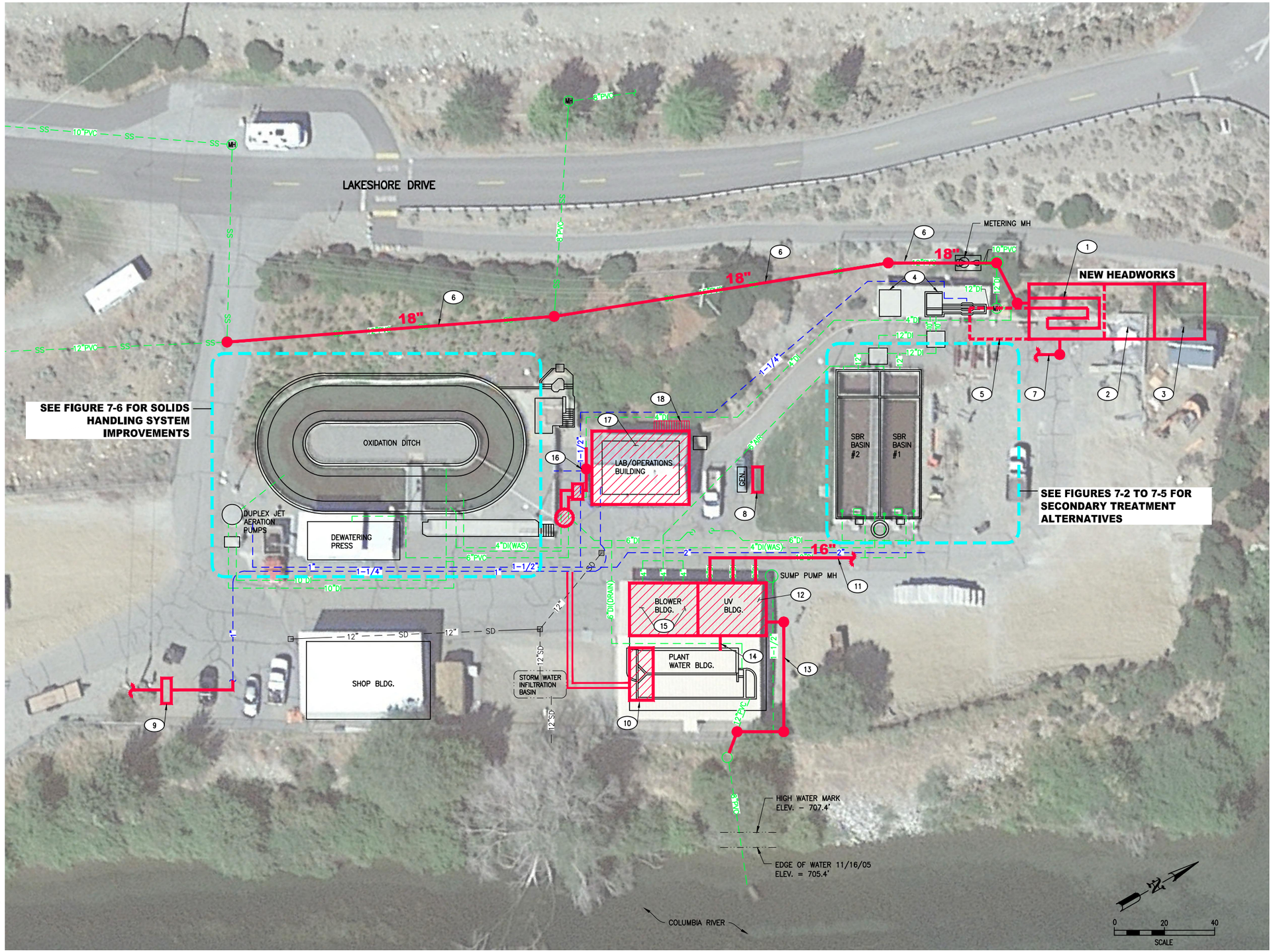
Recommended capital improvements and costs to retrofit the existing lab/operations building and for miscellaneous site improvements area follows (not including additional project costs such as contractor overhead/profit, mobilization, administrative, as well as contingency and engineering):

Table 7-10 Laboratory/Operations Bldg and Misc. Site Upgrades – Estimated Capital Cost

Laboratory/Operations Bldg and Misc. Site Improvements Description	Est. Cost
Interior demolition / clearing basement	$20,000
Building improvements (assume $150/SQ retrofit)	$96,000
Architectural components and HVAC	$50,000
Move stairwell outside	$20,000
Laboratory casework	$50,000
Budget for lab equipment	$30,000
Budget for misc. site improvements and landscaping	$150,000
Total:	**$416,000**

7.3.12 *Summary of Plant Improvement Costs*

Following is a summary of costs for the plant improvements recommended in this section. This estimate includes a budget for contractor overhead/profit, mobilization, administrative, as well as contingency and engineering. Costs for the secondary treatment system expansion and the solids handing improvements are included in subsequent sections.



NOTES

1. HEADWORKS INFLUENT CHANNELS, NEW FINE SCREEN, AND INFLUENT METERING
2. SCREENING ROOM. ROLL UP DOOR IN EAST WALL
3. NEW ELECTRICAL ROOM. LOCATE ELECTRICAL AND CONTROLS FOR NEW TREATMENT COMPONENTS
4. DEMOLISH EXISTING HEADWORKS AFTER NEW HEADWORKS IS CONSTRUCTED. LOCATION FOR FUTURE SELECTOR TANK
5. FUTURE GRIT REMOVAL LOCATION IF NEEDED
6. UPSIZE INFLUENT PIPING TO 18" DIAMETER
7. PIPING TO NEW SECONDARY TREATMENT DISTRIBUTION BOX
8. ADDITIONAL BACKUP GENERATOR. REGRADE HILLSIDE AS NEEDED
9. REDUCED PRESSURE BACKFLOW ASSEMBLY W/ HEATED ENCLOSURE AND 1" SERVICE LINE W/ CARRIER PIPE TO EXISTING SERVICE
10. AIR GAP / REPUMP SYSTEM FOR FULL HYDRAULIC SEPARATION FROM CITY WATER SUPPLY. LOCATE ON NEW STRUCTURAL SLAB ABOVE THE EXISTING STORAGE/CHANNELS. INSTALL PW1 WATER SUPPLY TO NEW HEADWORKS BUILDING AND DEWATERING BUILDING
11. UPSIZE EFFLUENT PIPING FROM THE SECONDARY TREATMENT TO THE UV SYSTEM TO 16" DIAMETER W/ (3) 10" DIAMETER TEES TO UV SYSTEM
12. REPLACE EXISTING UV REACTORS W/ (2) NEW MEDIUM PRESSURE ENCLOSED VESSEL REACTORS. REVISE INTERIOR PIPING TO ACCOMMODATE SMALLER REACTOR LENGTHS AND TO PROVIDE MORE OPERATIONAL ROOM
13. CORE EXISTING LOWER WALL AND INSTALL PIPING FOR DIRECT ROUTE FROM UV SYSTEM TO OUTFALL
14. PROVIDE PIPING/VALVING TO FILL REUSE WATER STORAGE WHEN EFFLUENT IS DISCHARGED DIRECTLY TO THE OUTFALL. PROVIDE IMPROVEMENT TO THE CHAMBERS TO ALLOW LESS STORAGE (IF DESIRED BY THE CITY). INSTALL PW1 WATER SERVICE FROM NEW REPUMP SYSTEM TO NPW STORAGE FOR EMERGENCY FILLING
15. REPLACE BLOWERS AND ADD ADDITIONAL ELECTRICAL/CONTROLS AS NEEDED. ADD A/C TO THE ELECTRICAL ROOM TO REDUCE HEAT LOAD TO EXISTING ELECTRICAL. CONSIDER RELOCATING BLOWERS TO PLANT WATER ROOM
16. NEW VAULT AND MAG METER
17. REFURBISH AND IMPROVE THE EXISTING BUILDING TO PROVIDE A LARGER LAB/OPERATIONS AREA. REMOVE INTERIOR WALLS AND STORAGE AREAS. PROVIDE MISC. BUILDING IMPROVEMENTS
18. PROVIDE EXTERIOR ACCESS TO BASEMENT; REMOVE INTERIOR ACCESS TO INCREASE SF OF LAB/OPERATIONS AREA. REFURBISH AND IMPROVE BASEMENT TO ALLOW STORAGE AND SHOP AREA

1950206-Fig 7-1_Exh_Treatment Plant Recomendations

SCALE:	AS SHOWN
DESIGNED:	DDC
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-01-06
DATE:	8/20/24

VARELA Engineering & Management

CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITIES PLAN AND GENERAL SEWER PLAN

TREATMENT PLANT RECOMMENDATIONS

FIGURE **7-1**

Table 7-11 Summary of Plant Improvements – Estimated Capital Cost

Improvement Description	Est. Cost [1]
Headworks / Preliminary Treatment	$1,112,000
Secondary Treatment System	
-Existing SBR Basin – Service Life Upgrade	$150,000
-Secondary Treatment Upgrades for Capacity [2]	***Not included*** [2]
Effluent Disinfection (UV)	$715,000
Solids Handling [3]	***Not included*** [3]
Plant Lift Station	$60,000
Electrical System and Generator	$625,000
NPW Storage and Outfall	$50,000
NPW / Repump System	$2,000
Potable Water System	$350,000
Laboratory/Operations Building and Site/Miscellaneous	$416,000
Subtotal:	$3,480,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$522,000
Subtotal Construction:	$4,002,000
Sales tax (8.4%)	$337,000
Contingency (25%)	$1,085,000
Construction Cost:	$5,424,000
Eng, admin, const mgt, insp (30%)	$1,628,000
Admin/environmental/funding	$100,000
Estimated Improvements Cost Total:	**$7,152,000**

1. *Costs rounded to the nearest thousand.*
2. *Not included in this estimate. Secondary treatment expansion evaluation, recommendations, and costs are included in the following section (**Section 7.4**).*
3. *Not included in this estimate. Solids handling evaluation, recommendations, and costs are included in a subsequent section (**Section 7.6**).*

7.4 Secondary Treatment Expansion

7.4.1 *Introduction*

This Section provides evaluation and recommendations for expanding the secondary treatment process of the existing treatment plant.

7.4.2 *Existing Secondary Treatment Process*

The existing sequencing batch reactor (SBR) secondary process is described in detail in **Section 7.3.3**. Selected excerpts are included in this section also as summary.

The existing secondary process consists of dual, continuous flow, sequencing batch reactors (SBR). The existing SBR basins are shown in the attached figures and are located within the overall footprint of the treatment plant site. Wastewater flows from the treatment plant headworks to the secondary treatment system that consists of two identical SBR treatment basins operated in parallel. The SBR process design and equipment is manufactured by Sanitaire (currently a Xylem brand) and is their ICEAS process.

The existing secondary treatment system is designed for the following parameters outlined in **Table 7-11**.

Table 7-11 Existing Secondary Trt System – SBR Design Criteria and Characteristics

Existing System Influent Design Criteria:	Value:
Flow:	
Annual Average Flow	0.12 MGD
Design (Ave. for Max Month) Flow	0.15 MGD
Design Peak Day Flow	0.20 MGD
Design Peak Hour Flow	0.48 MGD (333 gpm)
Minimum Ave Month Flow (Startup)	0.05 MGD
Loadings:	
BOD	302 lb/day (240 mg/L)
TSS	331 lb/day (265 mg/L)
NH3-H	n/a
TKN	80 lb/day (48 mg/L)
Phosphorus	5.45 mg/L
Alkalinity	332 mg/L
Min/Max Temp	10/20 deg-C
Existing System Effluent Design Criteria:	**Value:**
BOD (Ave. Weekly)	45 mg/L
TSS (Ave. Weekly)	45 mg/L
BOD (Ave. Monthly)	30 mg/L
TSS (Ave. Monthly)	30 mg/L
NH3-H	No requirement

The existing SBR's performance and ability to meet the City's NPDES permit requirements are discussed in **Chapter 6**. In general, the system meets the effluent limit requirements as outlined in the City's NPDES permit. At Entiat's current, 2024 wastewater load, the existing SBR is operating at 70% to 86% of design capacity, depending on loading parameter considered. Significant upgrades to the treatment system are needed to meet anticipated near-term growth, as well as the 20-year design criteria.

Refer to **Section 6.9.2** and **Section 7.3.3** for specific observations, issues, and recommendations regarding ongoing operation of the existing SBR. For continued operation of the existing SBR, and for capacity expansion alternatives that utilize the existing SBR system in its current configuration, **Section 7.3.3** recommends service life upgrades to insure the existing SBR will provide service through the next planning period (2044). Upgrades include blower replacement, control system upgrade, and budget allowance for miscellaneous valving, piping, manifolds, etc. A budget allowance of $150,000 was estimated (not including contractor overhead/profit, mobilization, administrative, contingency, engineering).

7.4.3 *Design Criteria For Secondary Treatment Alternatives*

The secondary treatment system expansion alternatives evaluated in this section are based on providing design capacity projected for 2044 as shown in the following table, excerpted from **Section 3**. The treatment effluent design criteria (summarized in the preceding **Table 7-11**) is based on Entiat's NPDES permit requirements.

Table 7-12 Projected Flows/Loadings/Existing Design Capacity (excerpted **Section 3**)

Flow or Loading	Existing (2024)	Criteria	Type	Projected (2044)	Existing WWTF Design Capacity
Service Area Population	1,360			3,000 (1)	
Avg Annual Flow (mgd)	0.095	100	gpcd	0.259	-
Max. Month Flow (mgd)	0.099	1.04	PF (3)	0.269	0.150 (4)
Max. Day Flow (mgd)	0.133	1.41	PF (3)	0.365	0.200 (5)
Peak Hour Flow (mgd)	0.352 (2)	3.7 / 3.4 (2)	PF (3)	0.892	0.480 (5)
Avg Month BOD Load (lbs/d)	173	0.20	lbs/d/cap	501	250 (4) / 302 (5) (6)
Max Month BOD Load (lbs/d)	226	-	n/a	-	
Avg Month TSS Load (lbs/d)	137	0.20	lbs/d/cap	465	250 (4) / 331 (5) (6)
Max Month TSS Load (lbs/d)	186	-	n/a	-	

1. *Per **Section 03**.*
2. *Peak flow estimated using existing population and method outlined in Section C1-3.3.2 of the Criteria for Sewage Works Design – Ecology Publication # 98-37 WQ.*
3. *Peaking factor is the ratio of the peaked flow to average annual flow.*
4. *From facility loading and design criteria in section S4.A. of the City's 2015 NPDES permit (WA0051276).*
5. *From Facility Design Criteria in the 2007 WWTP Construction Drawings.*
6. *The permitted design capacity for both BOD and TSS are lower than the WWTP design capacity indicated on the 2007 construction drawings and noted in the ECY fact sheet. Both capacities (permitted and design) are shown in the table. The permit does not indicate if the limit is based on average or maximum load; however, it is assumed it is based on max month. This is consistent with the RH2 2023 system evaluation technical memorandum.*

7.4.4 *Secondary Treatment System Expansion Summary of Alternatives*

Five alternatives for expanding Entiat's secondary treatment system component of the treatment plant were evaluated. The alternatives include:

- Alternative 1: Expand Existing SBR system
- Alternative 2: Conversion To Continuous Flow Reactors With External Clarifiers
- Alternative 3: Conversion To MBR Plant
- Alternative 4: Replace With Package Treatment System (Aero-Mod or Like)
- Alternative 5: Oxidation Ditch and Secondary Clarifiers

The five alternatives are evaluated in the following sections.

7.4.5 *Alternative 1: Expand Existing SBR System*

This alternative consists of expanding the existing SBR system using the same proprietary system by Sanitaire (currently a Xylem brand) ICEAS process. This approach is consistent with the original concept assumed during the formulation of the existing SBR system in 2004 and subsequent implementation in 2010. Thus, this is the logical next phase of the project the City envisioned during implementation of the existing SBR system.

Other SBR alternative configurations exist that could be explored. The City has expressed possible interest in considering other proprietary systems or possibly moving away from proprietary systems altogether. There are advantages and disadvantages to those various routes (discussed below).

Also, alternative flow configurations exist that could be considered. Entiat's current SBR system is a continuous influent flow SBR configuration versus a true SBR batch process. In a true conventional SBR process configuration, influent flow is alternated between the two basins and each basin is batch treated in five distinct steps:

1. *Fill (raw sewage influent/mixing/aeration)*
2. *React (mixing/aeration/treatment)*
3. *Settle (aeration stopped/sludge settling/clarification)*
4. *Decant (draw off treated effluent)*
5. *Idle (remove WAS/tank fill with new wastewater batch)*

In Entiat's case, the continuous flow configuration utilizes continuous influent flow to the SBR basin during the treatment and decanting phases.

Each configuration has its advantages and disadvantages including the previously selected proprietary ICEAS system. Entiat's current system is simpler and less complex than the more conventional full SBR process. This is an advantage for small communities where operational staff availability can be more limited than for larger facilities with multiple operators. It also has the advantage for expansion where additional basins may be added. More basins increase complexity with either system, but less so with the continuous influent flow configuration.

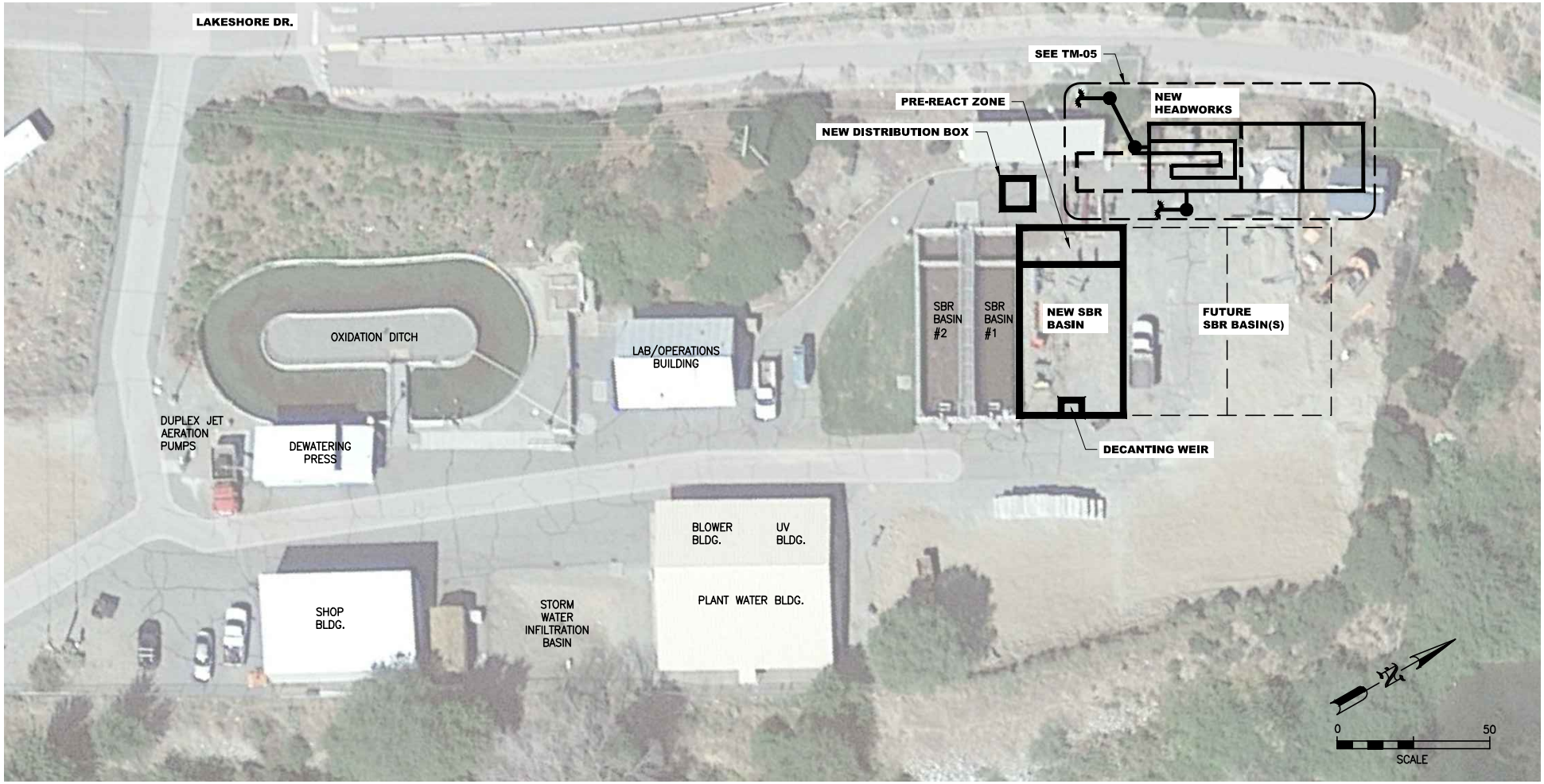
A disadvantage to the continuous flow configuration is some resulting treatment efficiency reduction can occur due to the introduction of raw sewage during the settling and decant stages. To reduce this effect, continuous flow systems usually are designed with long, narrow basins to reduce flow through and short circuiting. This is the case for Entiat. Entiat's treatment efficiency remains high (>90% efficiency).

This initial evaluation of SBR expansion to meet future capacity consists of assuming expanding the existing SBR system using the same proprietary system by Sanitaire (currently a Xylem brand) ICEAS process. Depending on the findings and desires of the City, other SBR configuration alternatives could be considered. However, for this evaluation, using a similar system is likely to be the most cost-effective SBR alternative, as opposed to pursuing other SBR systems and potentially winding up with two different operating systems for the new and old SBR plant. Keeping a single system will likely be the least problematic to the City's operational staff by not employing two different control systems and varying configurations.

If this alternative for expanding the existing SBR is the most cost-effective alternative, the pool of alternatives could be expanded, if the City wishes to explore further and consider alternate SBR systems. In this scenario, either potentially demolishing the existing dual train SBR basin and replacing with a single SBR system (with multiple reactor basins) could be considered or adding basins and retrofitting all basins (existing and new) with the same operating systems. This would maintain a single process consistency and uniformity, although likely not cost effective.

Improvements for expanding the existing SBR to meet future design capacity requirements are shown in **Figure 7-2**. Improvements and modifications include:

- Continued use of the existing dual train SBR basin with service life upgrades, of the existing SBR basin (per **Section 7.3.3** recommendations - $150,000). In addition, modification to the existing dual basin will be modified to operate as single basin, rather than the current dual train. Note: this could involve considering removal of the existing center dividing wall, if doing so would improve overall single basin operation or reduce future operation and/or maintenance requirements. Or



1950106-Fig 7-2 to 5_Treatment Alternative

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ALTERNATIVE 1
EXPAND EXISTING SBR SYSTEM

FIGURE
7-2

leaving the center wall intact but fitted to operate hydraulically as a single basin. These would be considered further during the design phase.

- Add new SBR basin adjacent to the existing SBR basin, with sufficient capacity to double existing plant capacity for the 20-year planning period. Reserve area (dashed lines) adjacent to the basins is designated for future ability to again expand and double the plant capacity when additional capacity is needed at the end of 20-year planning period (2044).

- Blowers for the existing and new SBR basins would utilize the existing blower room. The existing blower room houses two 15 HP blowers for the existing SBR, with room for a third. For the expansion the existing two blowers could be serviced and fully refurbished or replaced, and an additional two new 15 HP blowers be provided. Three of the blowers will be installed in the existing blower room, and a fourth one stored as standby.

- Construction of a new distribution box on the north side of the existing basin for more accurate flow splitting and distributing to the existing and new basins. The distribution box would be designed with the ability to expand and divide flows for the future (beyond 2044) capacity needs and additional SBR basins.

- New controls and PLC will be provided for the new SBR basin and new replacement controls for the existing SBR basins (operating at one basin in upgraded plant). The upgraded and expanded plant control system will be integrated into the overall plant electrical, control and SCADA system upgrades recommended in **Section 7.3.7**.

A summary of system component sizing and equipment are shown in the following table.

Table 7-3 Alternative 1 – Expand Existing SBR System – Data and Design Basis

Parameter	Data and Sizing	
Organic load	14.5	lbs BOD/1000 ft3/d
F/M Ratio	0.058	lbs BOD/lb MLSS
SRT (solids retention time)	20.8	days
SBR basins volume (existing + new)		
high level	0.368	MG
low level	0.311	MG
Operating depth		
high level	14	ft
low level	11.9	ft
Detention time (ave), HRT	30.3	hours
Max decant rate (MMF)	618	gpm
Equipment		
Decant weir mechanism	3	ft
Blowers	2 + 1 standby	
Capacity	240 SCF/blower @ 6.8 psig, 15 HP	
WAS pumps	2 each, 110 gpm/ea, 2.4 HP	

The estimated cost for Alternative 1 Expand Existing SBR System is included in the following table.

Table 7-14 Alternative 1 – Expand Existing SBR System – Estimated Capital Cost

Description	Est. Cost
SBR basins influent and effluent site piping upgrades	$40,000
New influent distribution box	$50,000
Existing SBR basins service life upgrades (per Section 7.3.3)	$150,000
Construction of new SBR basin	$575,000
SBR Xylem Sanitaire ICEAS equipment	$610,000
Contractor installation SBR equipment package	$200,000
Blowers and manifold modifications; site distribution piping modifications	$100,000
Electrical and controls pertaining to SBR system	$100,000
Plant Electric / Controls Upgrades for overall plant upgrade -- included in Section 7.3.7 analysis	-
Site grading, surfacing, finishing of trt disturbed areas (approx 8,500 sf)	$94,000
Sub-Total:	$1,894,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$284,00
Subtotal Construction:	$2,178,000
Sales tax (8.4%)	$183,000
Contingency (25%)	$591,000
Construction Cost:	$2,952,000
Eng, admin, const mgt, insp (30%)	$886,000
Alternative 1 Total:	**$3,840,000**

7.4.6 *Alternative 2: Conversion to Continuous Flow Reactors with External Clarifiers*

This alternative consists of converting the existing SBR system to continuous flow reactors with external clarifiers. The process will operate as an extended aeration activated sludge treatment configuration. This configuration of activated sludge operates in the endogenous respiration phase of the activated sludge growth curve. The City's existing SBR is similar in that it also operates in the extended aeration portion of the growth curve. This alternative is a common configuration for small to medium sized plants and provides a high quality of effluent.

Components of this treatment alternative consist of a complete mix aeration basin (or basins), external clarifiers, and a RAS (return activated sludge)/WAS (waste activated sludge) pumping station for returning or wasting sludge from the clarifiers. The City's existing SBR plant does not have a RAS pump station as the SBR system does not have external clarifiers. WAS is wasted directly from the existing SBR basin.

Alternative 2 for meeting the future design capacity requirements is shown in **Figure 7-3**. Improvements and modifications include:

- Converting the existing dual train SBR basin to operate as a single aeration basin. As with Alternative 1, conversion could involve considering removal of the existing center dividing wall, if doing so would improve overall single basin operation or reduce future operation and/or maintenance requirements. Or leaving the center wall intact but fitted to operate hydraulically as a single basin. These would be considered further during the design phase.

- Adding a second aeration basin adjacent to the existing converted basin, with sufficient capacity to double the existing plant capacity for the 20-year planning period. Additional reserve area (shown as dashed lines in **Figure 7-3**) adjacent to the basins is designated for future ability to again expand and double the plant capacity, when additional capacity is needed at the end of 20-year planning period (2044).

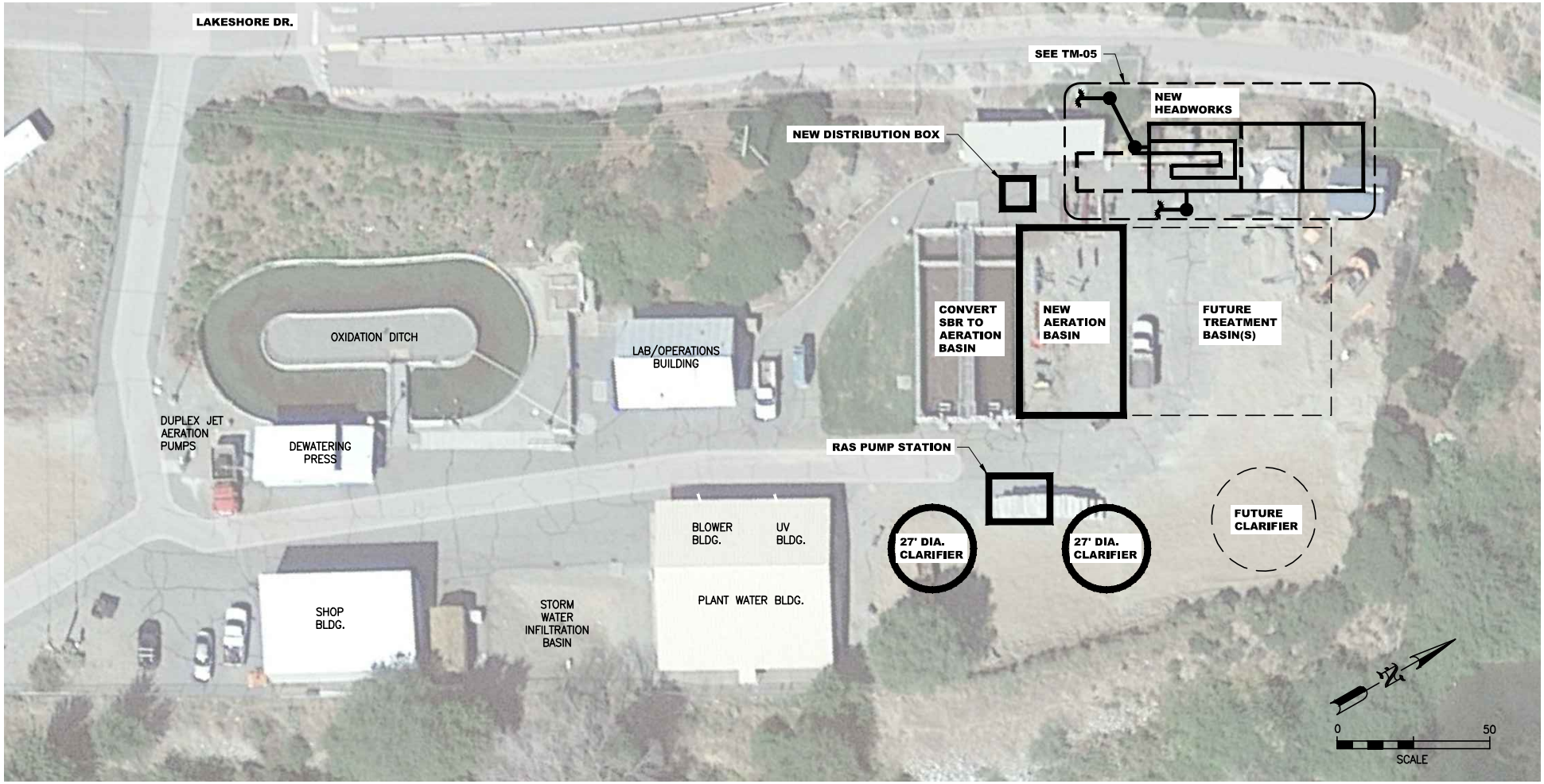
- Installation of new diffused aeration systems in the existing and new aeration basin.

- Construction of a new distribution box on the north side of the aeration basins for flow splitting and distributing to the existing and new basin. The distribution box would be designed with the ability to expand and divide flows for the future (beyond 2044) capacity needs and additional future aeration basins.

- Constructing two 27' diameter clarifiers south of the aeration basins, with room for a third clarifier in the future (beyond 2044).

- Constructing RAS/WAS pumping station, with space and piping provisions for expansion in the future for further growth (beyond 2044).

- Blowers for the aeration basins will utilize the blower room. The existing blower room houses two 15 HP blowers for the existing SBR, with room for a third. For the expansion the existing two blowers could be serviced and fully refurbished or replaced, and an additional two new 15 HP blowers be provided. Three of the blowers would be installed in the existing blower room, and a fourth one stored as standby.



1950106-Fig 7-2 to 5_Treatment Alternative

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ALTERNATIVE 2
CONVERSION TO CONTINUOUS FLOW REACTORS w/ EXTERNAL CLARIFIERS

FIGURE
7-3

- As an alternate for consideration, blowers could be moved to a new blower room enclosure that could be constructed in conjunction with the RAS/WAS pumping station. This could be considered during design to determine cost and benefit considerations.

- As with the Alternative 1, new controls and PLC would be provided for the aeration basins, clarifiers, and RAS/WAS pumping. The upgraded and expanded plant control system will be integrated into the overall plant electrical, control and SCADA system upgrades recommended in **Section 7.3.7**.

A summary of component sizing and equipment is shown in the following table.

Table 7-15 Alternative 2 – Conversion to Continuous Flow Reactors – Data/Design Basis

Parameter	Data and Sizing	
Organic load	15	lbs BOD/1000 ft3/d
F/M Ratio	0.063	lbs BOD/lb MLSS
SRT (solids retention time)	26.7	days
Aeration basin	Existing SBR basin + new basin	
Volume	0.3	MG
Operating depth	14	ft
Detention time (ave), HRT	27.8	hours
Clarifiers	2 each	
Diameter	27	ft
Operating depth	12	ft
Overflow rate, ADF	226	gpd/sf
Overflow rate, MMDF	235	gpd/sf
Overflow rate, PDF	319	gpd/sf
Overflow rate, PHF	779	gpd/sf

The estimated cost estimate for Alternative 2 for implementing the extended aeration activated sludge secondary treatment is included in the following table.

Table 7-16 Alternative 2 – Conversion to Continuous Flow Reactors – Est. Capital Cost

Description	Est. Cost
Aeration basins influent site piping modifications	$50,000
New influent distribution box	$50,000
Existing SBR basins structural and piping modifications converting to single aeration basin	$100,000
Construction of new additional new aeration basin	$675,000
Aeration basin equipment, piping, valving, grating, rails	$550,000
Install aeration basin equipment package, gates, valves, weirs, grating, railing	$200,000
Construction of 2 @ 27' clarifiers concrete structures	$650,000
Clarifiers equipment, internal piping, weirs, valving, grating, railing	$374,000

Installation of clarifier equipment package	$100,000
RAS/WAS pump station structure, building	$210,000
RAS/WAS pumping and equipment	$150,000
RAS/WAS piping and pumping equipment installation	$50,000
Aeration basins and site effluent piping and valving and modifications	$100,000
Blowers and manifold modifications; site distribution piping modifications	$50,000
Electrical and controls pertaining to AB, Clarifiers, RAS/WAS systems	$200,000
Plant Electric / Controls Upgrades for overall plant upgrade -- included in 7.3.7 analysis	-
Site grading, surfacing, finishing of trt disturbed areas (approx 11,500 sf)	$128,000
Sub-Total:	$3,637,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$546,000
Subtotal Construction:	$4,183,000
Sales tax (8.4%)	$352,000
Contingency (25%)	$1,134,000
Construction Cost:	$5,669,000
Eng, admin, const mgt, insp (30%)	$1,701,000
Alternative 2 Total:	**$7,370,000**

7.4.7 *Alternative 3: Conversion to MBR Plant*

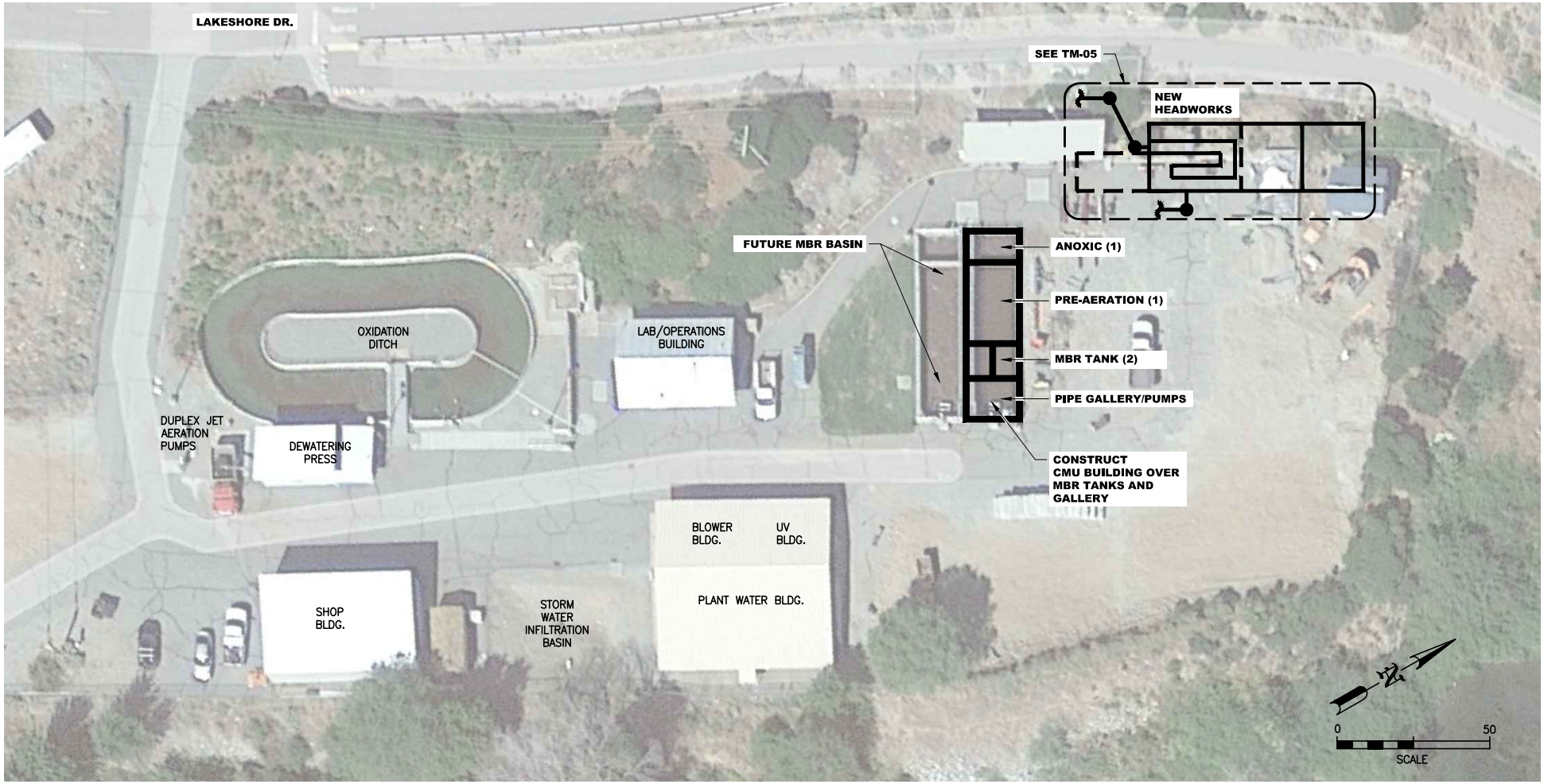
This alternative consists of converting the existing SBR system to a membrane bioreactor (MBR) process. MBR activated sludge systems use a series of pre-equalization, anoxic, and aerobic tanks (aeration). As with the SBR alternative, a clarifier is not necessary as the treated wastewater is filtered through membrane filters, which separate the biosolids from the effluent.

The MBR system is capable of higher mixed liquor concentration in the aeration basin reducing the volume of the tanks required for aerobic treatment resulting in a more compact process. It has the smallest footprint of the treatment alternatives evaluated. The membranes also provide treated effluent with lower TSS concentration and lower fecal coliform concentrations than the other alternatives evaluated.

MBR main advantages include smallest footprint size of all the alternatives, higher quality effluent (TSS and coliform), and no clarifier. MBR disadvantages include higher level of sophistication, higher equipment capital costs, slightly higher operating costs due to additional power for pumping and period membrane replacement (approx. 10 years). MBRs typically require operators to have more mechanical and electrical expertise than other activated sludge processes. However, MBRs have become more common place in recent years and are generally not considered significantly higher technology than other secondary alternatives.

Alternative 3 for meeting the future design capacity requirements is shown in **Figure 7-4**. Improvements and modifications include:

- Converting one of the dual SBR basins to operate as a single train anoxic and pre-aeration train, followed by dual MBR tanks (for redundancy). Interior concrete dividing walls would be constructed and existing interior walls modified.



1950106-Fig 7-2 to 5_Treatment Alternative

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ALTERNATIVE 3
CONVERSION TO MBR PLANT

FIGURE
7-4

- Converting the last portion of the basin to a (dry) piping and effluent pump gallery.
- A concrete slab and control building would be constructed over the top of the piping and pump gallery; or construction of a separate control building, depending on cost feasibility to be determined during predesign phase.
- Additional concrete treatment basins are not needed for this alternative due to the smaller footprint of the MBR alternative. In addition, the second SBR basin is available for future (beyond 2044) expansion. In the interim, the remaining SBR basin could be converted for use as an aerobic sludge storage tank and/or treated water storage tanks.
- Blowers for the aeration basins will utilize the existing blower room. The existing blower room houses two 15 HP blowers for the existing SBR, with room for a third. The existing two blowers could be serviced and fully refurbished or replaced, and additional blowers provided as needed.
- New controls and PLC would be provided for the MBR process. The upgraded and expanded plant control system will be integrated into the overall plant electrical, control and SCADA system upgrades recommended in **Section 7.3.7**.

A summary of component sizing and equipment is shown in the following table.

Table 7-17 Alternative 3 – Conversion to MBR Plant – Data and Design Basis

Parameter	Data and Sizing	
Organic load	58.2	lbs BOD/1000 ft3/d
F/M Ratio	0.078	lbs BOD/lb MLSS
MBR basins volume		
Anoxic	14,200	gal
Pre-Aeration	46,300	gal
MBR tanks (2 tanks)	17,000	gal
Total	0.078	MG
Operating depth	14.5	ft
Detention time (ave), HRT	6.9	hours
Submerged membrane units		
Type	Flat Plate	
Submerged units	4 each, 2 per MBR tank	
Rotating equipment		
Anoxic submersible mixer	1 + 1 standby	
Aeration blowers	265 SCFM at 8.35 psig; 1 + 1 standby	
MBR blowers	171 SCFM at 8.35 psig; 2 each	
Permeate pump	344 gpm, 2 + 1 standby	
RAS pumps	467 gpm, 2 + 1 standby	
WAS pumps	15 gpm, 2 + 1 standby	

The estimated cost for Alternative 3 Conversion To MBR Plant is included in the following table. There are a number of reputable manufactures of MBR equipment worldwide. For this evaluation, equipment was based on Kubota Corporation's MBR system. Kubota is one of the many prominent MBR suppliers with approximately 7,300 of their submerged membrane units installed worldwide and 525 installations in North America. If the MBR alternative is selected, other manufacturers can be explored, if desired.

Table 7-18 Alternative 3 – Conversion to MBR Plant Estimated Capital Cost

Description	Est. Cost
Modify existing one SBR train - structural modifications - construct interior walls	$150,000
MBR equipment package - filters, piping, valving, gates, grating, rails, controls	$1,360,000
Installation MBR equip package (grating, walkways, railing, pipe gallery piping, not included)	$250,000
Furnishing, installing piping gallery components, not included in equip package	$75,000
Furnishing, installing grating, walkways, railing (not included in MBR package)	$50,000
Site effluent piping and valving and modifications	$50,000
Allowance for modification of remaining SBR train for aerobic sludge storage and water storage	$50,000
Blowers and manifold modifications; site distribution piping modifications	$50,000
Construct reinforced floor slab and control building above piping gallery	$420,000
Electrical and controls pertaining to MBR systems	$150,000
Plant Electric / Controls Upgrades for overall plant upgrade -- included in Section 7.3.7 analysis	-
Site grading, surfacing, finishing of trt disturbed areas - minimal - allowance	$50,000
Sub-Total:	$2,655,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$398,000
Subtotal Construction:	$3,053,000
Sales tax (8.4%)	$257,000
Contingency (25%)	$828,000
Construction Cost:	$4,138,000
Eng, admin, const mgt, insp (30%)	$1,242,000
Alternative 3 Total:	**$5,380,000**

7.4.8 *Alternative 4: Proprietary Activated Sludge Systems (Aero-Mod or like)*

This alternative considers replacing the existing SBR system and basins with a new extended aeration activated sludge system. For this alternative, Aero-Mod's proprietary extended aeration activated sludge system is the basis of the evaluation. Aero-Mod is based in Manhattan, KS and was founded in 1981. Aero-Mod has approximately 600 installations of their treatment process and many in Washington State. Plants close to Entiat in the region include Coulee Dam, Rock Island, Royal City, and Pateros. Aero-Mod continues to be a popular proprietary system producing good results.

Aero-Mod was one of the five alternatives considered during the 2004-2005 wastewater facility planning. The SBR process was the selected alternative at the time, however the Aero-Mod alternative was also considered a favorable alternative. One of the disadvantages noted was that Aero-Mod was a proprietary system, however the City wound up selecting the SBR process which is also a proprietary system. Aero-

Mod is advantageous in its simplicity of operation, no moving parts under water, common wall construction (including clarifiers), and operator support.

Aero-Mod also has a biological nutrient removal process (SEQUOX) designed into their basic system in the event nutrient limits are a factor for Entiat in the future. Aero-Mod's system comes with a process treatment guarantee. If this alternative is cost effective and selected, other proprietary systems and/or fully custom systems can be explored further if desired.

For this alternative it is assumed the existing SBR basins would not be used. New concrete treatment basins would be constructed. Alternative 4 for meeting the future design capacity requirements is shown in **Figure 7-5**. Improvements and modifications include:

- Construction of new concrete basins for installation of the Aero-Mod equipment. The common wall concrete installation consists of a dual train treatment system with flows split between the two trains. Each treatment train consists of a bio-P selector tank and then a 3-stage aeration process, followed by Aero-Mod's Clarator (in basin clarifier tank) and effluent out.

- Each train includes an aerator sludge digestor tank for processing WAS.

- Reserve area (dashed lines shown in **Figure 7-5**) adjacent to the basins is designated for future ability to expand and double the plant capacity when additional capacity is needed at the end of 20-year planning period (2044).

- The reserve area noted in the previous bullet assumes demolition of the existing SBR concrete basins. In the interim (until 2044), the existing SBR basin could be converted for use as aerobic sludge storage tank(s).

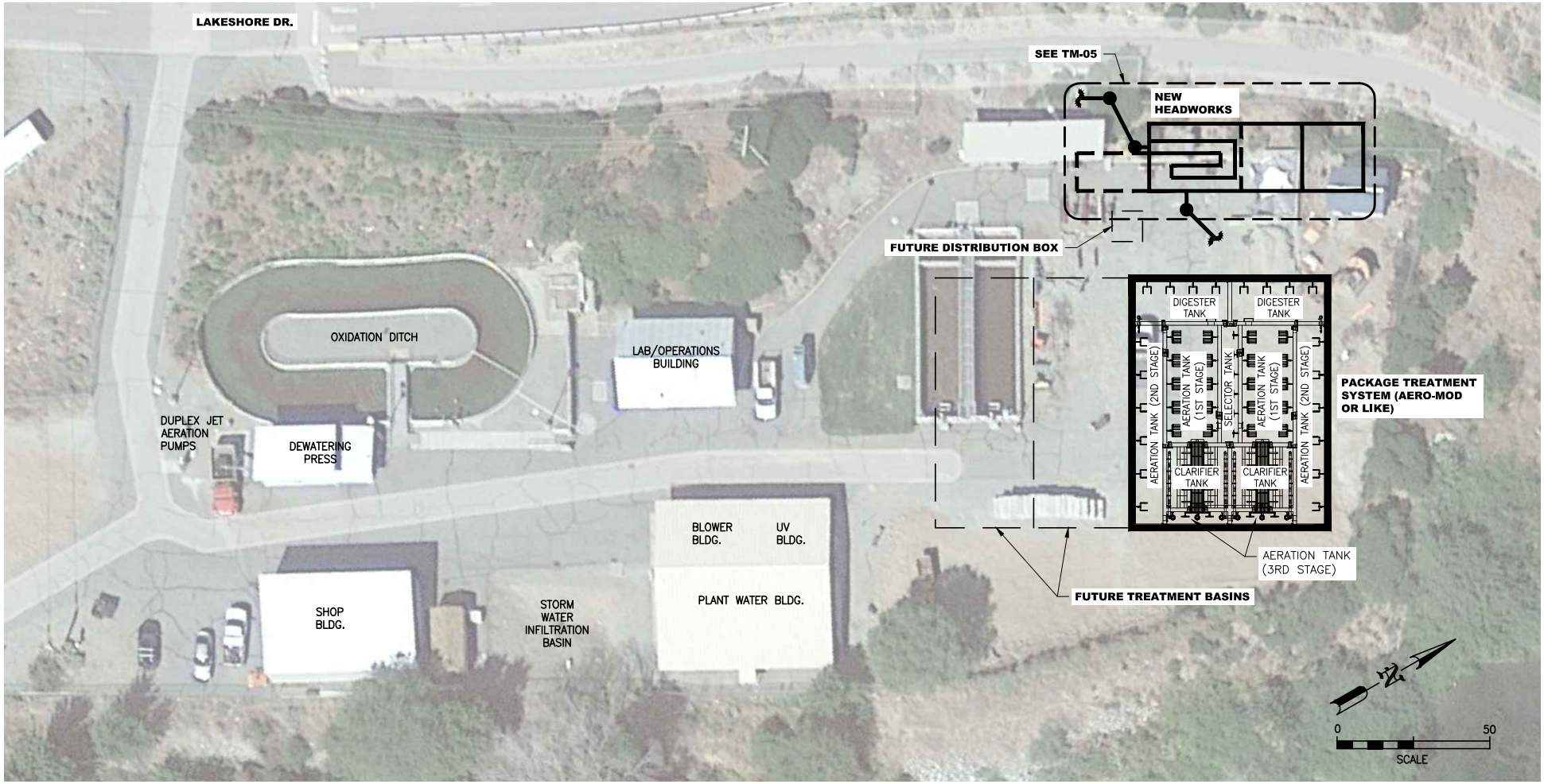
- Blowers for the plant will utilize the existing blower room. The existing blower room houses two 15 HP blowers for the existing SBR, with room for a third. For this alternative the existing two blowers would be serviced and fully refurbished or replaced, and an additional two new 15 HP blowers be provided. Three of the blowers would be installed in the existing blower room, and a fourth one installed in the new headworks facility.

- As with the Alternative 1, new controls and PLC would be provided for the aeration basins, clarifiers, and RAS/WAS pumping. The upgraded and expanded plant control system will be integrated into the overall plant electrical, control and SCADA system upgrades recommended in **Section 7.3.7**.

A summary of component sizing and equipment is shown in the following table.

Table 7-19 Alternative 4 – Proprietary Activated Sludge Systems – Data and Design Basis

Parameter	Data and Sizing	
Organic load	16.8	lbs BOD/1000 ft3/d
F/M Ratio	0.07	lbs BOD/lb MLSS
SRT (solids retention time)	23.9	days
Anoxic Selector	Single train	
Volume	22,174	gal
Operating depth	14	ft



1950106-Fig 7-2 to 5_Treatment Alternative

SCALE:	AS SHOWN
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ALTERNATIVE 4
REPLACE w/ PACKAGE TREATMENT SYSTEM (AERO-MOD OR LIKE)

FIGURE
7-5

Detention time (ave), HRT at MMDF	2.1	hours
Aeration basin	Dual train	
Volume (both trains)--Stage 1	134,055	gal
Volume (both trains)--Stage 2	122,522	gal
Volume (both trains)--Stage 3	16,755	gal
Total volume	0.273	MG
Operating depth	14	ft
Detention time (ave), HRT	24.4	hours
Clarifiers	2 each	
Volume	83,776	gal
Operating depth	14	ft
Overflow rate, MMDF	336	gpd/sf
Overflow rate, PDF	673	gpd/sf
Overflow rate, PHF	1,000	gpd/sf
Aerobic Digestor Tanks	2 tanks	
Volume (both tanks total)	85,304	gal
Operating depth	14.5	ft

The estimated cost for Alternative 4 for implementing the extended aeration activated sludge secondary treatment is included in the following table.

Table 7-20 Alternative 4 – Proprietary Activated Sludge Systems – Estimated Capital Cost

Description	Est. Cost
Influent site piping upgrades routing to new basin (& provision for future distribution box)	$50,000
Construction of new Aero-Mod dual train treatment and clarifier basins	$1,750,000
Aero-Mod equipment package	$920,000
Contractor installation Aeromod equipment package	$250,000
Blowers and manifold modifications; site distribution piping modifications	$50,000
Allowance for modification of existing SBR train for aerobic sludge storage	$50,000
Electrical and controls pertaining to Aero-Mod system	$50,000
Plant Electric / Controls Upgrades for overall plant upgrade -- included in Section 7.3.7 analysis	-
Site grading, surfacing, finishing of trt disturbed areas (approx 14,000 sf)	$156,000
Sub-Total:	$3,276,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$491,000
Subtotal Construction:	$3,767,000
Sales tax (8.4%)	$317,000
Contingency (25%)	$1,226,000
Construction Cost:	$5,310,000

Eng, admin, const mgt, insp (30%)	$1,593,000
Alternative 4 Total:	**$6,900,000**

7.4.9 *Alternative 5: Oxidation Ditch and Secondary Clarifiers*

This alternative was considered in conjunction with Alternative 2. Alternatives 2 and 5 have similar process components and layout, and as a result are expected to be similar in cost. However, the geometry and configuration requirements for Alternative 5 are more complicated than Alternative 2 and therefore will result in a higher cost than Alternative 2. Alternative 2 is the most costly of the four alternatives evaluated, and Alternative 5 would be expected to be of equal or greater cost. Due to these factors, Alternative 5 was not given further cost consideration.

7.5 Comparison of Secondary Treatment Alternatives

7.5.1 *Capital Cost Comparison*

The following table presents a summary of the estimated capital costs for the five alternatives evaluated.

Table 7-21 Cost Summary of Secondary Treatment System Alternatives

Treatment Process	Estimated Cost	$ Rank
Alternative 1: Expand Existing SBR System	$3,840,000	1
Alternative 2: Conversion to Continuous Flow Reactors With External Clarifiers	$7,370,000	4
Alternative 3: Conversion to MBR Plant	$5,380,000	2
Alternative 4: Proprietary Activated Sludge Systems (Aero-Mod or Like)	$6,900,000	3
Alternative 5: Oxidation Ditch and Secondary Clarifiers	*Eliminated*	*5*

The costs represent the total capital cost comparison for the secondary treatment process component of the plant but does not include the other plant component costs and upgrades identified in previous sections. The total combined plant upgrade costs will be addressed in another section of the WWFP. Therefore, considerations in this section pertain to the secondary treatment component only.

Alternative 1 – is the least expensive alternative at $3.840 million. This alternative utilizes and expands the current SBR configuration to provide service for the next 20-year planning period and can be further expanded in the future (2044 and beyond). This approach follows the original plan of how the plant was envisioned at the time the SBR was selected and implemented in 2009. This finding does not come as a surprise and is considered a favorable finding.

The existing SBR process equipment supplier is still in business and continues to provide similar equipment packages that have continued to evolve and further modernize as technologies have evolved. If the City selects this alternative, it appears to continue to be a sound decision.

Alternative 3 – Conversion To MBR Plant is the second least expensive alternative at $5.380 million. The competitive capital cost of this alternative is due to its ability to fully utilize one of the existing two SBR basin trains to provide sufficient capacity for the next 20-year planning period. Then at the end of the planning period (2044) the other SBR basin train could be converted and utilized again for further doubling

the plant capacity. However, there are other life cycle cost considerations that come into play with the MBR, discussed in the next section.

Alternative 4 – Proprietary Aero-Mod system is the next least cost alternative at $6.900 million. This alternative has significant benefits of operational simplicity, excellent treatment efficiencies, and future nutrient reduction treatment capabilities (if needed). However, this alternative is significantly higher cost than the least cost alternative due to the necessity of construction of new and costly treatment basins. This elevates the cost significantly over the two least cost alternatives.

Alternative 2 – Conversion To Continuous Flow Reactors With External Clarifiers is the highest cost alternative at $7.370 million. The high cost is due to the construction of a new aeration basin and other external components required, as opposed to the lowest cost alternatives that fully utilize the existing SBR basins. Alternative 3 is the most customizable alternative as it does not involve a package system but rather is comprised of individual components and non-proprietary control systems, but this aspect is not considered sufficient to offset the higher capital cost.

Alternative 5 – Oxidation Ditch and Secondary Clarifiers was eliminated from further consideration. The cost of Alternative 5 is expected to be greater than Alternative 2 since it constructs all new components similar to Alternative 3 but is a more complicated configuration and requires greater land area requirement than Alternative 2.

7.5.2 *Qualitative Comparison Considerations*

Life Cycle Costs

Qualitative life cycle cost factors were considered for the treatment alternatives evaluated. With the exception of Alternative 3, all of the alternatives are expected to have fairly comparable life cycle costs due to the similarity of components for the secondary treatment processes. Alternatives 2 and 5 may be slightly higher due to the additional equipment associated with external clarifiers and external RAS/WAS pumping.

Alternative 3 for the MBR plant is anticipated to have higher lifecycle costs than the other alternatives due to the cost of replacing the membrane filters approximately every 10-year intervals and other cleaning and maintenance requirements.

Land Use

The existing treatment plant site will accommodate all of the alternatives evaluated. Alternative 1 and Alternative 3 provide the best land use efficiency and provide expandability well beyond the current (2044) and future (2064) planning periods. Both of these alternatives are compact and utilize existing land efficiently.

Alternative 2 and Alternative 4 are more spread out taking up more area on the treatment site. The existing treatment site will accommodate these alternatives for the next 20-year (2044) planning period and the next planning period (through 2064) for again doubling the plant capacity. Beyond 2064, potential additional site could be required or revising the existing site layout that may be available (e.g., site of existing oxidation ditch eventually demolished).

All of the alternatives are capable of fitting on the sites for the next 40 years with the configurations evaluated. However, it is unknown what additional treatment requirements could come into play within that extended timeframe or growth and development considerations that might affect the determination.

Operation and Maintenance

With the exception of Alternative 3, all of the alternatives have similar operation and maintenance requirements and expected to have comparable costs. Process monitoring and testing requirements will be comparable for all of the alternatives. Alternative 3 – Conversion To MBR Plant has additional cost requirement for replacing membranes every 10 years (or shorter period) that the other alternatives do not have and other cleaning and maintenance requirements.

Simplicity/Ease of Operation

With the exception of Alternative 3, all alternatives have similar operational complexity and ease of operation. With the possible exception of Alternative 3, all of the alternatives are required to employ a certified Level 2 Operator. Regarding Alternative 3, it is understood MBR plants less than 1 MGD would be considered a class 2 facility and require a Level 2 Operator, and greater than 1 MGD will be required to employ a Level 3 Operator. Ecology indicates there are some nuances which can complicate the requirements that would have to be worked through on a case-by-case basis. In the event a Level 3 operator were required, this increases the salary cost for maintaining a Level 3 operator. Also, a Level 3 operator can be more difficult to keep long term due to the trend of promoting to larger plants where higher salaries can be obtained. In the event Alternative 3 is the favored alternative, more investigation is needed to confirm which classification would prevail.

Regarding Alternative 1 – Expansion of Existing SBR System, SBRs can be less intuitive than continuous flow through configurations. However, in Entiat's case their SBR system is less complex in that it is a continuous influent flow SBR configuration versus a true SBR batch process with five distinct steps and flow alternation between SBR basins. This simplifies the operation and is more intuitive if plant upsets occur. In addition, Entiat has demonstrated their operational ability by the successfully operation of their existing SBR system since 2009.

Energy Use

All of the alternatives have similar comparable energy costs due to the similarity of the extended aeration activated sludge treatment process requirements. All alternatives would be designed to be as efficient as possible via premium electric motor efficiencies, VFDs, DO monitoring, PLCs, etc. Alternative 3 – Convert To MBR Plant will have minimally higher energy cost due to need for permeate pumps and due to membrane scouring requirements.

Effluent Quality

All of the alternatives will produce effluent of similar quality that meets and exceeds the effluent quality requirements under the City's NPDES permit. Entiat's current SBR plant routinely meets and exceeds the effluent quality required to maintain NPDES permit compliance.

Alternative 3 is capable of higher effluent quality than the other alternatives due to its effectiveness at removing suspended solids and coliform bacteria. MBR's ability to produce a higher effluent quality is worthwhile in some applications, however in Entiat's case the additional quality is not required. Therefore, if cost and other factors of evaluation come out equal, it could be a reason to tip the scale in favor of the MBR. Selection of the MBR currently does not have a specific effluent water quality driving force to elevate the alternative above the others evaluated.

Nutrient Reduction

Entiat is currently not required to meet any nutrient limits for nitrogen (N) or phosphorus (P) in their effluent. Ecology has indicated there are no current plans in motion or being discussed for imposing nutrient limits on effluents for Entiat and other communities on the Columbia River. Therefore, the alternatives evaluated did not consider treatment components necessary for nutrient reduction. If nutrient reduction became a requirement in the future, additional flow elements would be required for each of the alternatives to achieve the conditions needed for nutrient reduction.

Alternative 4 for the proprietary Aero-Mod system has the multiple tankage and flow configuration built into the layout to facilitate efficient modification to incorporate N and P reduction. However, the significantly higher cost for Alternative 4 does not warrant its selection over the lower cost of Alternative 1 – Expand Existing SBR System or Alternative 3 – Conversion to MBR Plant

Although nutrient requirements could change in the future, indications on the horizon do not currently indicate regulatory plans in the making that will affect nutrient regulation.

7.5.3 *Weighted Ranking of Alternatives*

See **Table 7-22** for a comparison and weighting of the factors considered. The ranking is subjective in terms of applying a weighting to each of the factors considered. The City should review and assess whether the relative weighting of parameters and resulting ranking of alternatives align with the City's opinion of weight that should be given to each evaluation factor.

Table 7-22 Comparison and Ranking of Secondary Treatment Alternatives

			Secondary Treatment Process Alternatives				
			Alt. 1: Expand Existing SBR System	Alt. 2: Continuous Flow Reactors With External Clarifiers	Alt. 3: Conversion To MBR Plant	Alt. 4: Replace W/Package Trt. System	Alt. 5: Oxidation Ditch and Secondary Clarifiers
Evaluation Factor	Weight[1]		Relative Ranking Between Alternatives [1]				
Capital Cost	10		10	4	8	5	2
Life Cycle Cost	10		10	9	7	10	9
Land Use	3		10	4	10	8	4
Operation & Maintenance	7		10	10	7	10	10
Simplicity/Ease of Operation	7		8	8	7	10	9
Energy Use	4		10	10	7	10	10
Effluent Quality	6		8	8	10	8	8
Nutrient Reduction	2		5	5	5	9	5
Total Weighted Score			*454*	*366*	*376*	*420*	*353*
Order Of Ranking			***1***	***5***	***3***	***2***	***4***

[1] Weighting Factors:

- Evaluation Factor Weighting: each evaluation factor (e.g., Capitol Cost, Life Cycle Cost, etc.) is given a numeric weighting from 1 to 10; (10 is greatest weight).
- Relative Ranking of Alternatives: each alternative is given a numeric ranking between 1 and 10 (10 is highest rank) for each evaluation factor listed, representing its ranking, relative to the other alternatives.

7.5.4 *Highest Ranked Alternative 1 - Expand Existing SBR System*

Alternative 1 for expanding the existing SBR system is the least cost alternative and is also the overall highest ranked alternative when based on the qualitive factors applied and discussed in the preceding paragraphs. Alternative 1 – Expand Existing SBR System estimated capital cost is $3.840 million. This alternative utilizes and expands the current SBR configuration to provide service for the next 20-year planning period and beyond (i.e., can be further expanded in 2044 and beyond to 2064). As indicated in preceding paragraphs, this alternative follows the original plan regarding how the plant was envisioned at the time the SBR was selected and implemented in 2009.

7.6 Solids Processing Evaluation

7.6.1 *Introduction and Background*

This Section provides a description of the City of Entiat's existing biosolids treatment and beneficial reuse processes, estimates future needs, and provides evaluation and recommendations to meet solids projection needs.

The City's current wastewater treatment system uses a Sequencing Batch Bioreactor (SBR) which is an activated sludge form of treatment. Activated sludge treatment uses the growth of microorganisms, primarily bacteria and protozoa, to metabolize organic waste materials, converting them into carbon dioxide, water, and microbial biomass. Waste activated sludge (WAS) is the excess biomass generated during the treatment process. Periodically, a portion of the activated sludge is withdrawn from the aeration tanks to maintain optimal concentration of microorganisms for treatment. WAS is pumped to the aerobic digester (old oxidation ditch) for stabilization. Stabilized WAS is then dewatered in a belt filter press (BFP).

Historically, dewatered solids were transported to a City owned and operated composting facility, where it was mixed with chipped orchard pruning materials and similar local material, and stabilized in static piles. The composted material was utilized solely by the City Public Works Department. However, due to ongoing complaints about odors and insects from residences near the composting facility, the City chose to discontinue the Class A process and begin transporting dewatered biosolids to the Boulder Park Beneficial Reuse Facility located in Mansfield Washington. This TM assumes biosolids will continue to be hauled to Boulder Park and that stabilization and dewatering at the treatment plant will meet Boulder Park's requirements.

Replacement or modifications to the activated sludge treatment system is under consideration. It is expected that the selected secondary treatment system alternative will be an extended aeration activated sludge system and therefore estimates of future sludge production used herein assume an extended aeration treatment system.

7.6.2 *Existing Biosolids Processing System*

Entiat's wastewater treatment plant (WWTP) was originally constructed in 1977. In 2009 a major WWTP upgrade was completed. The upgrade shown on the 2010 record drawings by HCWL include the following solids processing improvements/modifications to the treatment plant:

- Convert existing oxidation ditch into an aerobic digester
- WAS pumps installed in the new SBR basins
- WAS piping from the SBR's to the new aerobic digester
- Install Jet aeration pump station for mixed liquor recycle and aeration

- Directional Jet aspirating FRP manifold to supply aeration, mixing and recirculation to the digester immediately after the WAS inlet
- Decant system to drain to yard sump. Decant system can operate between elevation 724.5 and 722.0. Bottom of basin is 720.0 with top of wall at 726.0

The existing dewatering building and belt filter press (BFP) predate the 2009 upgrade. A modification to the dewatering building drain was made to direct flow to the main yard sump instead of back into the oxidation ditch. The record drawings (Sheet G9 and D1) show a 3" PVC pipe between the oxidation ditch and building. This may be the feed pipe to the BFP, but the plans are not clear and needs to be verified.

Information on the existing dewatering building, BFP, and related piping is sparse. It appears that the building and equipment were in use before the 2009 upgrade. The 2010 record drawings show that clarifier settled solids (sludge) were pumped to the Control Building and Pump House then to the sludge drying beds prior to the 2009 upgrade. No piping is shown between the old clarifier and the dewatering building.

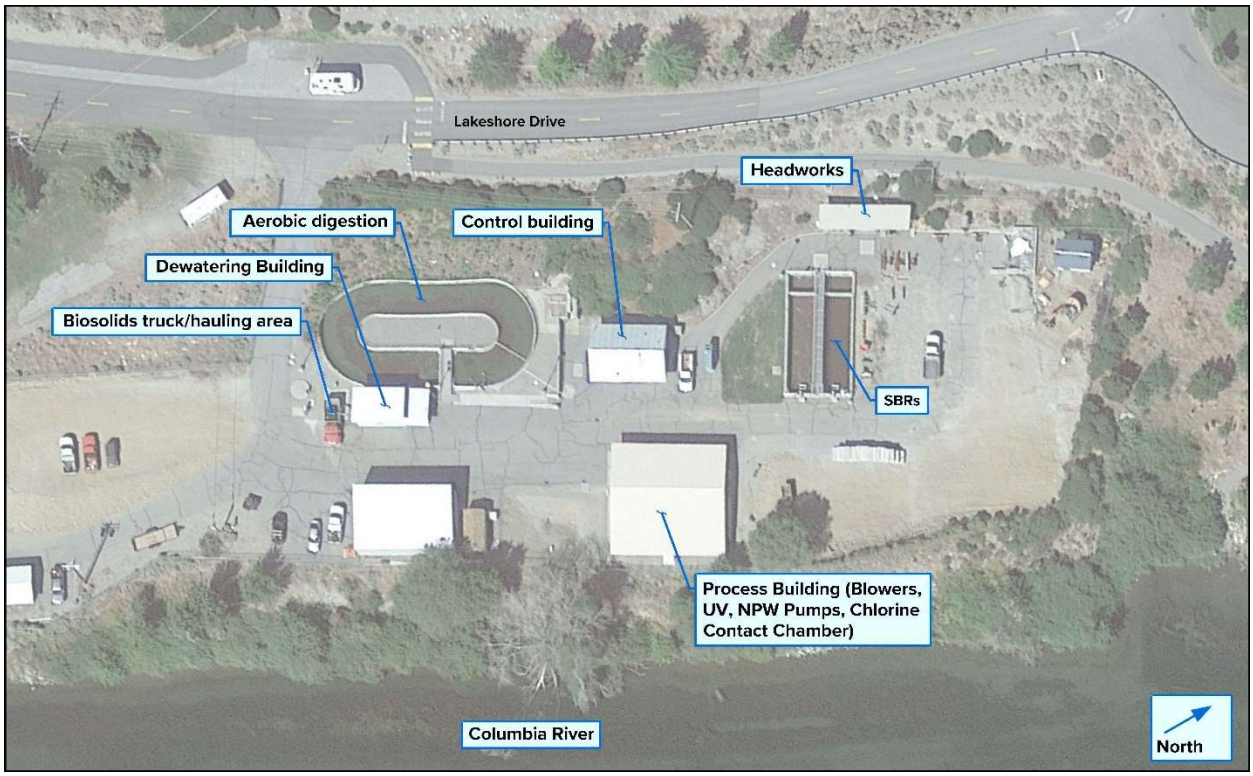
Table 1 summarizes information on the existing biosolids processing system. This information was assembled from the WWTP design plans and O&M Manual.

Table 7-23 Entiat's Solids Processing Components

Equipment/Component	Description	Notes
Sludge WAS Pumps	Located in the SBR	Design plans note 2- Flygt waste sludge pumps Model DP-3068, 3hp, 460v 3ph, 1650 rpm, 108 gpm @ 13.6 TDH
WAS Piping	Piping between SBR and oxidation ditch	4 inch diameter
Oxidation Ditch (aerobic digester)	Converted into the aerobic digester. Info from O&M Manual page 3-47, Table 3-42 and Table 3-42	Volume = 105,000 = gal Volume at 4' depth = 90,900 gal Aeration – 340 lbs-O2/day
Jet aeration pump station	Used for recycle and aeration of the aerobic digester	2-ESSCO 25 HP submersible Model 8"x 6"x 12" x3", 1150rpm, 3PH, 460v, 1560 GPM @42'TDH
Belt Filter Press (BFP)	Technofanghi Monobelt NP08C-Q-460T6A Job Code -C03/00003/2/2	No plans are known for installation of the BFP. Date on nameplate is 2003
Class A Composting Area **(no longer in use)**	Stabilized in static windrows	Composting results in a Class A biosolids. In 2024 the City began process of transitioning from the Class A system to hauling dewatered biosolids to Boulder Park
Boulder Park Inc. (BPI)	Located in Mansfield WA	Third party biosolids beneficial reuse facility.

Exhibit 7-1 provides an aerial overview of the WWTP and shows the solids processing components (aerobic digestion and dewatering building) located on the west side of the site. See also **Figure 6-1** and **7-6**.

Exhibit 7-1 Layout of the Existing WWTP



7.6.3 *Existing Sludge Production and Aerobic Digestor SRT*

Sludge is wasted from the treatment process via waste activated sludge (WAS) pumps located in the SBR treatment basins (see **Table 7-23**). WAS rate is set via operational set point in the SBR control panel. This set point increases/decreases pump runtime and resulting daily WAS volume. While the WAS process is automated, overall WAS volume is not metered or tracked and therefore exact WAS volumes are unknown.

During the sludge dewatering process, the City meters the volume of sludge drawn from the aerobic digestor for dewatering. Records for 2024 were provided by the City and are summarized below. These provide an estimate of existing solids production; and were also used to estimate existing WAS volumes and existing sludge retention time in the aerobic digestor.

Table 7-24 Existing Sludge Production From the Aerobic Digestor (2024)

Parameter	Value
Sludge volume wasted from the aerobic digestor in 2024	
Monthly Average	141,810 gallons
Max Month	271,110 gallons
Min Month	88,410 gallons
Solids content	
% solids - Range	0.5% to 0.7%
% solids - Average	0.654%
% solids - City goal	0.70%
Estimated dry solids	
Average month - dry solids	7,591 lbs/month
Dry solids per day	**245 lbs**
Population	1360
Dry lbs per person per day	0.18 lb/person/day

The following table estimates daily WAS volume followed by a table that provides operational conditions for the aerobic digestor based the sludge wasting information provided by the City (and summarized in **Table 7-24**).

Table 7-25 Calculated Existing WAS Production

Parameter	Value
Stabilized Dry Solids per day [1]	245 lbs/day
VS% in WAS	70%
VS reduction	38%
WAS Solids production [2]	334 lbs/day
WAS % solids [3]	0.7% solids
WAS volume per day [4]	5,700 gpd

1. *Per **Table 7-24**.*
2. *Calculated based on assumed VS percent and reduction values herein and stabilized dry solids per **Table 7-24**.*
3. *Per Digestor Design Criteria table in the 2007 SBR design drawings.*
4. *Based on calculated WAS production herein, rounded to nearest hundred.*

Table 7-26 Existing Aerobic Digestor SRT (2024)

Parameter	Value
Stabilized biosolids per day wasted from the digestor [1]	4,200 gpd
Existing aerobic digestor volume [2]	90,900 gal
Sludge retention time (SRT) [3]	21 days

1. *Based on 245 lbs/day dry solids wasted from the digestor (see Table 7-24) at 0.7% solids content.*
2. *Per Digestor Design Criteria table in the 2007 SBR design drawings.*
3. *This is based on the current solid's concentration (0.70%) the City maintains in the aerobic digestor. For reference, the SRT increases to 40 days at a solid's concentration of 1.3%.*

7.6.4 *Future Sludge Production*

The following table estimates future sludge production based on: 1) design population and planning information included in **Section 3**, and 2) the City's existing sludge production summarized in the previous section. Recommendations herein are based on these future solids production estimates.

Table 7-27 Future Sludge Production Estimate

Parameter	Existing	2044 (Design)	Ultimate
Population [1]	1,360	3,000	6,000
Stabilized dry solids per capita (lbs/cap/day)	0.18 [2]	0.16 / 0.18 [3]	0.14 [4]
Dry solids wasted from the aerobic digestor (lbs/day) [5]	**245**	**507**	**840**
Volume @ 1.3% solids (gpd) [6]	3,100	6,400	10,600
From extended aeration system (lbs/day) [7]	**334**	**691**	**1,144**
Volume @ 0.7% solids (gpd)	5,700	11,900	19,600

1. *See **Section 3.***
2. *Based on City records. See previous sections.*
3. *Assumes 0.18 lbs/cap/day for existing population and 0.16 lbs/cap/day for projected populations.*
4. *As population increases, sludge production will likely yield more typical textbook values. Assume 0.14 lb/cap/day for "Ultimate" sludge production calculation.*
5. *Calculated from on rows 1 and 2.*
6. *Will be used to size the wet thruput of the dewatering equipment and therefore conservatively does not factor in VS reduction in the digestor (i.e. calculated using the solids production from the extended aeration system).*
7. *Existing WAS production is not metered. Calculated based on stabilized dry solids and VS reduction assumptions in **Table 7-25**.*
8. *Numbers rounded to the nearest hundred.*

7.6.5 *Regulatory Requirements and BPI Requirements*

Biosolids treatment and beneficial reuse are regulated by WAC 173-308 "Biosolids Management". WAC 173-308-170 addresses pathogen reduction requirements and WAC 173-308-180 provides vector reduction requirements. In addition to meeting the WAC regulations,

Reliably and consistently meeting the presumptive pathogen (40/60 day SRT at 20C/15C) and vector reduction (38% reduction in volatile solids) requirements of WAC 173-308 is known to be difficult with the extended aeration treatment process. Extended aeration almost fully oxidizes biological solids (endogenous respiration) in the main treatment process (i.e. aeration basin) making significant additional volatile solids reduction difficult in the sludge digester. The biosolids regulations assume that most oxidation and volatile solids reduction takes place in the digester, which is true of conventional and high rate treatment processes. Therefore, the regulations include alternate testing requirements for oxygen uptake (SOUR test) to show acceptable vector attraction requirements and testing requirements for fecal coliforms (WAC 173-308-170(5) Alt 1) to show pathogen reduction requirements have been met in systems where volatile solids reduction requirements are not met through sludge digestion. This is consistent with similar systems in the area that meet Class B biosolid requirements. If compliance is not met via fecal coliform testing, BPI will still receive the non-Class B biosolids for an additional fee; and will provide the additional treatment and/or immediate incorporation as needed to meet WAC 173-308-170.

For much of the year the presumptive pathogen reduction (40/60 day SRT) and the vector reduction (38% VSS reduction) will likely not be met due to the long SRT in the extended aeration treatment system and

maintaining higher temperatures in the digester during the winter. The testing alternatives described above (SOUR and Fecal Coliform tests) will generally be used to classify the biosolids as a Class B biosolid.

In addition to meeting the requirements above, Boulder Park Incorporated (BPI) also requires that biosolids be dewatered to a minimum of 10% solids.

7.6.6 *Evaluation of Existing Solids System*

This section provides observations and recommendations for each of the components of Entiat's existing solids processing system.

7.6.6.1 WAS Pumping and Piping

Description:

The existing WAS pump system includes two 3 HP submersible Flygt sludge pumps installed on guiderails and located at the east end of each SBR basin near the center dividing wall (with one pump per basin—two total WAS pumps). See **Table 7-23** for pump model information. Each WAS pump is rated for 108 gpm and discharges to a valve vault south of the SBR basin that includes check valves and isolation valves.

WAS piping is 3" diameter from the pumps to the valve vault and 4" diameter from the valve vault through the treatment site where it discharges to the aerobic digestor (converted oxidation ditch). Controls for the WAS pumps are included with the SBR control system in the existing electrical room.

Observations/comments/recommendations:

Overall, the WAS pumping system and site piping appear to be functioning as intended and are in satisfactory condition. Following are observations and recommendations:

- The City reports the existing WAS pumps are in satisfactory condition without issue. If the pumps are going to be reused with the secondary treatment upgrades, it is recommended the pumps be removed and inspected by a certified pump technician and seals replaced and both the pumps serviced. Given the age of the pumps and reported condition, it is likely the pumps have adequate service life for the planning period.

- **Table 7-25** estimates daily WAS pumping volume. The future WAS volume per day is approximately 12K gpd (at a solids concentration of 0.7%). Assuming the existing SBR basins constitute approximately half the secondary treatment capacity, each WAS pump will need to run approximately 30 minutes per day to maintain the basin's MLSS.

- The existing 4" diameter WAS piping has a velocity of 2.7 ft/second when 1 pump is operating; and about 5 ft/second with both pumps operating. It is likely the existing piping is adequate for future WAS pumping (to be confirmed during design of the secondary treatment upgrades). Under the ultimate condition the WAS site piping may need to be upsized to 6" diameter or parallel WAS piping installed from future basins. If new digestors are installed at a different location on the site it is recommended upsizing the WAS piping to 6" be considered during design.

7.6.6.2 Digestors

Description:

During the 2007 treatment plant upgrade project, the city converted the existing oxidation ditch into an aerobic sludge digestor. The oxidation ditch is in the southwest corner of the site and is approximately 50' by 110'. The oxidation ditch is 6' deep (bottom elevation of 720.0 with a top of wall elevation of 724.5). The ditch is trapezoidal shape with a top width of 18' and a bottom width of 10'. The decant system drains to the plant lift station and can operate between 2' and 4.5' depth. Total volume of the ditch is 105,000 gallons with an operational volume at 4' depth of 90,900 gallons.

The digestor uses a jet aeration pump station for mixed liquor recycle and aeration. This includes an aeration pump station located at the southeast corner of the oxidation ditch just north of the dewatering building. The pump station includes two (2) 25HP submersible pumps (1560 gpm at 42' TDH). The aeration pump system discharges to a directional aspiration FRP manifold to supply the air, mixing and recirculation to the digestor and is located immediately after the WAS outlet. Aeration system is rated for 14 lbs of O_2 per hour.

Observations/comments/recommendations:

Overall, the City reports the digestor is functioning satisfactorily without major issue. Following are observations and recommendations regarding the aerobic digestor:

- The City reports difficulty with sludge dewatering when the digestor mixed liquor exceeds 7,000 mg/L. Because of this, City attempts to maintains a target solids concentration of 0.7% solids (i.e. 7,000 mg/L) in the digestor. It is unclear the exact reason for the dewatering issues and might be particular to operation of the BFP. Since 0.7% solids is roughly the solids concentration of the secondary WAS, maintaining this concentration in the digestor is relatively easy and requires very little decanting/thickening.

- Operating the digestor at 0.7% solids significantly decreases the SRT of the digestor. According to the 2007 design plans, the digestors are sized for a SRT that exceeds 60+ days. However, based on actual 2024 sludge projection records (which exceed the estimates in the 2007 digestor design criteria) and the lower operational solids concentration (0.7%), we estimate actual SRT in the existing digestor to be in the 21 day range.

- The future SRT (2044) will drop to approximately 10 days if the digestor continues to be operated at a solid's concentration of 0.7%. This is below typical minimums for aerobic digestion (which is more typically in the 15 day range for extended aeration activated sludge); and means the digested sludge at times may not stabilize to the extent needed to meet Class B biosolids testing requirements (see Section 1.5). If the digestor is operated at a higher solid's concentration (say 1.3%) this increases the future SRT to approximately 17 days which is more in the typical range for communities in colder climates.

- The jet aeration system for the aerobic digester operates satisfactorily. However, there is no simple method for isolating the jet pump for maintenance. For continued use of the jet aeration system, it is recommended that some method of isolation be provided between the jet pump wet well and the aerobic digester to facilitate pump maintenance.

- The geometry of the existing digestor (i.e. repurposed oxidation ditch) is not ideal. The basin uses significant site space compared to the actual volume provided. Typical digestors are deeper with more efficient cross sections. Given the anticipated growth and treatment plant improvements needed, site space is limited and therefore this is a significant disadvantage of the existing digestor. Additionally. Given the area of the basin verses depth (only 4'), decanting and sludge

thickening is less efficient as compared to a deeper basin. The effect of this inefficiency will likely become more pronounced as sludge volumes increase.

- Given the inefficient site layout of the existing digestor, the marginal sizing of the digestor, the difficulty w/ thickening, and the reduced reliability of a single digestor, we recommend the City demolish the existing digestor which will make room for dewatering improvements and replace with two new aerobic digestors (see following section).

- Since the existing digestor consists of a single basin, reliability is limited and makes maintenance and servicing the basin difficult. The Ten State Standards recommend at least two digestors for any plants with an average daily flow exceeding 100K per day. Entiat's design flow is almost three times that. We recommend the City plan to have at least two digestor basins.

- Aerobic digestion is the most commonly used method of digestion for plants like Entiat's in similar sized communities due to ease of operation and lower potential for odors. The City also has expressed significant concern regarding the treatment plant's proximity to residences and wishes to minimize any potential for odors. Therefore, we recommend the City continue to utilize aerobic digestion.

- Aerobic digestors should be sized to stabilize solids and provide volatile solids digestion/reduction. See aerobic digestor sizing recommendations in the following section.

7.6.6.3 Mechanical Dewatering (Belt Filter Press) Facility

Description:

Solids dewatering is accomplished using a Technofanghi Monobelt belt filter press (BFP) located in a 500SF dewatering building located immediately east of the aerobic digestor (repurposed oxidation ditch). The BFP pulls solids from the aerobic digestor for dewatering. Dewatered solids are discharged via a conveyor shoot through the south side of the building which discharges directly to the back of dump truck. The 2009 plans show a dewatered sludge storage / pickup area surrounded by concrete ecology blocks on the south side of the dewatering building. The ecology blocks have since been removed.

Information on the existing dewatering building, BFP, and related piping is sparse. It appears the building and equipment were in use before the 2009 upgrade. The BFP nameplate shows a date of 2003; however, no plans are known for installation of the BFP.

During the 2009 upgrade, a modification to the dewatering building drain was made to direct flow to the main yard sump instead of back into the oxidation ditch. The record drawings (Sheet G9 and D1) show a 3" PVC pipe between the oxidation ditch and the building. This may be the feed pipe to the BFP, but the plans are not clear and should be verified.

Observations/comments/recommendations:

Overall, the mechanical dewatering facility and equipment are nearing the end of their service life and need to be replaced. Following are observations and recommendations:

- The City reports that the BFP operates satisfactorily producing roughly biosolids at roughly 13% to 15% dry solids, depending on the characteristics of the digested solids. As noted previously, when solids content in the digestor gets above 0.7%, the City has difficulty dewatering. It is unclear if this is primarily due to the belt filter press and/or the characteristics of Entiat's solids.

- Replacement parts for the belt filter press are available from the manufacturer's representative; however, City staff report that the BFP is increasingly requiring more and more labor/materials to maintain.

- Given the age of the BFP (21 years) and typical service life and the increasing maintenance requirements, we recommend the City plan to replace the BFP.

- The City desires dewatering equipment that can operate with less attended operation and reduced maintenance. Because of this, the City has indicated they do not want a new BFP for future dewatering. The City has reviewed other dewatering equipment and their preference is a screw press for a variety of reasons including ease of maintenance, slow moving parts, reliability, etc. During meetings with the City we discussed potentially considering a centrifuge which the City was open to considering.

- Additionally, operators noted that the belt press needs to be operated more frequently for reduced durations to mitigate the filtrate slug loading to the secondary treatment process. An appropriately selected screw press could potentially mitigate this condition by operating largely continuously at reduced flow rates.

- The existing dewatering building is small (+/- 500 SF) and would be difficult (if not impossible) to install other types of mechanical dewatering equipment without significant modifications and/or expansion to the building. Additionally, the building is old and needs improvements for continued use. The location of the building is not ideal in terms of site layout. If the aerobic digestor is demolished and replaced as recommended in the previous section, the building would be better situation west of its current location to provide more site/access room.

- The existing dewatering facility does not have a covered storage area for storing dewatered biosolids onsite. Historically the City has stored dewatered biosolids in piles at the Class A composting property. However, since the City has transitioned from the Class A process to Class B w/ hauling to Boulder Park Incorporated (BPI) for beneficial reuse, the City plans to sell the compost facility property. The City has indicated their intention is not to store biosolids onsite and instead haul immediately to BPI after dewatering. However, we recommend dewatering improvements still provide a covered storage area for dewatered biosolids in the event hauling to BPI is temporarily halted.

- The City has also expressed concern that storing biosolids onsite could cause odor issues. If the storage area is utilized regularly and odor issues become problematic for the City, the area can be completely enclosed and ventilation system installed to utilize either biofiltration or carbon adsorption odor control.

7.6.6.4 Beneficial Reuse / Boulder Park Incorporated (BPI)

Description:

Dewatered biosolids discharge from the BFP dewatered sludge conveyor into the back of a City owned dump truck. Biosolids are then hauled to BPI for beneficial reuse.

Previously the City utilized a Class A composting process located on city owned property on the north side of Entiat. However due to increasing number of odor issues and insect complaints form nearby residences, the City discontinued the Class A process and began hauling Class B biosolids to BPI. The City reports using BPI is much more economical and reduces overall labor costs to the City.

The City prepared an updated Biosolids Sampling and Analysis Plan for Ecology review in May of 2024 that outlines updated test procedures and requirements based on a Class B process w/ hauling to BPI. BPI adds an additional charge if solids need to be incorporated immediately.

Observations/comments/recommendations:

Following are observations and recommendations:

- Since changing their beneficial reuse method from the Class A system to a Class B system with transport to BPI, the City reports a significant savings in labor and overall costs.
- At this time the City is not interested in pursuing other Class A options. Given the City's proximity of BPI, beneficial reuse at their facility is the most practical option for the City compared to other methods. This conclusion is similar to many other similar facilities in the area.

7.6.7 *Aerobic Digestor and Dewatering Equipment Sizing*

Based on the previous evaluation, it is recommended the City replace their existing aerobic digestor with two (2) new aerobic digestors and construct a new dewatering facility. This section provides sizing criteria for the aerobic digestors and dewatering equipment.

See previous **Table 7-27** for sludge production estimates. Sizing herein is based on 2044 sludge production estimates (3,000 persons). See recommended improvements in the following section for improvements needed to serve the ultimate population (6,000 persons).

7.6.7.1 Aerobic Digester Sizing

It is expected that WAS will be stabilized using aerobic digestion with the final biosolids hauled to the Boulder Park Inc. (BPI). An aerobic digester will be used to stabilize the waste sludge produced in the aeration basin. **Table 7-28** shows the design parameters used to size the digester. See also, aerobic digestor recommendations in previous sections.

Table 7-28 Aerobic Digestor Design Criteria

Parameter	Value
WAS solids concentration	0.7% (7,000 mg/L)
Solids production at design flow (2044)	691 lbs/day
WAS @ design flow (@ 0.7%)	11,900 gpd
Digestor solids concentration	1.25% (12,500 mg/l)
Percent volatile (%)	70
Reaction rate (kd)	0.02 @ 10C
Temperate range	Mesophilic digestion
SRT	25 days [1]
Air requirement	2 mg/L; 500 cfm [2]
VS loading	0.03 lbs VS/cu-ft-d
VSS reduction expected	35 %
Total volume	120,000 gal (16,000 cf) [3]
Number of digestors	2
Mass of solids to dewater	507 lbs/d
Volume to dewater	6,400 gpd

1. *Typical aerobic digestor minimum SRT is 15 days (MOP/8 and ECY Orange Book) and assumes solids will stabilize to meet Class B requirements via testing described in previous sections. If in the future the City would like to meet the Class B prescribed 40/60 day SRT method in lieu of testing method, additional digestor volume will be required.*
2. *Actual air requirement to be finalized during design by the aeration system manufacturer to maintain minimum oxygen requirement for aerobic digestion and full mixing. Air should be designed assuming the largest blower out of service.*
3. *Final volume should be selected during design based on secondary treatment system design and wasting recommendations and final design parameters.*

7.6.7.2 Digestor Operational Considerations

Aerobic digestion produces a sludge that is low in odors, similar to humus, and biologically stable. Operation of the aerobic digester is similar to the extended aeration basin but due to its smaller size is sensitive to temperature and low pH inhibiting oxidation. Solids are wasted from an aerobic digester to a dewatering method discussed below. Excess liquid is recycled back into the aeration basin.

- Treatment in aerobic sludge digesters is sensitive to temperature and pH. At liquid temperatures below 10° Celsius reaction rates are very low. Insulating the digesters reduces heat loss.

- Aerobic digestion promotes nitrification with a corresponding decrease in pH, at times below 5.5 pH. An alkalinity feed may be added to the digesters to provide flexibility in limiting potential pH excursions. Operational means to reduce the impact of nitrification are to reduce the DO in the aerators and to denitrify by periodically turning off the aerators.

- Literature reports long detention times can cause dewatering problems. Long detention times are not explicitly defined. The operator will need to determine the optimum operational sequence for the plant and may need to adjust thickening and SRT to maximize dewatering characteristics.

- The operator can vary dewatering frequency in order to accommodate his workload. Decreased dewatering frequency will require longer dewatering periods.

- Solids wasting and dewatering should be done frequently to maintain a uniform MLSS in the aeration basins. For design purposes, a dewatering frequency of 3 days per week at 6 hours per day is assumed for normal operations. See following section for dewatering equipment sizing.

7.6.7.3 Dewatering Equipment Sizing

Treated biosolids will be pumped from the aerobic digestors to mechanical dewatering equipment where the solids will be dewatered and then transported to Boulder Park Incorporated (BPI) facility near Mansfield, Washington for beneficial reuse.

Three dewatering equipment options were considered for Entiat as part of this evaluation including: 1) belt filter press (BFP), 2) screw press, and 3) centrifuge. Following are considerations regarding dewatering equipment section:

- The City currently uses a BFP and does not want to consider a BFP for future use.
- Both screw presses and centrifuges provide good dewatering characteristics with the centrifuge producing a somewhat drier solid. Typical dry solids percentage for a screw press is in the 18% range while a centrifuge is in the 20% range.
- The drier solids produced from a centrifuge will result in less trips to BPI which lowers labor/disposal costs. However, given Entiat's close proximity to BPI, the overall annual cost savings is relatively minor.
- Centrifuges require fast moving parts and consume significantly more energy to operate than screw presses. Screw presses have slow moving parts and tend to require less ongoing maintenance compared to a centrifuge.
- Screw presses can be operated with little to no supervision. Many communities operate their screw presses at night.
- Service life for a screw press is longer than for a centrifuge.

Given that Entiat is located close to BPI, the drier solids produced by a centrifuge will not significantly lower operational costs compared to the higher power costs, increased maintenance requirements, and the lower service life of a centrifuge, and therefore we recommend a screw press be use.

Table 7-29 provides a summary of sizing and design criteria for a screw press dewatering system.

Table 7-29 Dewatering Equipment Criteria and Sizing

Description	Design Criteria
Operating Schedule	
Weekly dewatering schedule	3 days per week for 6 hours [1]
Hours / week	18 hrs / week
Dry Thruput	
Ave. dry solids per day	507 lb/day [2]
Solids per week	3,552 lb/day
Min. dry thruput required	**197 lb/hr**
Wet Thruput	
Digestor - % solids range	0.7% to 1.3%
Ave. volume wasted from digestor	8,300 gpd @ 1% [3]
Weekly total wasted from digestor	58,100 gallons
Hours / week operation	18 hrs / week
Min. wet thruput required	**53.8 gpm**
Annual Number of Truck Loads	
Solids content of biosolids	18%
Sludge SG	1.03
Volume of dried biosolids/week	13.6 CY
Weight of dried biosolids/week	12 Tons
Truck capacity	15 CY
Annual truckloads	48

1. *Hours represent actual operational time and does not include cleanup and other operational and maintenance labor required. This also assumes the dewatering equipment is only operated during typical work hours. To accommodate ultimate design population the City could either increase hours of operation (including night time operation which is commonly done with screw presses or install a second screw press. See discussion in following section.*
2. *See **Table 7-28**.*
3. *It is assumed the digestor will be operated at a higher solids content; however, conservatively a 1% concentration is used to calculate the wet thruput requirement for the screw press and does not include VS reduction in the digestor.*

7.6.8 *Recommended Improvements*

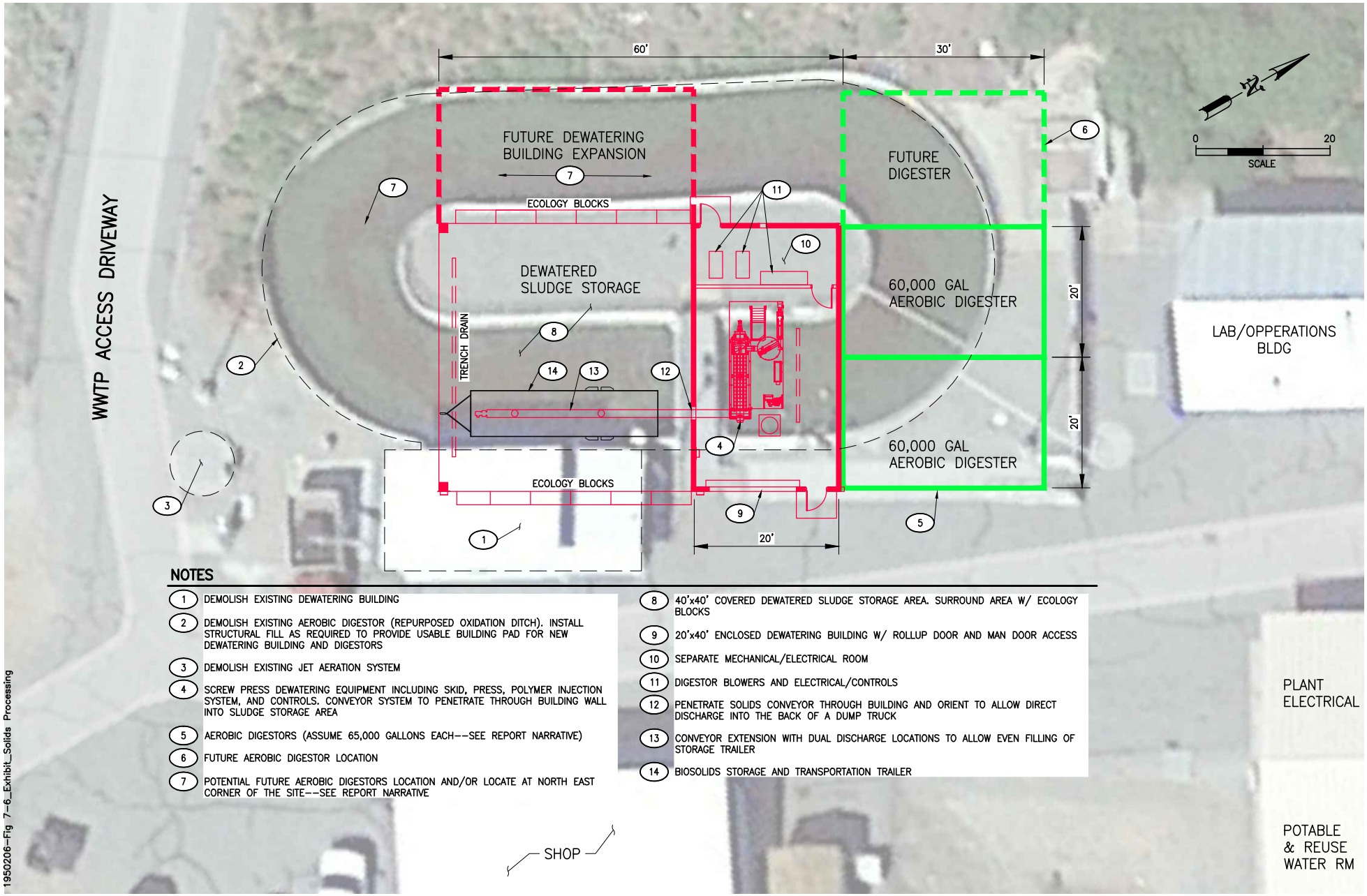
Following summarizes recommended improvements to Entiat's biosolids processing system. Recommendations are based on deficiencies identified and sizing herein and as needed to meet projected 2044 flows and solids production.

See attached **Figure 7-6**.

7.6.8.1 Recommended Improvements

Following are recommended improvements:

- Demolish existing aerobic digestor and jet aeration system. Import structural fill as needed to provide usable building pad to locate proposed improvements.



NOTES

1. DEMOLISH EXISTING DEWATERING BUILDING
2. DEMOLISH EXISTING AEROBIC DIGESTOR (REPURPOSED OXIDATION DITCH). INSTALL STRUCTURAL FILL AS REQUIRED TO PROVIDE USABLE BUILDING PAD FOR NEW DEWATERING BUILDING AND DIGESTORS
3. DEMOLISH EXISTING JET AERATION SYSTEM
4. SCREW PRESS DEWATERING EQUIPMENT INCLUDING SKID, PRESS, POLYMER INJECTION SYSTEM, AND CONTROLS. CONVEYOR SYSTEM TO PENETRATE THROUGH BUILDING WALL INTO SLUDGE STORAGE AREA
5. AEROBIC DIGESTORS (ASSUME 65,000 GALLONS EACH--SEE REPORT NARRATIVE)
6. FUTURE AEROBIC DIGESTOR LOCATION
7. POTENTIAL FUTURE AEROBIC DIGESTORS LOCATION AND/OR LOCATE AT NORTH EAST CORNER OF THE SITE--SEE REPORT NARRATIVE
8. 40'x40' COVERED DEWATERED SLUDGE STORAGE AREA. SURROUND AREA W/ ECOLOGY BLOCKS
9. 20'x40' ENCLOSED DEWATERING BUILDING W/ ROLLUP DOOR AND MAN DOOR ACCESS
10. SEPARATE MECHANICAL/ELECTRICAL ROOM
11. DIGESTOR BLOWERS AND ELECTRICAL/CONTROLS
12. PENETRATE SOLIDS CONVEYOR THROUGH BUILDING AND ORIENT TO ALLOW DIRECT DISCHARGE INTO THE BACK OF A DUMP TRUCK
13. CONVEYOR EXTENSION WITH DUAL DISCHARGE LOCATIONS TO ALLOW EVEN FILLING OF STORAGE TRAILER
14. BIOSOLIDS STORAGE AND TRANSPORTATION TRAILER

1950206-Fig 7-6_Exhibit_Solids Processing

SCALE:	AS SHOWN
DESIGNED:	DDC
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-02-06
DATE:	12/19/2024

VARELA Engineering & Management

CITY OF ENTIAT, WASHINGTON
WASTEWATER FACILITY PLAN AND GENERAL SEWER PLAN

SOLIDS PROCESSING - RECOMMENDED IMPROVEMENTS

FIGURE
7-6

- Construct two (2) new aerobic digestors—see previous section for sizing criteria. Recommend the following:
    - Locate new digestors on north side of the new building pad created by demolishing the aerobic digestor.
    - For planning purposes assume liquid depth of 14' and horizontal dimensions of 30'x20'.
    - If possible, install digestors with a bottom elevation high enough to allow gravity drainage of the tank to the plant lift station.
    - Install coarse bubble aeration system in each aerobic digestor. Locate blowers, electrical, and controls in new biosolids dewatering building.
    - Install decanting system for each aerobic digestor for sludge thickening. Install piping to route decant liquid to the plant lift station.
    - Note, final digestor volume/configuration to be finalized during design based on sludge storage requirements and secondary treatment manufacturer's recommendations.
- Construct new 2,400 SF solids dewatering building and covered sludge storage area south of the proposed aerobic digestors (see attached figure). Recommend building include the following:
    - Assume pre-engineered metal building (PEMB) construction type which is typically cost effective for these types of facilities and can easily accommodate an attached covered sludge storage area as part of the structure.
    - Building structure to consist of two separate facilities:
        - 20'x40' enclosed building with two separate rooms: 1) dewatering room to house the new dewatering equipment (screw press), and 2) separate electrical/mechanical room to house the digestor and dewatering system electrical/controls and aeration system blowers. Recommend roll up door access to the dewatering room in addition to man door access.
        - 40'x40' covered sludge storage area constructed as part of the PEMB building. Include roof structure and supports. Recommend ecology blocks be installed around the perimeter to improve City's ability to move and store biosolids onsite if needed. Design structure to allow full encloser of the sludge storage area for future odor control (if needed in the future).
- Install screw press dewatering equipment in the dewatering room w/ sludge conveyor penetrating the south exterior wall into the sludge storage area. Conveyor should be sized to allow for direct discharge of dewatered solids into the back of a parked dump truck.
- Final sizing of the building/storage areas will be finalized during design depending on selected dewatering equipment sizing and layout.

7.6.8.2 System Expandability and Ultimate Population (6,000)

Following are recommendations for system expandability to meet ultimate population (6,000 persons):

- Reserve site space for additional future aerobic digestors to accommodate ultimate flows (population 6,000) and/or if additional digestion is needed for future solids stabilization to meet Class B.

- Potential locations for future digestors include: 1) directly west of the new digestors; 2) west of the new dewatering building; and/or, 3) at the northeast corner of the treatment site depending on the secondary treatment alternative selected.

- Recommend solids processing improvements include accommodations for the future digestor installations. This may include: removal of demolition material as needed for the future digestors, installation of building footings to a depth as needed to allow future digestor construction, installation of piping and electrical stubs, etc.

- Ultimate flows require additional dewatering capacity. This can be accomplished by either: 1) increasing the screw press dewatering schedule to include nighttime dewatering which is commonly done by communities with a screw press equipment but does leave the equipment unattended; or 2) by adding a second dewatering system.

- It is assumed the City will prefer adding a second future dewatering system to accommodate ultimate design since it provides additional dewatering capacity, does not require nighttime operation, and provides system redundancy for maintenance. Therefore, site space should be reserved for a second dewatering system located to the south side of the covered sludge storage area. Design dewatering building structure to accommodate future expansion to the south and should include piping and electrical stubs as needed.

7.6.8.3 Estimated Cost

Following estimates costs for the recommended improvements:

Table 7-30 Solids Handling Improvements – Estimated Capital Cost

Improvement Description	Est. Cost [1]
Demolition of aerobic digestor, dewatering building, jet aeration system	$50,000
Structural fill and site misc. site work	$20,000
Aerobic digestors (two at 60K gallons each)	$250,000
Digestor equipment: aeration system, decant system, appurtenances, etc.	$100,000
Pre-engineered metal building (20'x40' w/ 40'x40' SS covered area)	$550,000
Dewatering equipment (based on FKC BHX-600x3500L)	$650,000
Surfacing and site improvements	$100,000
Site piping	$50,000
Subtotal:	$1,770,000
Contractor mob/admin/overhead/profit (15% of Subtotal)	$266,000
Subtotal Construction:	$2,036,000
Sales tax (8.4%)	$171,000
Contingency (25%)	$509,000
Construction Cost:	$2,716,000
Eng, admin, const mgt, insp (30%)	$815,000
Total:	**$3,531,000**

4. *Costs rounded to the nearest thousand.*

7.6.8.4 FKC Class A Option

A proprietary Class A process manufactured by FKC was also considered for potential use in Entiat. The process includes treatment of solids via lime stabilization, gravity sludge thickening, pasteurization and screw press dewatering. This process produces Class A biosolids.

For Entiat this option would be similar to the recommended improvements but with the following revisions:

- Utilize FKC's Class A Capable Screw Press model SHX-500x4000L rated for 94 dry lbs/hour. Note, the screw press thruput rating is less than the sizing herein due to requirements associated with the Class A process. This system therefore would require longer hours of operation compared to the sizing assumptions in the previous sections.

- Larger building footprint required for installation of the process equipment including: rotary screen thickener with support structure, flocculation tank, boiler system, and steam/condensate piping for the screw press

- Requires a below grade lime/sludge storage/mixing tank w/ quicklime storage and feed system installed above the tank. Building needs to be vehicle accessible for quicklime deliveries.

The manufacturer's estimates for the Class A process increases the equipment costs by about $800K over the Class B screw press. Additionally, adding the building square footage, construction of the lime tank, and installation of the Class A equipment would likely at least double those additional costs (if not more). This presents an increase in cost of approximately $1.5 to $2.0 Million.

The City has indicated that biosolids produced by their recently abandoned Class A system were not in high demand and presented very little financial benefit to the City. After consideration of the additional costs associated with this Class A process, the City is not interested in pursuing this option any further at this time.

7.7 Reclaimed Water Evaluation

7.7.1 *Introduction*

RCW 90.48.112 states the evaluation of wastewater systems and alternatives must include consideration of opportunities for the use of reclaimed water. An evaluation of reclaimed water was conducted as part of the facility planning process. Producing reclaimed water for irrigation at recreational, agricultural, and/or public sites in the Entiat area is technically feasible, however it is not economically feasible due to the cost and the readily available alternate source of irrigation water for the Entiat area. Following is a summary of the consideration and finding.

7.7.2 *Entiat Setting and Potential Reclaimed Water Users*

Entiat is situated adjacent to the Columbia River along a narrow band running north to south. The band is fairly flat to gently sloping and consists of city developed areas and orchards. Moving further west, the sloping band of green development and orchards transitions to step undeveloped dry hills rising to the west.

Potential sites for reclaimed water use include City parks, School District grounds, orchards, and other irrigated agriculture sites. Currently all potential sites identified are irrigated using Columbia River water conveyed by the Entiat Irrigation District.

7.7.3 *Entiat Irrigation District*

The Entiat Irrigation District is an independent irrigation water purveyor serving the Entiat area. The District pumps water from the Columbia river and is conveyed to users via a pressure pipeline. Irrigation water is delivered to users along the pipelines route at 75 to 90 psi pressure.

The irrigation system was installed in 1973 for use by orchardists and paid for by the growers. The service was later expanded to residents of Entiat. The system operates from spring until early fall (2025 system operation 4/6/25 to 10/12/25).

The system provides water to customers on a "share" purchased basis. One share is equivalent to 1 acre. Customers pay $175 per year per share. The smallest share purchase increment available is 0.5 shares or 0.5 acres @ $87.50 per year.

Customers are not metered and may use as much water as they are able to draw as determined by flow limitation from their connection based on the number of shares purchase. Each connection has a flow limiting orifice restricting flow to 10 gpm per 1 share – i.e., 5 shares is allowed a flow of 50 gpm.

The irrigation system is used by orchardist and agriculture customers, Entiat residents and commercial customers. The City is a customer and currently irrigates their City parks including:

- Abby Park
- Abby Dabby Park
- Butts Park (by the fire station)
- Kiwanis Park
- Rainbow Park
- PUD Park (along the river)

The School District is a customer and irrigates their grounds and athletic fields.

The current Irrigation District customers constitute the majority of users that would typically be identified as potential reclaimed water users. Other potential users for a new reclaimed water source are not available in the Entiat area. If other potential users were identified, the Irrigation District water would be their primary source for consideration.

7.7.4 *Reclaimed Water Development Costs*

7.7.4.1 Treatment Plant Upgrades

In considering reclaimed water for the Entiat area, Class A reclaimed water is recommended and assumed. Due to the makeup of the potential users, it is anticipated that the public would come into contact with the reclaimed water.

The existing treatment and future upgrade for increasing capacity, are not capable of treating to Class A standards. The following additional treatment modifications would be required:

- Coagulation and filtration
- Upgraded disinfection system to meet higher coliform requirements

- Addition of chlorination system to maintain chlorine residual in the product water
- Additional controls and telemetry for reliability and redundancy
- A building enclosure to house the applicable equipment and systems

The order of magnitude capital cost range for plant upgrades for meeting Class A requirements for reclaimed water is estimated to range from $1.0 to $1.5 million.

7.7.4.2 Reclaimed Water Distribution

In addition, capital costs for pipeline improvements would be required for conveyance and distribution of reclaimed water (purple pipe) to potential users. Costs for installation and surface restoration costs could range from $400k to $500k per mile. Running a single pipeline the length of Entiat from north to south would require about 3 miles. Rough capital costs could range from $1.2 to $1.5 million. Additional costs would likely be necessary at delivery locations for other ancillary irrigation or control elements. It could be possible to mitigate some distribution costs if the reclaimed water could be coordinated and integrated into the Entiat Irrigation District's pressure irrigation main. This would require further research and discussions with the District. This is not warranted at this time.

7.7.4.3 Ongoing Costs

Additional, ongoing costs (not estimated) would include:

- Increased ongoing operation and maintenance costs
- Ongoing costs for hiring a Group 3 plant operator (current operator is Group 2)

7.7.5 *Finding and Conclusions*

The costs for providing a reclaimed Class A water source for Entiat is costly and not cost effective when comparing to water provided by the Entiat Irrigation District. One illustrative comparison is to compare the capital cost (not including ongoing operation or Group 3 operator costs) of providing "1 share" of reclaimed water (per the Irrigation District's definition of 1 share) with 1 share of the District's irrigation water:

- Entiat's current wastewater average day flow is 0.12 mgd or 83 gpm. Future average day design flows are projected at 0.26 mgd or 180 gpm. Using the future design flow average of 180 gpm, and assuming equalization storage to enable (and limiting) the delivery over a 6 hour period, would result in an equivalent 72 shares in comparison to the Entiat Irrigation District.
- Order of magnitude, capital costs for providing reclaimed water is estimated $2.2 to $3.5 million. Amortizing the low range capital costs ($2.2 million) for 20 years, 2.0%, and 20% reserve results in an annual payment of $161k
- The resulting cost per 1 share of District irrigation water is $2,236 per share per year
- Comparison:
    - Entiat reclaimed water cost per share = $2,236 per year
    - Entiat Irrigation District cost per share = $175 per year

Producing reclaimed water for irrigation in the Entiat area is technically feasible. However, at this time, it is not economically feasible.

8.0 Implementation and Financing

8.1 Summary of Projects

Costs are estimated in the preceding sections for project elements. **Table 8-1** provides a summary of costs used to develop funding scenarios in this section.

Table 8-1 Capital Improvements Plan and Estimated Project Costs

Description	Estimated Costs
Summary of Plant Improvements	$7,152,000
Secondary Treatment SBR Plant Expansion	$3,531,000
Plant Solids Handling Upgrades	$3,840,000
Collection System Upgrades Budget	$1,000,000
Total	**$15,523,000**

Regarding the collection system $1 million shown, this is a budgetary allowance and not a firm estimate of work. The overall collection system is in good condition. Potential improvements are identified in section 4 and a $1 million allocation is assumed for funding analysis considerations.

Table 8-2 Estimated Project Budget for Funding

Description	Estimated Costs
Estimated Capital Cost	$15,523,000
Estimated Rate of Annual Inflation	3.0%
Inflation Allowance - years assumed	4
Total Inflation Contingency	12.6%
Total	**$17,470,000**

The estimated improvements costs are based on 2024/2025 dollars. **Table 8-1** projects the future costs assuming a four-year allowance for project design, funding acquisition, and subsequent construction during the 2028/2029 period. The future cost with inflation is assumed for funding budgeting and planning purposes.

8.2 Funding Sources

There are several funding sources available to municipalities for financing public works projects (some specifically directed at wastewater improvements) through grants and low interest loans (and forgivable loans – equivalent to grant). The favorability of each program varies from community to community, and project to project depending on several factors (e.g. $ size of project; need; potential health and safety threat; impacts to water quality; anticipated sewer rate impacts to customers; and other funding criteria).

Three funding agencies with potentially the most favorable funding packages for Entiat are:

- WA Department of Ecology

    - Centennial Clean Water Program (Centennial), and
    - Clean Water State Revolving Fund Loan Program (CWSRF)
- US Department of Agriculture – Rural Development (RD)
    - Water and Waste Disposal Loan and Grant Program
- WA Department of Commerce
    - Public Works Board (PWB)

There are also other potential funding opportunities available with variable future applicability depending on available funding, aggressiveness of Entiat in pursuing funding, or other factors that may emerge as planning moves forward. They are discussed in following paragraphs under "Other Funding Programs."

8.2.1 *WA Department of Ecology (ECY)*

Funding programs under WA Department of Ecology include:

- Centennial Clean Water Program (Centennial) (grants)
- Clean Water Revolving Fund Loan Program (CWSRF) (loans and forgivable loans)

Both programs are administered by the WA State Department of Ecology (ECY). The programs fund planning, design, and construction costs associated with wastewater facilities and the implementation of non-point activities. To be eligible, projects must be water quality projects that prevent and control pollution of ground and surface waters.

Although the two programs are listed separately and have specific criteria unique to each, they are accessible through a single application process through ECY. Applications are submitted online via Ecology Administration of Grants and Loans (EAGL). Following application submission, ECY reviews and determines the most applicable funding source and amount to be applied form each program, depending on eligibility and other criteria specific to the project.

Interest rates for loans are based on a percent of tax-exempt municipal bonds. For hardship communities, interest rates are lower, depending on the degree of hardship. Forgivable loan (equivalent to grant) may also be offered to applicants depending on funds available and depending on financial hardship criteria of the community.

Limited grant subsidy is available to applicants that can demonstrate financial hardship. Hardship interest rates and grant subsidy eligibility are shown in **Table 8-3**. ECY requires user rates include an annual 20% reserve to be collected during the first five years, equivalent to at least one annual debt service on the loan.

Table 8-3 Hardship Interest Rates and Grant Subsidy Eligibility [1]

Sewer Rate [2] ÷ MHI [3]	< 2%	≥ 2% but < 3%	≥ 3% but < 5%	≥ 5%
Hardship Designation	Non-hardship	Moderate Hardship	Elevated Hardship	Severe Hardship
5-year Loan Rates	1.0%	0.7%	0.3%	0.0%
20-year Loan Rates	2.0%	1.4%	0.7%	0.0%
30-year Loan Rates	2.7%	2.0%	1.4%	0.7%
Grant Eligibility	Not eligible	50% up to $5M	75% up to $5M	100% up to $5M

1. *Based on MHI information per Appendix M of ECY funding guidelines (August 2024).*
2. *"Sewer Rate" for this calculation is the potential future sewer that would result if no grant funding was provided.*
3. *MHI – Median Household Income for Entiat = $75,978 per the ECY SFY 2026 – August 2024 Funding Guidelines)*

8.2.1.1 Small Communities Project Priority List

For communities that have an existing open ECY funding contract, ECY has implemented a simplified process for requesting additional funding – the "Small Communities Project Priority List (SCPPL)." For eligible wastewater projects that qualify for SCPPL, the recipient will not have to submit new applications to fund the next project step. Funds can be amended into an existing funding agreement at the current step (planning or design).

For projects that have an active Step 1 Planning or Step 2 Design funding agreement, the Ecology Project Manager, Financial Manager, or Ecology Engineering Team can be contacted to determine if SCPPL will apply to the project.

Entiat has an existing Step 1 Planning funding contract and is currently eligible for the SCPPL process, while the Step 1 funding agreement is still active.

8.2.2 US Department of Agriculture – Rural Development (RD)

Funding programs under US Department of Agriculture – Rural Development (RD) include:

- Water and Waste Disposal Loan and Grant Program

The USDA Rural Development (RD) – Water and Waste Disposal Loan and Grant Program funds projects for small (less than 10,000 people) financially distressed communities to extend and improve water and waste treatment facilities. The program is primarily a loan program however grants are also offered on projects where sewer rates become excessive as compared to sewer rates being paid in other similar communities in the region.

Applicants must demonstrate effort and subsequent inability to finance the project through their own resources or commercial credit, and demonstrate the financial feasibility of the project, including ability to repay the loan. Loan security is normally a revenue bond ordinance, with loan repayment from utility rates, although repayment from taxes can also be used for RD loans.

- Applications for funding are accepted year-round with award typically within 3 to 6 months of application submittal.

- Interest rates vary – RD's rates are adjusted quarterly. The current rates (Feb 2025) for market rate is 4.125%, intermediate rate is 3.25%, and poverty rate is 2.5%. Most communities are eligible for

the intermediate rate. The poverty rate can be applied for if "poverty level" can be shown and there is a "health and safety threat" due to the need for the project. RD should be contacted for their current rates in effect during preparation of an application. Assumed rates (Feb 2025) have been used for funding scenarios in this section. 30 to 40-year loan terms. To obtain grant funding, applicant must accept 40-year term. No prepayment penalty for early repayment.

- Application requirements:
    - Approved environmental review
    - Preliminary engineering report
    - Financial feasibility and cost analysis

8.2.3 *Public Works Board Traditional Financing – PWB (formerly public works trust fund)*

This state program is funded through the state budget's Public Works Assistance Account and administered by the WA Department of Commerce. PWB provides low interest loans to cities, towns, counties, and utility districts for the repair, rehabilitation, and reconstruction of seven infrastructure systems: roads and bridges, drinking water, wastewater, stormwater, solid waste, recycling and organics, and broadband. PWB has historically been a sought-after source of low interest loans due to the simplicity and flexibility of the program. The program's grant availability fluctuates based on the state budget allocation per biennium. Funding maximum is $10 million per biennium for construction loans and $1 million for preconstruction loans; no matching funds required; low interest rates, with up to 20-year loan term and no loan fee.

Interest rates vary, depending on loan term and degree of financial distress of the communities as measured by the affordability index. Entiat is currently considered distressed.

Table 8-4 FY2025 PWB Interest Rates [1]

Funding Type	Non-distressed	Distressed	Severely Distressed
Loan Term: 5 years or less (Preconstruction)	0.86%	0.68%	0.43%
Loan Term: >5 to 20 years [2]	1.71%	1.38%	0.86%
Loan Fee	None		

1. *Based on FY2025 PWB Traditional Programs Loan Application Guidelines (April 2024).*
2. *The loan term cannot exceed the life of the asset being financed.*

Planning and preconstruction funding applications are accepted year-round and awarded quarterly. Construction applications are usually due in June.

8.2.4 *Community Development Block Grant (CDBG)*

The WA Department of Commerce administers the CDBG program. These Federal Department of Housing and Urban Development (HUD) funds are available each Fall for water and sewer projects for areas with at least 51% low to moderate income (LMI) residents, which have public health and safety or economic development issues.

The maximum grant amount is $2,000,000. Applications are accepted year-round.

The CDBG program is highly competitive and funds projects which primarily serve at least 51% LMI residents. Cities can conduct independent income surveys in an effort to demonstrate at least 51% LMI.

Entiat is not eligible for CDBG funding due to not meeting the 51% LMI threshold. According to the latest HUD LMI Data issued 2024, Entiat's LMI is 45.10%.

8.2.5 *Other Funding Programs*

There are other funding opportunities and mechanisms available that were not considered in depth at this time but that may have future applicability depending on available funding, aggressiveness of Entiat in pursuing funding, or other factors that may emerge as planning moves forward. The following list is not exhaustive but represents the more common funding programs that can be pursued.

8.2.5.1 Federal Appropriations – Community Project Funding (CPF) / Congressionally Directed Spending (CDS)

This funding program was created during the Biden Administration under the 5-year Bipartisan Infrastructure Law. The U.S. House of Representatives calls it "Community Project Funding" and the U.S. Senate refers to the program as "Congressionally Directed Spending." Both terms refer to the same program.

Federal appropriation requests are submitted directly to the community's U.S. Representative or Senator, who then choose which projects to sponsor. The list of projects goes through several rounds of approval before being signed into law by the President via the Annual Appropriations bill. This program works well as seed funding as it requires no planning documents, no match, and is 100% grant.

Applications are due in the Spring (usually March or April). If awarded, the applicant must go through a second application process with the federal agency administering their award (HUD, EPA, etc.). This second application process takes approximately one year.

8.2.5.2 State Appropriations – Local Community Projects (LCP)

Each year, State Representatives and Senators have the opportunity to sponsor funding requests for local community projects that do not fit easily into the state's existing grant and loan programs. A small number of communities have obtained funding for their public works projects directly from the legislature. The City of Tonasket obtained funding toward their downtown revitalization project after a significant investment of time making connections with the state legislators in Olympia. The Town of Cusick recently obtained LCP funding toward their Water Treatment Plant project after receiving a federal appropriation but being rejected by several traditional state funders.

LCP applications are due in January or February, with awards announced a few months later. Funding is administered by the WA State Department of Commerce. While there is no official match requirement, this funding program prefers to fund less than 25% of the project cost after all other funding program options have been exhausted. Funding is 100% grant; however, Commerce takes 3% of the award as an administration fee.

8.2.5.3 Revenue Bonds / General Obligation Bonds

Revenue bonds and general obligation bonds have historically been a means of funding public works projects by some communities. These funding mechanisms will likely not be needed due to the high likelihood Entiat will qualify favorably for the other loan/grant programs previously discussed. These funding mechanisms can be considered further if other more advantageous sources cannot be obtained.

8.2.5.4 City / Utility Reserve Funds

Accumulated local reserve funds are usually insufficient to fund large scale capital improvements without considerable supplemental funding. Communities are encouraged to budget sufficiently to be able to save and accumulate local reserves for responsible operation, future improvements, and emergency reserves for the utility. In the case where large capital projects are anticipated, local reserves are generally used as seed money to match or leverage funding sources to obtain more favorable funding consideration and funding offers. Communities are encouraged to begin accumulating reserves well ahead of project implementation and set utility rates accordingly.

8.3 ERU's, Revenue, O&M costs, and Cost of Service

A summary of Entiat's 2022 and 2023 actual and 2024 budgeted revenue and expenditures is included in **Table 8-5**. Also shown is the calculated cost of service for each year and the estimated rate for use in the funding scenarios included later in this section.

For the purposes of evaluating funding scenarios in a subsequent section, "rate" ERUs are calculated. The significance of a "rate" ERU count is it represents the invoicing weight of each customer and therefore translates to revenue charged to customers and received by the City. For rate estimating purposes, 700 "rate" ERUs has been used as a representative current estimate of ERUs. ERUs fluctuate from year to year; in Entiat ERUs are expected to increase as it is a growing community.

Table 8-5 Budgeted Revenue and Expenditures

Descriptions	2022	2023	2024	Pro Forma [2]
SEWER RATES: [1]				
Residential Sewer Rate (per month)	$80.15	$80.15	$87.36	$95.22
SEWER REVENUE: [3]				
Sewer Rate Revenue	$578,988	$662,250	$734,351	
Miscellaneous Revenue	$13,174	$7,995	$8,600	
Total Revenue [5]	$592,162	$670,244	$742,951	
CALCULATION OF RATE ERUs:				
Revenue From Sewer Base Rate Only (see above)	$578,988	$662,250	$734,351	
Residential Sewer Base Rate During Period	$80.15	$80.15	$87.36	
Calculated Number of Rate ERUs	602	689	701	
ERUs Estimate Used In Funding Scenarios				700
SEWER EXPENSES: [4]				*$728,000*
Salaries & Benefits	$162,847	$209,711	$272,900	
Supplies, Maintenance, Utility, Expense	$150,765	$165,856	$120,700	

Professional Services/Testing	$20,722	$87,233	$51,000	
Biosolids			$32,000	
Utility & B&O Taxes	$48,962	$59,917	$56,500	
Existing Debt Service	$150,758	$150,754	$150,500	
	$20,000			
Total Sewer Expenses	$554,054	$673,472	$683,600	$728,000
CALCULATION OF COST OF SERVICE:				
Total Cost of Service (from above)	$554,054	$673,472	$683,600	$728,000
Est. Equiv. Cost of Service per ERU per month [9]	$76.70	$81.51	$81.32	$86.67

1. *Rate for single family residential (in-City) rate. Utility tax included*
2. *Proforma sewer rate per 2025 rate in effect. Estimated sewer expenses per 2025 budget*
3. *2022, 2023, 2024 revenues actual*
4. *2022 & 2023 expenses based on actual; 2024 & Proforma based on budget*

8.4 Funding Scenarios and Estimated Sewer Rate Impacts

As indicated in the preceding sections, there are several funding sources available to municipalities for financing public works projects through grants and low interest loans. Three potential funding agencies that will likely result in the most favorable funding packages for Entiat are:

- WA Department of Ecology
    - Centennial Clean Water Program (CCWP), and
    - Clean Water State Revolving Fund Loan Program (CWSRF)
- US Department of Agriculture – Rural Development (RD)
    - Water and Waste Disposal Loan and Grant Program
- WA Department of Commerce
    - Public Works Board (PWB)

As noted previously, there are also other potential funding opportunities via Federal and State appropriation avenues. These are variable and future applicability depends on available funding, aggressiveness of Entiat in pursuing funding, or other factors that may emerge. Due to the significant cost projected for improvements, funding scenarios considered show possible appropriations to illustrate the effects on future potential sewer rates.

For planning and illustration, the following **Table 8-6** provides an abbreviated funding summary of scenarios and estimated rate impact ranges. The scenarios progress from “loan only” funding showing the actual cost of the project, to scenarios with grants, and then with State/Federal appropriations. The higher grant and appropriations scenarios generally require more aggressive City pursuit and involvement; and also, generally longer timeframe necessary to achieve the higher levels.

Table 8-6 Funding and Rate Impacts Summary (Abbreviated Table)

Description / Assumptions:	Ecology (ECY) Funding [1]		Rural Develop. (RD) Funding [2]		RD + ECY + Appropriation	
	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	Scenario #6 [3]
	ECY Loan Only	ECY Loan + Hardship Grant	RD Loan Only	RD Loan + RD Grant	ECY Hrd + RD Loan / Grant + Appropriation	Same as #5 + Increased Appropriation
Total Estimated Project Cost	$17,470,000					
Approximate Loan/Grant Ratio	100% / 0%	71% / 29%	100% / 0%	55% / 45%	39% / 61%	20% / 80%
Loan terms	30 years, 2%, 20% reserve		40 years, 3.25%, 10 % reserve		Combination of previous	
Potential Rate Impacts:						
Approx. Sewer Rate Req'd ($/mo/ERU)	$198	$166	$190	$143	$127	$108
Current (2025) Sewer Rate ($/mo/ERU)	$95	$95	$95	$95	$95	$95
Rate Impact ($/mo/ERU)	**$103**	**$71**	**$94**	**$48**	**$32**	**$12**

The following table is an expanded representation of the previous table. The expanded table provides a more detailed description of the funding scenarios breakdown of cost components and assumptions.

Table 8-7 Funding and Rate Impacts (Expanded Table)

Description / Assumptions:	Ecology (ECY) Funding [1]		Rural Develop (RD) Funding [2]		RD + ECY + Appropriation	
	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	Scenario #6 [3]
	ECY Loan Only	ECY Loan + Hardship Grant	RD Loan Only	RD Loan + RD Grant	ECY Hrd + RD Loan / Grant + Appropriation	Same as #5 + Increased Appropriation
Total Estimated Project Cost	$17,470,000	$17,470,000	$17,470,000	$17,470,000	$17,470,000	$17,470,000
Assumed Funding Source:						
RD Loan			$17,470,000	$9,608,500	$6,858,500	$3,558,500
SRF/CCW Loan	$17,470,000	$12,470,000				
RD Grant				$7,861,500	$2,611,500	$2,911,500
CCW Hardship Grant or Forgivable Loan		$5,000,000			$5,000,000	$5,000,000
Legislative Appropriation					$3,000,000	$6,000,000
Local Contribution	To be deter	To be deter	To be deter	To be deter	To be deter	To be deter
Estimated Loan Portion of Project	$17,470,000	$12,470,000	$17,470,000	$9,608,500	$6,858,500	$3,558,500
% Loan	100%	71%	100%	55%	39%	20%
% Grant (+Local)	0%	29%	0%	45%	61%	80%
Est Rate per ERU:						
Estimated Number of ERUs [4]	700	700	700	700	700	700
Approx Req'd Rate per ERU ($/mo/ERU)						
New Debt Cost	$111.43	$79.54	$103.01	$56.65	$40.44	$20.99
Existing O&M Costs (Pro Forma)	$68.75	$68.75	$68.75	$68.75	$68.75	$68.75
Existing Debt Costs	$17.92	$17.92	$17.92	$17.92	$17.92	$17.92
Approx. Sewer Rate Req'd ($/mo/ERU)	**$198.10**	**$166.20**	**$189.68**	**$143.32**	**$127.11**	**$107.65**
Current (2025) Sewer Rate ($/mo/ERU)	**$95.22**	**$95.22**	**$95.22**	**$95.22**	**$95.22**	**$95.22**
Rate Impact ($/mo/ERU)	**$102.88**	**$70.98**	**$94.46**	**$48.10**	**$31.89**	**$12.43**

1. *ECY funding: hardship eligibility with full project = 2.6%; thus 50% grant eligibility, up to $5 mil. Std interest = 2.7% for 30yrs; hardship = 2.0%*
2. *RD funding: max allowable grant = 45% (without health/safety designation & poverty); int = 3.25%, 40 years, 10% reserve*
3. *Full $5 million ECY hardship grant may not be achieved with other grant/appropriation amounts; case by case with ECY*
4. *See ERU explanation / determination in prior paragraph*

8.5 Recommended Funding Steps and Timeline

Ecology (ECY) and/or the USDA – Rural Development (RD) funding both have the potential for funding offers for Entiat consisting of loan and grant funding elements. Adding PWB loan could further increase opportunity for flexibility and leveraging funding offers.

One of the challenges (disadvantages) of ECY grant funding (i.e. hardship grant) is the program is very competitive with many more applications submitted than there is hardship grant available. A strong water quality "benefit" is necessary to be well documented and well presented in the application to have the best chance of receiving hardship funding.

In comparison, an advantage of USDA-RD funding (over ECY funding) is the opportunity for greater City involvement in the funding procurement process and application process, and the resulting assurance of knowing the loan/grant combined funding that will likely be offered by USDA-RD ahead of time.

State and Federal appropriations requests are generally added in, after or in conjunction with, the conventional ECY, USDA, and PWB application process. State and Federal appropriations requests have the highest potential for success when there is other funding partners already involved in the project. Also, State and Federal appropriations have a non-appropriation funding share requirement that must come from other funding sources.

Regarding application process, historically, Ecology's funding applications are received once per year in October and funding is awarded the following spring and summer. However, applicants like Entiat that have an open contract with ECY are able to simplify the process by requesting additional funding via the Small Communities Project Priority List (SCPPL). The recipient does not have to submit new applications to fund the next project step. Funds can be amended into an existing funding agreement. This has been assumed in the funding timeline table presented in a later section.

RD's funding program receives applications on a continuous year-round basis. The most favorable funding windows for RD are at the first of the year in January (i.e. following the previous October start of their fiscal year), and before late summer (August during their national pooling of funding) of each year.

Generally, the most successful funding strategy is to pursue funding from the primary funding agencies most likely to offer favorable funding packages. In the case of Entiat, likely primary funders include ECY, USDA-RD, and/or PWB. In conjunction, submission of State and Federal appropriations request throughout the process should be included.

After receiving results on the initial applications and/or following discussions with the agencies, make decision(s) on the most advantageous funding offer or funding plan approach. The final most advantageous plan may include funding from a single agency or could include partial funding from all the agencies and potential appropriations. As indicated, this is a process requiring time and intermediate adjustment as the process progresses.

The following table provides a potential timeline for overall funding and project implementation. Expectations and adjustment of results will occur as the timeline progresses and evolves.

Table 8-8 Projected Timeline Estimate

Task/Description	Estimated Timeline
WWFP/GSP Review and Approval	May 2025
Submit WWFP/GSP to ECY	May 2025
WWFP/GSP Review, Revisions, ECY approval	Aug – Sep 2025
Design Phase Timeline (funding dependent)	
Design funding:	
Submit PWB application for design loan/grant	May 2025
Submit ECY SCPPL request for design funding (potential 50% forgivable loan)	October 2025
Determine local contribution City will include (City decision)	July 2026
Design Engineering/P&S/bid documents	Sep 2025 – Aug 2026
ECY review/approval	Aug – Dec 2026
Environmental and Culture Review Process and Clearances	
If RD funding is utilized (see Construction Funding Acquisition), environmental clearances required prior to RD funding obligation. Conduct environmental in conjunction with design phase	Jan – Aug 2026
Construction Funding Acquisition	
Funding acquisition timeline is variable – duration could range from 1 year to 3 years, or longer, depending on availability of funding, City's tolerance of rate increase levels, and City involvement in appropriation requests • For planning, estimate 30-month (2.5 year) funding timeline	May 2025 – Oct 2027
Submit funding requests: • ECY SCPPL request construction funding • PWB construction funding • RD funding application (requires environmental clearances) • State appropriation request • Federal appropriation request	 Sep 2025 Jun 2025 (Jun 2026) Dec 2025 – Jan 2026 Jan 2026 (& 2027) Mar 2026 (& 2027)
After initial funding indications, assess whether a phased implementation plan is necessary. Developed proposed phasing plan, timeline, and cost breakouts anticipated	May 2026 – Dec 2026
IACC conference/set up tech team meeting Oct 2025 (and Oct 2026 if needed)	Oct 2025 (& 2026)
Monitoring / updating funding status and development; coordination	Monthly / Quarterly
Construction Phase (funding dependent)	
• Bid/award/notice to proceed	Jan – Mar 2028
• Construction phase	Apr 2028 – Oct 2029

Implementation steps forward for Entiat represents a significant challenge for the City due to the project cost. The most efficient and lowest overall project costs generally result when project improvements are kept integrated vs. breaking the project into two or more phases and extended over multiple years. However, phasing is frequently necessary and unavoidable to enable breaking up the cost impact and extending over several years to spread out the rate impact on the community.

Another factor that will likely affect funding acquisition efforts and timeline is that there is currently no mandate or administrative order from ECY requiring Entiat to complete the project. However, this could change in the future as capacity limits of the existing plant are further pressed and exceeded due the pressure for growth in Entiat.

During the funding acquisition process, considerations for phasing will need to be considered and assessed if a single integrated project scenario cannot be realized, due to cost. The preceding timeline table includes a step for considering and defining phasing for the project.

It is recommended Entiat initiate the steps forward outlined in the preceding **Table 8-8**, beginning with the WWFP/GSP approval and the initial submission of the funding application submittals outlined.

APPENDICES

Appendix A

Permit Information
Administrative Extension for NPDES Permit No. WA0051276, October 10, 2022
NPDES Permit No. WA0051276; Expiration: July 31, 2022

Appendix B

Needs Assessment
City of Entiat, WWTP and Collection System Needs Assessment RH2 Engineering, Inc. August 25, 2023

Appendix C

Collection System Hydraulic Model Outputs
Scenario: Existing Conditions
Scenario: Future, 20YR
Scenario: Future, 20YR with Improvements
Scenario: Future, 40YR
Scenario: Future, 40YR with Improvements
Manhole Summary Report

Appendix D

Sewer System Regulations
City Code Section 13.10 – Sewer System Regulations
City Code Section 13.20 – Utility Main Charges
City Code Section 13.25 – Developer Extension Connection Charges
City Code Section 13.30 – Municipal Equipment Usage
City Code Section 13.35 – Developer Extension manual

Appendix E

Mixing Zone and Effluent Temperature Attachments
PLUMES 2 Mixing Zone Data Sheets
Ecology Reasonable Potential Spreadsheet (NH3, CU, ZN)
Temperature Ecology Reasonable Potential Spreadsheet
Ambient River Data used for the ECY Cormix Model from 2016 Fact Sheet

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Environmental Documentation
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SEPA Documentation
SERP Documentation

APPENDIX A

Permit Information
Administrative Extension for NPDES Permit No. WA0051276, October 10, 2022
NPDES Permit No. WA0051276; Expiration: July 31, 2022

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Central Region Office
1250 West Alder St., Union Gap, WA 98903-0009 • 509-575-2490

October 10, 2022

Entiat POTW
Mark Botello
PO Box 228
Entiat, WA 98822-0228

Sent via email only: mbotello@entiatwa.us

RE: Administrative Extension for NPDES Permit No. WA0051276 for Entiat POTW, Effective 08/01/2022

Dear Mark Botello:

The Washington State Department of Ecology (Ecology) acknowledges receiving a NPDES permit application for Entiat POTW on 08/19/2021. The application was reviewed and accepted as complete on 08/24/2021. Your current NPDES permit has an expiration date of 07/31/2022. Renewal of your permit is in process; however, the permit may not be issued by the expiration date. If your new permit is not issued and effective by the current permit's expiration date, then the current permit and its terms and conditions are hereby administratively extended effective **08/01/2022**, the day following expiration of your existing permit**. It will remain in effect and enforceable until Ecology issues a new permit for your facility**, in accordance with the Washington Administrative Code 173-220-180(5).

That means your facility must continue to comply with the terms and conditions of the previous permit, issued on 06/21/2017. During the permit renewal process, Ecology may determine that additional information is necessary to complete the permit. In order to maintain complete application status, Entiat POTW must provide any additional information Ecology may request in a timely manner.

If you have any questions regarding the permitting process, please contact Stephanie Giesin at 509-504-0172 or Stephanie.giesin@ecy.wa.gov.

Sincerely,

Damon G. Roberts
Section Manager
Water Quality Program

e-c: Water Quality Fee Unit, Lacey
Stephanie Giesin, Ecology-Union Gap

Issuance Date: June 21, 2017
Effective Date: August 1, 2017
Expiration Date: July 31, 2022

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0051276

State of Washington
DEPARTMENT OF ECOLOGY
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

CITY OF ENTIAT
PUBLICLY-OWNED TREATMENT WORKS
PO BOX 228
ENTIAT, WA 98822

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location: 1947 Lakeshore Drive Entiat, WA 98822 Treatment Type: Class II Activated Sludge Sequencing Batch Reactor	Receiving Water: Columbia River at River Mile 485.0

David B. Bowen
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

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Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements. The following table is for quick reference only. Enforceable submittal requirements are contained in the permit narrative.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR) **Monthly**	Monthly	**September 15, 2017**
S3.A	DMR **Semiannual**	Semi-Annual	**January 15, 2018**
S3.F	Reporting Permit Violations	As necessary	
S4.B	Plans for Maintaining Adequate Capacity	As necessary	
S4.D	Notification of New or Altered Sources	As necessary	
S4.E	Infiltration and Inflow Evaluation	1/permit cycle	**July 31, 2021**
S4.F	Wasteload Assessment	1/permit cycle	**July 31, 2021**
S5.F	Bypass Notification	As necessary	
S5.G	Operations and Maintenance Manual Review	Annually	**As needed**
S6.D	Industrial User Survey Submittal	As needed	
S8	Application for Permit Renewal	1/permit cycle	**July 31, 2021**
S9.A	Acute Toxicity: Written Report	Twice per permit cycle Winter/ Summer 2021	**July 31, 2021**
S.A	Chronic Toxicity: Written Report	Twice per permit cycle Winter/Summer 2021	**July 31, 2021**
S11	Priority Pollutant scans	Twice per permit cycle Winter/Summer 2021	**July 31, 2021**
G1	Notice of Change in Authorization	As necessary	
G4	Reporting Planned Changes	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G20	Compliance Schedules	As necessary	
G21	Contract Submittal	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Effluent limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on **August 1, 2017**, the Permittee may discharge treated wastewater to the Columbia River at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 **Latitude 47.678056 Longitude -120.205556**		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 mg/L, 38 lbs/day 85% removal of influent BOD_5	45 mg/L, 56 lbs/day
Total Suspended Solids (TSS)	30 mg/L, 38 lbs/day 85% removal of influent BOD_5	45 mg/L, 56 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.5 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100 CFU/100 milliliter (mL)	200 CFU/100 mL

a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.
b	Average weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.
c	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf

S1.B. Mixing zone authorization

Mixing zone for Outfall 001

The paragraphs below defines the maximum boundaries of the mixing zones.

Chronic mixing zone

The width of the chronic mixing zone is limited to a distance of 97.8 feet. The length of the chronic mixing zone extends 300 feet upstream and 30 feet downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute mixing zone

The width of the acute mixing zone is limited to a distance of 11.5 feet in any horizontal direction from the outfall. The length of the acute mixing zone extends 3 feet upstream and 30 feet downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

Available Dilution (dilution factor)	
Acute Aquatic Life Criteria	48
Chronic Aquatic Life Criteria	217

S2. Monitoring requirements

S2.A. Monitoring Schedule

The Permittee must monitor the wastewater according to the following schedule. The Permittee must use the specified analytical methods unless the method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136. If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report. If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

Parameter	Units	Minimum Sampling Frequency	Sample Type
Wastewater Influent			
Wastewater Influent means the raw sewage flow. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
Flow	MGD	Continuous [a]	Metered
BOD_5	mg/L	1/week	24-hour composite
BOD_5	lbs/Day	1/week	Calculation
TSS	mg/L	1/week	24-hour composite
TSS	lbs/Day	1/week	Calculation
Final Wastewater Effluent			
Final Wastewater Effluent means wastewater, which is exiting, or has exited, the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The Permittee may take effluent samples for the BOD_5 analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.			
BOD_5	mg/L	1/week	24-hour Composite [b]
BOD_5	lbs/day	1/week	Calculation [c]
BOD_5	% removal	1/month [d]	Calculation [e]
TSS	mg/L	1/week	24-hour Composite
TSS	lbs/day	1/week	Calculation
TSS	% removal	1/month	Calculation
Fecal Coliform [f]	CFUs100 mL	1/week	Grab [g]
Total ammonia	mg/L	2/month	Grab
Total ammonia	lbs/day	Monthly	Calculation
pH	Standard Units	5/week [h]	Grab
Dissolved Oxygen	mg/L	1/week	Grab
Temperature [i]	°C	1/week	Grab
Permit Application Requirements – Final Wastewater Effluent			
Total Kjeldahl Nitrogen as N	mg/L	2/year [j]	24-hour Composite
Nitrate plus Nitrite as N	mg/L	2/year	24-hour Composite
Oil and Grease	mg/L	2/year	Grab
Phosphorus (Total)	mg/L	2/year	24-hour Composite
Total Dissolved Solids	mg/L	2/year	24-hour Composite
Total Nitrogen	mg/L	2/year	24-hour Composite
Alkalinity	mg/L	2/year	24-hour Composite
Total Hardness	mg/L	2/year	24-hour Composite
Arsenic, Total	mg/L	2/year	Grab
Copper, Total	mg/L	2/year	Grab
Cyanide, Total	mg/L	2/year	Grab
Lead, Total	mg/L	2/year	Grab
Mercury, Total	mg/L	2/year	Grab
Zinc, Total	mg/L	2/year	Grab
Acute Toxicity	See Special Condition S9		Grab
Chronic Toxicity	See Special Condition S10		Grab

Parameter	Units	Minimum Sampling Frequency	Sample Type
Effluent Priority Pollutant Scan	See Special Condition S11		Grab

a	Continuous means uninterrupted except for brief lengths of time for calibration, for power failure, or for unanticipated equipment repair or maintenance. The Permittee must sample Describe Frequency when continuous monitoring is not possible.
b	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
c	Calculation means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day
d	1/month means once every calendar month during alternate weeks.
e	Calculate the Percent (%) removal of BOD and TSS using the following algorithm (concentrations in mg/L): (Average Monthly Influent Concentration - Average Monthly Effluent Concentration)/Average Monthly Influent Concentration.
f	Report a numerical value for fecal coliforms following the procedures in Ecology's *Information Manual for Wastewater Treatment Plant Operators*, Publication Number 04-10-020 available at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html . Do not report a result as too numerous to count (TNTC).
g	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
h	5/week means five (5) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.
i	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature which is usually in the late afternoon. If temperature is measured continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. To determine the daily average, use the temperature on the half-hour from the chart for the twenty-four (24) hour period and calculate the average of the values. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.
j	2/year means two (2) times each year on alternating quarters. Submit data on the Biannual DMR.

S2.B. Flow measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:

    a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.
    b. Must calibrate continuous pH measurement instruments using a grab

sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.

c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.

4. Calibrate micro-recording temperature devices, known as thermistors, using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams Version 1.0 10/26/2011*). This document is available online at: http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_Cont_Temp_Mon_Ambient_v1_0EAP080.pdf

   Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.

5. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
6. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

S2.C. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

S2.D. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on **August 1, 2017.** The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for the Water Quality Permitting Portal go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

2. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

3. The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

4. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:

   a. Submit **monthly** DMRs by the 15th day of the following month.
   b. Submit **semi-annual DMRs**, unless otherwise specified in the permit, by July 15 and January 15 for the previous calendar year. The semi-annual sampling periods each calendar year of the permit cycle.

5. Enter the "No Discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

6. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.

7. Report single analytical values between the detection level (DL) and the quantitation level (QL) by entering the estimated value, the code for estimated value/below quantitation limit (j) and any additional information in the comments. Submit a copy of the laboratory report as an attachment using WQWebDMR.

8. **Not** report zero for bacteria monitoring. Report as required by the laboratory method.

9. Calculate and report an arithmetic average value for each day for bacteria if multiple samples were taken in one day.

10. Calculate the geometric mean values for bacteria (unless otherwise specified in the permit) using:

    a. The reported numeric value for all bacteria samples measured above the detection value except when it took multiple samples in one day. If the Permittee takes multiple samples in one day it must use the arithmetic average for the day in the geometric mean calculation.
    b. The detection value for those samples measured below detection.

11. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.

12. Calculate average values and calculated total values (unless otherwise specified in the permit) using:

    a. The reported numeric value for all parameters measured between the detection value and the quantitation value for the sample analysis.
    b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
    c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

13. Report single-sample grouped parameters (for example: priority pollutants,

PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary).

S3.B. Permit Submittals and Schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must immediately report to Ecology and the Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses resulting in a discharge.
- Any other failures of the sewage system (pipe breaks, etc).

Central Regional Office	509-575-2490
Department of Health,	1-800-521-0323 (business hours)
Drinking Water Program	1-877-481-4901 (after business hours)
Chelan Douglas Health	509-886-6400 (M-F, 8-5)
District	509-886-6499 (after business hours)

Additionally, for any sanitary sewer overflow (SSO) that discharges to a municipal separate storm sewer system (MS4), the Permittee must notify the appropriate MS4 owner or operator.

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours

from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the

terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of Oil or Hazardous Materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

b. Failure to submit relevant or correct facts

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 Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Facility loading

S4.A. Design criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Parameter	Design Quantity
Monthly average flow (max. month)	0.15 MGD
BOD_5 influent loading	250 lbs/day
TSS influent loading	250 lbs/day

S4.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and schedule content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system
3. Limits on future sewer extensions or connections or additional waste loads
4. Modification or expansion of facilities
5. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

S4.C. Duty to mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of new or altered sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:

   a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
   b. Is not part of an approved general sewer plan or approved plans and specifications.
   c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.

2. This notice must include an evaluation of the wastewater treatment plant’s

ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S4.E. Infiltration and inflow evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, I/I Analysis and Project Certification, available as Publication No. 97-03 at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html
2. The Permittee may use monitoring records to assess measurable infiltration and inflow.
3. The Permittee must prepare a report summarizing any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule to locate the sources of infiltration and inflow and to correct the problem.
4. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions **by July 31, 2021.**

S4.F. Wasteload assessment

The Permittee must conduct an assessment of its influent flow and waste load and submit a report to Ecology **by July 31, 2021**. The report must contain:

1. A description of compliance or noncompliance with the permit effluent limits.
2. A comparison between the existing and design:

    a. Monthly average dry weather and wet weather flows.
    b. Peak flows.
    c. BOD_5 loading.
    d. Total suspended solids loadings.

3. The percent change in the above parameters since the previous report (except for the first report).
4. The present and design population or population equivalent.
5. The projected population growth rate.
6. The estimated date upon which the Permittee expects the wastewater treatment plant to reach design capacity, according to the most restrictive of the parameters above.

Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. Operation and maintenance

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

S5.A. Certified operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class II plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class I plant must be in charge during all regularly scheduled shifts. The Permittee must notify Ecology when the operator in charge at the facility changes. It must provide the new operator's name and certification level and provide the name of the operator leaving the facility.

S5.B. Operation and maintenance program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.
2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.

S5.C. Short-term reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and

such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

S5.D. Electrical power failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

S5.E. Prevent connection of inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass procedures

A bypass is the intentional diversion of waste streams from any portion of a treatment facility. This permit prohibits all bypasses except when the bypass is for essential maintenance, as authorized in special condition S5.F.1, or is approved by Ecology as an anticipated bypass following the procedures in S5.F.2.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit allows bypasses for essential maintenance of the treatment system

when necessary to ensure efficient operation of the system. The Permittee may bypass the treatment system for essential maintenance only if doing so does not cause violations of effluent limits. The Permittee is not required to notify Ecology when bypassing for essential maintenance. However the Permittee must comply with the monitoring requirements specified in special condition S2.B.

2. Anticipated bypasses for non-essential maintenance

   Ecology may approve an anticipated bypass under the conditions listed below. This permit prohibits any anticipated bypass that is not approved through the following process.

   a. If a bypass is for non-essential maintenance, the Permittee must notify Ecology, if possible, at least ten (10) days before the planned date of bypass. The notice must contain:

      - A description of the bypass and the reason the bypass is necessary.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the potential impacts from the proposed bypass.
      - A cost-effectiveness analysis of alternatives.
      - The minimum and maximum duration of bypass under each alternative.
      - A recommendation as to the preferred alternative for conducting the bypass.
      - The projected date of bypass initiation.
      - A statement of compliance with SEPA.
      - A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
      - Details of the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

   b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project-specific engineering report as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will determine if the Permittee has met the conditions of special condition S5.F.2 a and b and consider the following prior to issuing a determination letter, an administrative order, or a permit modification as appropriate for an anticipated bypass:

- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.
- If the bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.
- If feasible alternatives to the bypass exist, such as:
  - The use of auxiliary treatment facilities.
  - Retention of untreated wastes.
  - Stopping production.
  - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance.
  - Transport of untreated wastes to another treatment facility.

S5.G. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-080(1) through (5), the O&M Manual must be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008. The O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.
5. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
6. The treatment plant process control monitoring schedule.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

S6. Pretreatment

S6.A. General requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

S6.B. Duty to enforce discharge prohibitions

1. Under federal regulations (40 CFR 403.5(a) and (b)), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC 173-216-060.

2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:

    a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than

140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).

b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.
c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.
d. Any pollutant, including oxygen-demanding pollutants, (BOD_5, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.
e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.
f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.
g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.
h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.
i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).

3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:

   a. Noncontact cooling water in significant volumes.
   b. Stormwater and other direct inflow sources.
   c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.

4. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

S6.C. Wastewater discharge permit required

The Permittee must:

1. Establish a process for authorizing non-domestic wastewater discharges that ensures all SIUs in all tributary areas meet the applicable state waste discharge permit (SWDP) requirements in accordance with chapter 90.48 RCW and chapter 173-216 WAC.
2. Immediately notify Ecology of any proposed discharge of wastewater from a source, which may be a significant industrial user (SIU) [see fact sheet definitions or refer to 40 CFR 403.3(v)(i)(ii)].
3. Require all SIUs to obtain a SWDP from Ecology prior to accepting their non-domestic wastewater, or require proof that Ecology has determined they do not require a permit.
4. Require the documentation as described in S6.C.3 at the earliest practicable date as a condition of continuing to accept non-domestic wastewater discharges from a previously undiscovered, currently discharging and unpermitted SIU.
5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses.
6. Keep all records documenting that its users have met the requirements of S6.C.

S6.D. Identification and reporting of existing, new, and proposed industrial users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see **Appendix C** of the fact sheet for definitions).
2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be a significant industrial user (SIU), the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.
3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S6.E. Sewer-Use Ordinance

The Permittee must review, and update as needed, its sewer-use ordinance. The ordinance must contain general and specific prohibitions as described in S6.D. above. A copy of the updated ordinance must be sent to Ecology for review prior to its adoption.

S7. Solid wastes

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by **July 31, 2021**.

The Permittee must also submit a new application or addendum at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S9. Acute toxicity

S9.A. Testing Requirements

The Permittee must test final effluent at least twice in 2020 - one sample in summer and another in winter prior to submission of the application for permit renewal. The two species listed below must be used on each sample and the results submitted to Ecology as a part of the permit renewal application process.

The Permittee must conduct acute toxicity testing on a series of five concentrations of effluent and a control in order to be able to determine appropriate point estimates and an NOEC. The percent survival in 100% effluent must also be reported.

Acute toxicity tests must be conducted with the following species and protocols:

Freshwater Acute Test	Species	Method
Fathead minnow	*Pimephales promelas*	EPA-821-R-02-012
Water flea	*Ceriodaphnia dubia*	EPA-821-R-02-012

S9.B. Sampling and Reporting Requirements

1. All reports for effluent characterization or compliance monitoring must be submitted in accordance with the most recent version of Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* in regards to format and content. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data on floppy disk for electronic entry into Ecology's database, then the Permittee must send the disk to Ecology along with the test report, bench sheets, and reference toxicant results.
2. **Testing must be conducted on grab effluent samples**. Samples taken for toxicity testing must be cooled to 4 degrees Celsius while being collected and must be sent to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was ended.
3. All samples and test solutions for toxicity testing must have water quality measurements as specified in Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* or most recent version thereof.
4. All toxicity tests must meet quality assurance criteria and test conditions in the most recent versions of the EPA manual listed in subsection A and Ecology of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If test results are determined to be invalid or anomalous by Ecology, testing must be repeated with freshly collected effluent.
5. Control water and dilution water must be laboratory water meeting the requirements of the EPA manual listed in subsection A or pristine natural water of sufficient quality for good control performance.
6. Effluent samples for whole effluent toxicity testing must be collected just prior to the chlorination step in the treatment process.
7. The Permittee may choose to conduct a full dilution series test during compliance monitoring in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include **the acute critical effluent concentration (ACEC). The ACEC equals 14.6%.**

8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing, and do not comply with the acute statistical power standard of 29% as defined in WAC 173-205-020, must be repeated on a fresh sample with an increased number of replicates to increase the power.
9. The Permittee must coordinate with its Significant Industrial User (SIU) to sample when the SIU is discharging at near maximum levels.
10. The Permittee must submit the **Acute Toxicity Summary Reports to Ecology by July 31, 2021** (with their application for permit renewal).

S10. Chronic toxicity

S10.A. Testing Requirements

The Permittee must test final effluent at least twice in 2020 - one sample in summer and another in winter prior to submission of the application for permit renewal. The two species listed below must be used on each sample and the results submitted to Ecology as a part of the permit renewal application process.

Chronic toxicity tests must be conducted with the following species and protocols:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

S10.B. Sampling and Reporting Requirements

1. All reports for effluent characterization or compliance monitoring must be submitted in accordance with the most recent version of Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* in regards to format and content. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data on floppy disk for electronic entry into Ecology's database, then the Permittee must send the disk to Ecology along with the test report, bench sheets, and reference toxicant results.
2. **Testing must be conducted on grab effluent samples.** Samples taken for toxicity testing must be cooled to 4 degrees Celsius while being collected and must be sent to the lab immediately upon completion. The lab must begin the

toxicity testing as soon as possible but no later than 36 hours after sampling was ended.

3. All samples and test solutions for toxicity testing must have water quality measurements as specified in Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* or most recent version thereof.
4. All toxicity tests must meet quality assurance criteria and test conditions in the most recent versions of the EPA manual listed in subsection A and Ecology of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If test results are determined to be invalid or anomalous by Ecology, testing must be repeated with freshly collected effluent.
5. Control water and dilution water must be laboratory water meeting the requirements of the EPA manual listed in subsection A or pristine natural water of sufficient quality for good control performance.
6. Effluent samples for whole effluent toxicity testing must be collected just prior to the chlorination step in the treatment process.
7. The Permittee may choose to conduct a full dilution series test during compliance monitoring in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the ACEC and **the chronic critical effluent concentration (CCEC). The CCEC equals 4.6%.** The Permittee must compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing, and do not comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020, must be repeated on a fresh sample with an increased number of replicates to increase the power.
9. The Permittee must coordinate with its Significant Industrial User (SIU) to sample when the SIU is discharging at near maximum discharge.
10. The Permittee must submit the **Chronic Toxicity Summary Reports** to Ecology by **July 31, 2021.**

S11. ADDITIONAL CHEMICAL ANALYSIS OF EFFLUENT

S11.A. General Requirements

The Permittee must conduct two chemical analyses on effluent samples collected from the wastewater treatment system in accordance with protocols, monitoring requirements, and QA/QC procedures specified in this section. **The sampling must occur simultaneously with WET Test sampling in the summer of 2020 and winter of 2020.**

The effluent samples must be analyzed for concentrations of the priority pollutants given in Tables II and III of Appendix D of 40 CFR Part 122, as amended. The grab samples must also be analyzed for any other pollutants expected from non-domestic sources. Results of the two effluent analyses must be summarized and **submitted to Ecology by July 31, 2021** (with the submittal of the application for permit renewal).

S11.B. Monitoring Requirements

The POTW effluent must be sampled on a day when industrial discharges are occurring at normal to maximum levels. The samples for the analysis of acid and base/neutral extractable compounds and metals must be a grab sample. The analysis of volatile organic compounds, cyanide, and FOG (fats, oils, and grease) must be collected using grab sampling techniques at equal intervals for the total of four grab samples per day. Unless otherwise indicated, all reported test data for metals must represent the total amount of the constituent present in all phases, whether solid, suspended, dissolved, elemental, or combined including all oxidation states.

S11.C. Protocols

The Permittee must have the final effluent sample handled, prepared, and analyzed by GC/MC in accordance with the EPA Methods 624 and 625 (October 26, 1984). All other tests not applicable to analysis by GC/MC must be conducted in accordance with 40 CFR Part 136.

S11.D. Quality Assurance/Quality Control Procedures

The Permittee must follow the quality assurance procedures of 40 CFR Part 136.

General Conditions

G1. Signatory requirements

1. All applications submitted to Ecology must be signed and certified.

   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      - A president, secretary, treasurer, or vice-president of the corporation in charge

of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or

- The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. In the case of a partnership, by a general partner.

c. In the case of sole proprietorship, by the proprietor.

d. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity must be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to Ecology.

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any

reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:

   a. Violation of any permit term or condition.

b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
c. A material change in quantity or type of waste disposal.
d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.
e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.
f. Nonpayment of fees assessed pursuant to RCW 90.48.465.
g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

a. A material change in the condition of the waters of the state.
b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

a. When cause exists for termination for reasons listed in 1.a through 1,g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.
b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or

additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
2. A significant change in the nature or an increase in quantity of pollutants discharged.
3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification

   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.
b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.

2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.F.
4. The Permittee complied with any remedial measures required under S3.F of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit must, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Service agreement review

The Permittee must submit to Ecology any proposed service agreements and proposed revisions or updates to existing agreements for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW as required by RCW 70.150.040(9). In the event that Ecology does not comment within a thirty-day (30) period, the Permittee may assume consistency and proceed with the service agreement or the revised/updated service agreement.

Appendix A
LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

The lists below include conventional pollutants (as defined in CWA section 502(6) and 40 CFR Part 122.), toxic or priority pollutants as defined in CWA section 307(a)(1) and listed in 40 CFR Part 122 Appendix D, 40 CFR Part 401.15 and 40 CFR Part 423 Appendix A), and nonconventionals. 40 CFR Part 122 Appendix D (Table V) also identifies toxic pollutants and hazardous substances which are required to be reported by dischargers if expected to be present. This permit appendix A list does not include those parameters.

CONVENTIONAL POLLUTANTS

Pollutant	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL) [2] *µg/L unless specified*
Biochemical Oxygen Demand		SM5210-B		2 mg/L
Biochemical Oxygen Demand, Soluble		SM5210-B [3]		2 mg/L
Fecal Coliform		SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
Oil and Grease (HEM) (Hexane Extractable Material)		1664 A or B	1,400	5,000
pH		SM4500-H^+ B	N/A	N/A
Total Suspended Solids		SM2540-D		5 mg/L

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Alkalinity, Total		SM2320-B		5 mg/L as CaCO3
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH3-B and C/D/E/G/H		20
Barium Total	7440-39-3	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)		EPA SW 846 8021/8260	1	2
Boron, Total	7440-42-8	200.8	2.0	10.0
Chemical Oxygen Demand		SM5220-D		10 mg/L
Chloride		SM4500-Cl B/C/D/E and SM4110 B		Sample and limit dependent
Chlorine, Total Residual		SM4500 Cl G		50.0
Cobalt, Total	7440-48-4	200.8	0.05	0.25
Color		SM2120 B/C/E		10 color units

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Dissolved oxygen		SM4500-OC/OG		0.2 mg/L
Flow		Calibrated device		
Fluoride	16984-48-8	SM4500-F E	25	100
Hardness, Total		SM2340B		200 as CaCO3
Iron, Total	7439-89-6	200.7	12.5	50
Magnesium, Total	7439-95-4	200.7	10	50
Manganese, Total	7439-96-5	200.8	0.1	0.5
Molybdenum, Total	7439-98-7	200.8	0.1	0.5
Nitrate + Nitrite Nitrogen (as N)		SM4500-NO3- E/F/H		100
Nitrogen, Total Kjeldahl (as N)		SM4500-N_{org}B/C and SM4500NH_3-B/C/D/EF/G/H		300
NWTPH Dx [4]		Ecology NWTPH Dx	250	250
NWTPH Gx [5]		Ecology NWTPH Gx	250	250
Phosphorus, Total (as P)		SM 4500 PB followed by SM4500-PE/PF	3	10
Salinity		SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids		SM2540 -F		Sample and limit dependent
Soluble Reactive Phosphorus (as P)		SM4500-P E/F/G	3	10
Sulfate (as mg/L SO_4)		SM4110-B		0.2 mg/L
Sulfide (as mg/L S)		SM4500-S^2F/D/E/G		0.2 mg/L
Sulfite (as mg/L SO_3)		SM4500-SO3B		2 mg/L
Temperature (max. 7-day avg.)		Analog recorder or Use micro-recording devices known as thermistors		0.2º C
Tin, Total	7440-31-5	200.8	0.3	1.5
Titanium, Total	7440-32-6	200.8	0.5	2.5

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Total Coliform		SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total Organic Carbon		SM5310-B/C/D		1 mg/L
Total dissolved solids		SM2540 C		20 mg/L

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS					
Antimony, Total	114	7440-36-0	200.8	0.3	1.0
Arsenic, Total	115	7440-38-2	200.8	0.1	0.5
Beryllium, Total	117	7440-41-7	200.8	0.1	0.5
Cadmium, Total	118	7440-43-9	200.8	0.05	0.25
Chromium (hex) dissolved	119	18540-29-9	SM3500-Cr C	0.3	1.2
Chromium, Total	119	7440-47-3	200.8	0.2	1.0
Copper, Total	120	7440-50-8	200.8	0.4	2.0
Lead, Total	122	7439-92-1	200.8	0.1	0.5
Mercury, Total	123	7439-97-6	1631E	0.0002	0.0005
Nickel, Total	124	7440-02-0	200.8	0.1	0.5
Selenium, Total	125	7782-49-2	200.8	1.0	1.0
Silver, Total	126	7440-22-4	200.8	0.04	0.2
Thallium, Total	127	7440-28-0	200.8	0.09	0.36
Zinc, Total	128	7440-66-6	200.8	0.5	2.5
Cyanide, Total	121	57-12-5	335.4	5	10
Cyanide, Weak Acid Dissociable	121		SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	121		SM4500-CN G	5	10

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS					
Phenols, Total	65		EPA 420.1		50

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
ACID COMPOUNDS					
2-Chlorophenol	24	95-57-8	625	1.0	2.0
2,4-Dichlorophenol	31	120-83-2	625	0.5	1.0
2,4-Dimethylphenol	34	105-67-9	625	0.5	1.0
4,6-dinitro-o-cresol (2-methyl-4,6,-dinitrophenol)	60	534-52-1	625/1625B	2.0	4.0
2,4 dinitrophenol	59	51-28-5	625	1.5	3.0
2-Nitrophenol	57	88-75-5	625	0.5	1.0
4-Nitrophenol	58	100-02-7	625	1.0	2.0
Parachlorometa cresol (4-chloro-3-methylphenol)	22	59-50-7	625	1.0	2.0
Pentachlorophenol	64	87-86-5	625	0.5	1.0
Phenol	65	108-95-2	625	2.0	4.0
2,4,6-Trichlorophenol	21	88-06-2	625	2.0	4.0

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
VOLATILE COMPOUNDS					
Acrolein	2	107-02-8	624	5	10
Acrylonitrile	3	107-13-1	624	1.0	2.0
Benzene	4	71-43-2	624	1.0	2.0
Bromoform	47	75-25-2	624	1.0	2.0

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
VOLATILE COMPOUNDS					
Carbon tetrachloride	6	56-23-5	624/601 or SM6230B	1.0	2.0
Chlorobenzene	7	108-90-7	624	1.0	2.0
Chloroethane	16	75-00-3	624/601	1.0	2.0
2-Chloroethylvinyl Ether	19	110-75-8	624	1.0	2.0
Chloroform	23	67-66-3	624 or SM6210B	1.0	2.0
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624	1.0	2.0
1,2-Dichlorobenzene	25	95-50-1	624	1.9	7.6
1,3-Dichlorobenzene	26	541-73-1	624	1.9	7.6
1,4-Dichlorobenzene	27	106-46-7	624	4.4	17.6
Dichlorobromomethane	48	75-27-4	624	1.0	2.0
1,1-Dichloroethane	13	75-34-3	624	1.0	2.0
1,2-Dichloroethane	10	107-06-2	624	1.0	2.0
1,1-Dichloroethylene	29	75-35-4	624	1.0	2.0
1,2-Dichloropropane	32	78-87-5	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) [6]	33	542-75-6	624	1.0	2.0
Ethylbenzene	38	100-41-4	624	1.0	2.0
Methyl bromide (Bromomethane)	46	74-83-9	624/601	5.0	10.0
Methyl chloride (Chloromethane)	45	74-87-3	624	1.0	2.0
Methylene chloride	44	75-09-2	624	5.0	10.0
1,1,2,2-Tetrachloroethane	15	79-34-5	624	1.9	2.0
Tetrachloroethylene	85	127-18-4	624	1.0	2.0
Toluene	86	108-88-3	624	1.0	2.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624	1.0	2.0
1,1,1-Trichloroethane	11	71-55-6	624	1.0	2.0
1,1,2-Trichloroethane	14	79-00-5	624	1.0	2.0
Trichloroethylene	87	79-01-6	624	1.0	2.0
Vinyl chloride	88	75-01-4	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Acenaphthene	1	83-32-9	625	0.2	0.4
Acenaphthylene	77	208-96-8	625	0.3	0.6
Anthracene	78	120-12-7	625	0.3	0.6
Benzidine	5	92-87-5	625	20	40
Benzyl butyl phthalate	67	85-68-7	625	0.3	0.6
Benzo(*a*)anthracene	72	56-55-3	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) [7]	74	205-99-2	610/625	0.8	1.6
Benzo(j)fluoranthene [7]		**205-82-3**	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) [7]	75	207-08-9	610/625	0.8	1.6
Benzo(r,s,t)pentaphene		**189-55-9**	625	1.3	5.0
Benzo(*a*)pyrene	73	50-32-8	610/625	0.5	1.0
Benzo(*ghi*)Perylene	79	191-24-2	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane	43	111-91-1	625	5.3	21.2
Bis(*2-chloroethyl*)ether	18	111-44-4	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether	42	39638-32-9	625	0.5	1.0
Bis(*2-ethylhexyl*)phthalate	66	117-81-7	625	0.3	1.0
4-Bromophenyl phenyl ether	41	101-55-3	625	0.3	0.5
2-Chloronaphthalene	20	91-58-7	625	0.3	0.6
4-Chlorophenyl phenyl ether	40	7005-72-3	625	0.3	0.5
Chrysene	76	218-01-9	610/625	0.3	0.6
Dibenzo (a,h)acridine		**226-36-8**	610M/625M	2.5	10.0
Dibenzo (a,j)acridine		**224-42-0**	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (1,2,5,6-dibenzanthracene)	82	53-70-3	625	0.8	1.6
Dibenzo(a,e)pyrene		192-65-4	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene		189-64-0	625M	2.5	10.0
3,3-Dichlorobenzidine	28	91-94-1	605/625	2.0	14.0
Diethyl phthalate	70	84-66-2	625	1.9	7.6
Dimethyl phthalate	71	131-11-3	625	1.6	6.4

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Di-n-butyl phthalate	68	84-74-2	625	0.5	1.0
2,4-dinitrotoluene	35	121-14-2	609/625	1.0	2.0
2,6-dinitrotoluene	36	606-20-2	609/625	1.0	2.0
Di-n-octyl phthalate	69	117-84-0	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*)	37	122-66-7	1625B	5.0	20
Fluoranthene	39	206-44-0	625	0.3	0.6
Fluorene	80	86-73-7	625	0.3	0.6
Hexachlorobenzene	9	118-74-1	612/625	0.3	0.6
Hexachlorobutadiene	52	87-68-3	625	0.5	1.0
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	2.0	4.0
Hexachloroethane	12	67-72-1	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene	83	193-39-5	610/625	0.5	1.0
Isophorone	54	78-59-1	625	0.5	1.0
3-Methyl cholanthrene		**56-49-5**	625	2.0	8.0
Naphthalene	55	91-20-3	625	0.4	0.75
Nitrobenzene	56	98-95-3	625	0.5	1.0
N-Nitrosodimethylamine	61	62-75-9	607/625	2.0	4.0
N-Nitrosodi-n-propylamine	63	621-64-7	607/625	0.5	1.0
N-Nitrosodiphenylamine	62	86-30-6	625	1.0	2.0
Perylene		**198-55-0**	625	1.9	7.6
Phenanthrene	81	85-01-8	625	0.3	0.6
Pyrene	84	129-00-0	625	0.3	0.6
1,2,4-Trichlorobenzene	8	120-82-1	625	0.3	0.6

PRIORITY POLLUTANT	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
DIOXIN					
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (2,3,7,8 TCDD)	129	1746-01-6	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
PESTICIDES/PCBs					
Aldrin	89	309-00-2	608	0.025	0.05
alpha-BHC	102	319-84-6	608	0.025	0.05
beta-BHC	103	319-85-7	608	0.025	0.05
gamma-BHC (Lindane)	104	58-89-9	608	0.025	0.05
delta-BHC	105	319-86-8	608	0.025	0.05
Chlordane [8]	91	57-74-9	608	0.025	0.05
4,4'-DDT	92	50-29-3	608	0.025	0.05
4,4'-DDE	93	72-55-9	608	0.025	0.05
4,4' DDD	94	72-54-8	608	0.025	0.05
Dieldrin	90	60-57-1	608	0.025	0.05
alpha-Endosulfan	95	959-98-8	608	0.025	0.05
beta-Endosulfan	96	33213-65-9	608	0.025	0.05
Endosulfan Sulfate	97	1031-07-8	608	0.025	0.05
Endrin	98	72-20-8	608	0.025	0.05
Endrin Aldehyde	99	7421-93-4	608	0.025	0.05
Heptachlor	100	76-44-8	608	0.025	0.05
Heptachlor Epoxide	101	1024-57-3	608	0.025	0.05
PCB-1242 [9]	106	53469-21-9	608 - Modified	0.05	0.2
PCB-1254	107	11097-69-1	608 - Modified	0.05	0.2
PCB-1221	108	11104-28-2	608 - Modified	0.05	0.2
PCB-1232	109	11141-16-5	608 - Modified	0.05	0.2

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
PESTICIDES/PCBs					
PCB-1248	110	12672-29-6	608 - Modified	0.05	0.2
PCB-1260	111	11096-82-5	608 - Modified	0.05	0.2
PCB-1016 [9]	112	12674-11-2	608 - Modified	0.05	0.2
Toxaphene	113	8001-35-2	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
   ALSO GIVEN AS:
   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

3. Soluble Biochemical Oxygen Demand method note: First, filter the sample through a Millipore Nylon filter (or equivalent) - pore size of 0.45-0.50 um (prep all filters by filtering 250 ml of laboratory grade deionized water through the filter and discard). Then, analyze sample as per method 5210-B.

4. NWTPH Dx - Northwest Total Petroleum Hydrocarbons Diesel Extended Range – see http://www.ecy.wa.gov/biblio/97602.html

5. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see http://www.ecy.wa.gov/biblio/97602.html

6. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

8. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 0.025/0.050.

9. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

APPENDIX B

Needs Assessment

City of Entiat, WWTP and Collection System Needs Assessment RH2 Engineering, Inc. August 25, 2023

Client:	City of Entiat
Project:	Collection Needs and WWTP Assessment
Project File:	ENT 220075.01
Project Manager:	John Ricardi, PE
Composed by:	Katrina Olson, EIT and Carter Zachow, EIT
Reviewed by:	Eric Smith, PE and John Ricardi, PE
Subject:	WWTP and Collection System Needs Assessment
Date:	August 25, 2023



Signed: 08/25/2023
Note: This stamp and signature applies to the WWTP Assessment.



Signed: 08/25/2023
Note: This stamp and signature applies to the Collection System Assessment.

Introduction

The City of Entiat (City) is currently experience significant interest in development of multiple areas throughout the City. The City desires to better understand the condition and capacity of their existing wastewater collection system and wastewater treatment plant (WWTP) to serve the existing and future needs of the City. This technical memorandum is intended to provide an overview the City's wastewater system and assess the basic need of the system going forward. This document is organized into two sections: the first section being the analysis of the Collection System; the section is the analysis of the WWTP. These systems were analyzed based on the best available information and the findings and recommendations are documented herein.

Collection System

Background

The City, with an estimated population of 1,459, maintains a wastewater collection system and treatment facility within the City limits serving a significant portion of the developed areas. Collection is performed using a conventional gravity system with the aid of six lift stations. The system primarily provides residential services, with some commercial and industrial services along US Highway 97A (US 97A) and Shamel Street.

Existing System Analyses

The collection system consists of approximately 61,000 linear feet (lf) of gravity main and 12,000 lf of pressure main. Much of the gravity system (49,000 lf of the total 61,000 lf) is 8-inch polyvinyl chloride (PVC) pipe. Exhibit 1 in Appendix A depicts the existing system. Exhibits referenced throughout this technical memorandum are included in Appendix A.

Data collected from the 2020 US Census reports the City has an average household size of 2.3. The City's *Standard Plan Guidebook* (Standard Plan) lists 100 gallons per day (gpd) per person as the design criteria for a dwelling. This results in a standard Equivalent Residential Unit (ERU) of 230 gpd. Using Chelan County GIS data, developed residential parcels along the collection system were each counted as one ERU. Significant non-residential sites, such as schools and the Entiat City Park (City Park), were estimated using the City's Standard Plan design basis, while flow for minor commercial and transition zones conservatively were estimated at 300 gpd (1.3 ERU) and 460 gpd (2 ERU) per acre, respectively. These values were taken from the City's *Wastewater Treatment Plant Facilities Plan and Plan to Maintain Adequate Capacity* (Facility Plan) from 2005, which developed flow projections for different zoning classifications within the City. The existing collection system was calculated to have approximately 596 ERUs, which is equal to 0.137 million gallons per day (MGD). GIS-derived data for existing users can be seen in Table 1, and assumptions for wastewater generation are listed in Table 2.

Table 1
Existing Users

Classification	Value	Unit
Residential Dwellings	491	dwelling
Developed Commercial Acreage	14	acre
Developed Transition Acreage	21.8	acre

Table 2
Assumed Flow Generation Per Source

Customer Type	Value	Unit	ERU
Residential Dwelling	230	gpd/dwelling	1.00 per dwelling
School	16	gpd/student	0.07 per student
Campsite (Tent)	50	gpd/site	0.22 per site
Campsite (RV)	100	gpd/site	0.43 per site
Commercial	300	gpd/acre	1.30 per acre
Transition	460	gpd/acre	2.00 per acre

The calculated flow of the system, (Table 3) is notably higher than the observed current Maximum Month Average Day Flow of 0.098 MGD at the treatment plant, as shown in Table 6 in the Wastewater Treatment Plant section of this technical memorandum. The ERU estimate is not an assessment of the actual flow volume entering the treatment plant, but rather a planning-level estimation of potential flows for the purposes of conservatively analyzing the hydraulic capacity of the collection system. Similarly, industrial flows are estimated conservatively for the hydraulic capacity analyses.

Table 3
Existing Basin Flow Distribution for Capacity Analyses

Basin No.	1	2	3	4	5	6	Total
ERUs	129	112	169	118	47	21	596
Flow (gpd)*	29,600	25,820	38,900	27,100	10,800	4,800	137,000
Peak Flow (gpm)	76	66	100	70	28	12	352

*Flow (gpd) rounded to the nearest 100 gpd.

From the daily flow, a maximum flow could be determined using the peak hourly flow calculation taken from the Washington State Department of Ecology's (Ecology) *Criteria for Sewage Works Design* (Orange Book).

$$\frac{Q_{\text{Peak Hourly}}}{Q_{\text{Average Annual}}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}} = peak\ factor$$

$$Where\ P = population\ in\ thousands.$$

This calculation results in a peak factor of 3.7 and a peak hourly flow of 352 gallons per minute (gpm).

Basin by Basin Analyses

For the purposes of this capacity analysis, the collection system was separated into basins to facilitate collection system analysis. Collection basins were identified using ArcGIS Pro, which helped delineate flow paths created from LiDAR data of the ground terrain. The basins were drawn to align with the existing system, with basin low points located at the existing lift stations. Exhibits 2 through 6 depict basin topography, and Exhibits 7 through 11 depict basin zoning (Appendix A). Using the GIS data derived in the previous section, ERUs were separated by basin boundaries, and the results are listed in Table 3.

Basin No. 1

Basin No. 1 lines the eastern boundary of the Urban Growth Area (UGA) and has an 8-inch trunkline that follows Saska Way and Entiat River Road before emitting into the School Street Lift Station. Basin No. 1 serves almost entirely residential dwellings and the school district. Much of the land within Basin No. 1 sits at a steep incline from the existing collection system, making additional lift stations unlikely if development pushes northwest. However, depending on existing system elevations, a potential pressure line may be required if service is to be provided to parcels in the southwest corner of the City limits.

Basin No. 2

Basin No. 2 receives wastewater pumped from Basin No. 1 on Entiat Way and conveys it along US 97A before cutting through the City Park to dispense in the Lakefront Lift Station. The trunkline is composed primarily of 8-inch pipe but transitions to 10-inch pipe when passing underneath the City Park. Basin No. 2 primarily serves residential areas but also serves the City Park's 26 tent sites and 29 recreational vehicle (RV) sites. Much of the basin is already served or within the serving range of the existing collection system. There is undeveloped land to the northwest, and the topography would facilitate linking this land with the two tributary sewers that discharge into the sewer trunkline.

Basin No. 3

Basin No. 3 has two trunklines that empty into the WWTP. The southern trunkline consists of 10-inch pipe that transitions to 12-inch pipe and conveys wastewater lifted from the Lakefront Lift Station in Basin No. 2. Between the Lakefront Lift Station's discharge point and the WWTP, there are only a few residential properties contributing to this trunkline's flow. The northern truckline consists of an 8-inch pipe receiving sewage discharge lifted from Basin No. 4's Shamel

Street Lift Station. The northern trunkline transitions into a 10-inch pipe and then returns to an 8-inch pipe as it turns onto Lakeshore Drive and feeds into the WWTP. Basin No. 3 serves a mixture of residential, commercial, and industrial areas, with tributary sewers in the west serving residential zones, while commercial and industrial zones adjoin the trunkline. Undeveloped land sits in the center and the east of Basin No. 3. Neither area would require lift stations as they slope continuously towards the existing system.

Basin No. 4

Basin No. 4 collects wastewater from both Basin Nos. 5 and 6 along US 97A and carries it south to the Shamel Street Lift Station. The trunkline consists of 8-inch pipe that also accepts wastewater from a tributary flowing from the west, which serves a residential development. This development also contains a low point in the north that the Stoneridge Lift Station addresses. This low point was not delineated as its own basin due to its small size and inability to be further developed. Basin No. 4 is bound by the Columbia River to the east and foothills to the west and is mostly developed. Undeveloped land zoned as Medium Density Residential sits in the southwest of the basin.

Basin No. 5

Basin No. 5 lies along the Columbia River in the northernmost section of the City's UGA. It serves commercial properties along US 97A and a group of waterfront residences along Lakeshore Drive that are largely developed. This basin's trunkline is a 2-inch low pressure system that flows into Basin No. 4 along US 97A.

Basin No. 6

Basin No. 6 sits along the foothills in the northwest of the UGA. It serves the Shadow Ridge housing development and currently undeveloped commercially designated properties. The trunkline of this basin consists of mostly 8-inch pipe and a stretch of 4-inch pipe along US 97A northwest of Lakeview Street. Basin No. 6 deposits into the Shadow Ridge Lift Station, which lifts the wastewater along US 97A to Basin No. 4.

The City's collection system utilizes a sequential pumping plan to move wastewater from distant basins to inner basins before reaching the WWTP. This is necessary to traverse the topography but puts increased load on the inner basin lift stations.

Existing Collection System Capacity Analyses

The City's gravity collection system is mostly 8-inch PVC pipe. Currently, there is not a survey of the City's collection system. When analyzed using a conservative slope of 0.5-percent and a growth rate of 2.82 percent per year, the collection system has the capacity to serve its current and future customers well into the future. However, it is advised that the City survey its collection system and perform detailed design review on all future developments to ensure that there are not specific geographical constraints to the system that cannot be analyzed at this time due to a lack of available collection system information. The following sections provide a high-level summary of each basin's capacity.

Methodology

Analyses in this section were made based on the following basic assumptions due to a lack of available data. A conservative estimate of a 0.5-percent slope and a Manning's coefficient of 0.0015 were assumed for all pipe slopes and pipe roughness coefficients. This assumption aligns with the City's design criteria of minimum sanitary sewer slopes, as outlined by the Standard Plan. Without information on lift station pump flow rates, wet well dimensions and pump specifications the pipe capacity analysis is only as accurate as the estimated contributing lift station flow rates. For this reason, it is recommended that flow meters be installed at each lift station, and lift station assessments be performed to determine wet well dimensions and pump specifications.

Basin No. 1

Basin No. 1 currently has 129 ERUs with a cumulative peak flow of 76 gpm. For an 8-inch line at a 0.5-percent slope, the allowable flow is approximately 318 gpm when the depth to diameter ratio is equal to 0.8. This results in the trunkline capacity being approximately 23.9-percent full.

A simple 2040 capacity projection with population growth at 2.82 percent per year would result in 78 additional ERUs, a peak flow of 122 gpm, and a trunkline capacity of approximately 38.3-percent full.

Basin No. 2

Basin No. 2 currently has 112 ERUs with a cumulative peak flow of 66 gpm. For an 8-inch line at a 0.5-percent slope, the allowable flow is approximately 318 gpm when the depth to diameter ratio is equal to 0.8. This results in the trunkline capacity being approximately 20.8-percent full.

A simple 2040 capacity projection with population growth at 2.82 percent per year would result in 68 additional ERUs, a peak flow of 106 gpm, and a trunkline capacity of approximately 33.3-percent full.

Basin No. 3

Basin No. 3 currently has 169 ERUs with a cumulative peak flow of 100 gpm. For an 8-inch line at a 0.5-percent slope, the allowable flow is approximately 318 gpm when the depth to diameter ratio is equal to 0.8. This results in the trunkline capacity being approximately 31.1-percent full.

A simple 2040 capacity projection with population growth at 2.82 percent per year would result in 103 additional ERUs, a peak flow of 160 gpm, and a trunkline capacity of approximately 50.2-percent full.

Basin No. 4

Basin No. 4 currently has 118 ERUs with a cumulative peak flow of 70 gpm. For an 8-inch line at a 0.5-percent slope, the allowable flow is approximately 318 gpm when the depth to diameter ratio is equal to 0.8. This results in the trunkline capacity being approximately 22.0-percent full.

A simple 2040 capacity projection with population growth at 2.82 percent per year would result in 103 additional ERUs, a peak flow of 160 gpm, and a trunkline capacity of approximately 50.2-percent full.

Basin No. 5

There currently is not enough information on Basin No. 5 to provide a capacity analysis aside from the current ERUs of 47 and peak flow of 28 gpm.

Basin No. 6

Basin No. 6 currently has 21 ERUs with a cumulative peak flow of 12 gpm. For a 4-inch line at a 0.5-percent slope, the allowable flow is approximately 51 gpm when the depth to diameter ratio is equal to 0.8. This results in the trunkline capacity being approximately 23.5-percent full.

A simple 2040 capacity projection with population growth at 2.82 percent per year would result in 13 additional ERUs, a peak flow of 160 gpm, and a trunkline capacity of approximately 37.1-percent full.

In summary, the basins have available capacity but it is important to note there needs to be further analysis completed on the City's sewer lift stations and WWTP to determine how much growth the overall sewer utility can support. Aging infrastructure and areas with consistent issues should be assessed. The City should commence a preventive maintenance program such as a sewer jetting and video inspection of the system on a bi-annual basis.

Existing Lift Station Capacity

Pump specifications, wet well size, and flow rate data were not provided for the existing lift stations within the system. Estimates were made for pump flow rates using pump activation timings taken from supervisory control and data acquisition (SCADA) data along with the basin flow rate estimates performed previously. Due to the lack of data, the estimated pump flow rates were not used to analyze the lift station sizing. Rather, pump run times were reviewed to determine if the lift stations have sufficient available capacity. Given the short duration of pump run times for the lift stations, the stations do not appear to be undersized but further analysis is recommended.

Collection System Analyses with Growth

While the system serves much of the currently developed land within its boundaries, the boundaries also contain undeveloped land along the western boundary of the UGA, orchards that have development potential throughout the service area, and large undeveloped parcels in the southwest section of the UGA.

Planned Developments

The City identified River Village and Stone Basin as developments to consider for the analysis. River Village is a mixed-use development project located on the southern side of the City off Saska Way. It is expected to create 37 single-family homes, 3 duplexes, and 66 townhomes, equivalent to 109 ERUs to be added to Basin No. 1. This development would discharge from an 8-inch PVC pipe into the existing manhole at the intersection of Saska Way and the proposed Silco Way. The trunkline for Basin No. 1 from that point is an existing 8-inch PVC sewer collection pipe that terminates at the School Street Lift Station.

When this development is fully built out, a planning-level analysis reveals the impact of an additional 109 ERUs would result in an additional 25,070 gpd and 64 gpm to the 8-inch PVC

sewer collection pipe. This additional flow represents approximately 20 percent of the capacity of an 8-inch PVC sewer trunkline when the line is assumed to have a slope of 0.5 percent and when the depth to diameter ratio is equal to 0.8. When the development is added to the current 129 ERUs in Basin No. 1, a planning-level analysis reveals 238 ERUs would result in a total of 54,692 gpd and 141 gpm, representing approximately 44 percent of the capacity of an 8-inch PVC sewer trunkline when the line is assumed to have a slope of 0.5-percent and when the depth to diameter ratio is equal to 0.8. These planning-level analysis calculations show that the collection system, as currently documented, has the capacity to support the River Village development. However, there needs to be further analysis completed on the City's sewer lift stations and WWTP to determine how much growth the overall sewer utility can currently support.

Stone Basin is an anticipated subdivision to be constructed in Basin No. 4. It is expected to create 32 single-family lots, which is equivalent to 32 ERUs being added to Basin No. 4. Eighteen ERUs would be discharged into an existing manhole near the intersection of Stoneridge Street and Red Delicious Street and 14 ERUs would be discharged into an existing manhole near Voss Place.

When this development is fully built out, a planning-level analysis reveals the impact of an additional 32 ERUs would result in an additional 7,440 gpd and 19 gpm to the 8-inch PVC sewer collection pipe. This additional flow represents approximately 6 percent of the capacity of an 8-inch PVC sewer trunkline when the line is assumed to have a slope of 0.5 percent and when the depth to diameter ratio is equal to 0.8. When the development is added to the current 118 ERUs in Basin No. 4, a planning-level analysis reveals 150 ERUs would result in a total of 34,417 gpd and 88 gpm, representing approximately 28 percent of the capacity of an 8-inch PVC sewer trunkline when the line is assumed to have a slope of 0.5-percent and when the depth to diameter ratio is equal to 0.8.

These planning-level analysis calculations show that the collection system, as currently documented, has the capacity to support the River Village development. However, there needs to be further analysis completed on the City's sewer lift stations and WWTP to determine how much growth the overall sewer utility can currently support.

These two developments do not pose a capacity issue for the collection system; however, the WWTP is nearing capacity and further analysis of the City lift stations should be conducted.

Basin Build-out

Utilizing Chelan County LiDAR data, terrain slopes were delineated for each basin. In terms of area, Basin No. 1 has the largest amount of undeveloped land, although nearly all of it exceeds 10-percent slope and much of it exceeds 20-percent slope above 1,000 lf in elevation. Basin No. 2 has similar topography issues, with approximately 85 acres of developable land and most of it lying on slopes greater than 10 percent. Basin No. 3 has the most readily developed land, with over 100 acres of residential zoned land sloped less than 10 percent. Basin No. 3 also has undeveloped land zoned for commercial and industrial usage along US 97A and Shamel Street. Basin No. 4 has approximately 18 acres of developable residential land. Basin Nos. 5 and 6 are

fully saturated in residential zoned areas but have small commercial zones ready to be developed along US 97A.

Utilizing the derived slope data and GIS zoning data, total areas below a 30-percent slope for each basin and each land designation were determined. Twenty-five percent of the area available for development was removed from these totals to account for right-of-way (ROW), utility structures and other infrastructure, leaving 75 percent as developable land. The residential densities determined in the 2019 *Entiat Comprehensive Plan* were applied to each zone area to determine potential ERUs due to growth in each basin. In addition, since the Facility Plan was written, significant changes have been made to the zoning classifications. In Basin Nos. 1, 2, and 3, land previously designated as Mixed Tourist-Recreational has been rezoned as Low Density Residential and all zoning classification changes have been incorporated into this analysis. Table 4 lists the developable acreage per basin by zone. Table 5 then calculates the potential ERUs, assuming 25 percent of the developable land is reserved for ROW and the remaining 75 percent is used for development. Exhibit 12 depicts slopes within the UGA (Appendix A).

Table 4

Developable Land Designations per Basin in Acres

Land Designation	Acres per Basin						
	1	2	3	4	5	6	Total
Low Density Residential	370	124	159	6	33	15	707
Undevelopable Land (Slope > 30 percent)	32	15	25	0	0	0	72
Developable Land	338	109	134	6	33	15	635
Medium Density Residential	0	27	84	45	0	0	156
High Density Residential	0	0	47	0	0	0	47
Commercial	0	0	46	17	14	18	95
Transition	0	0	27	16	4	0	47
Total	338	136	338	84	51	33	980

Table 5

Potential ERU per Basin (Assuming 25 Percent of Developable Land Area Reserved for ROW)

Land Designation	ERU per Acre	ERU per Basin						
		1	2	3	4	5	6	Total
Low Density Residential	4	1014	327	402	18	99	45	1,905
Medium Density Residential	10	0	203	630	338	0	0	1,171
High Density Residential	15	0	0	529	0	0	0	529
Commercial	1.3	0	0	45	17	14	18	94
Transition	2	0	0	41	24	6	0	71
Total ERUs		1014	530	1,647	397	119	63	3,770
Total gpd		233,220	121,900	378,810	91,310	27,370	14,490	867,100
Total gpm		598	313	972	234	70	37	2,224

Ample land exists within the City's service area to adequately support development and growth, the first restraints to growth will be the capacity of the collection system and WWTP.

Collection System Recommendations

The City is currently experiencing substantial development interest and has substantial undeveloped land that could contribute flow to the wastewater collection system if developed. However, it is difficult to accurately gauge the capacity of the collection system based on the limited available documentation for this system. At a minimum, it is recommended that the City complete a General Sewer Plan in accordance with WAC 173-240-050, which would be formally adopted by the City for the purposes of providing collection system planning over a defined timeline, such 20 years. In order properly complete a General Sewer Plan, additional information on the collection system and lift station would need to be obtained through the original contract documents or asbuilts, a collection system survey, and/or camera and visual observation. The General Sewer Plan would include and estimate the projected growth within the collection system service area through the planning period; identify major need capital improvements to rectify current deficiencies and support future needs; and outline policies and procedures for the Ownership and operation of the system.

Additionally, budgetary items for other collection system-related items are identified in the Capital Improvements Plan section of this report based on the analyses and discussions with City staff.

It is also recommended that the City commence a preventative maintenance program for the collection system, which would include periodic and strategic flushing, jetting, and camera inspection at a minimum.

Wastewater Treatment Plant

Background

The City owns and operates its WWTP located along the Columbia River in Chelan County, Washington. The WWTP serves primarily residential customers, a small number of commercial facilities, and an industrial foundry.

The WWTP provides preliminary treatment at its headworks and secondary treatment with two sequencing batch reactors (SBRs). Treated effluent is disinfected with ultraviolet (UV) light and then discharged through an outfall into the Columbia River.

The original WWTP was constructed in 1977. The original facility included the headworks, an oxidation ditch, a secondary clarifier, a chlorine contact chamber, and an outfall structure.

Two planning documents are known to have been completed to evaluate the WWTP's growth needs and deficiencies since its original construction: *Comprehensive Sewer Plan* (CSP) in 1997, and the Facility Plan in 2005.

In 2009, a major upgrade was completed to increase the WWTP capacity and address deficiencies identified in the CSP and Facility Plan. Upgrades included a mechanical bar screen and grit removal at the headworks, two SBRs, a UV disinfection system, and other facility improvements. The secondary clarifier was removed, the oxidation ditch was converted to an aerobic digester for solids handling, and chlorine disinfection was replaced with UV.

Appendix B provides the full design criteria sheet, hydraulic profile, and process schematic from the construction contract documents from the 2009 upgrade.

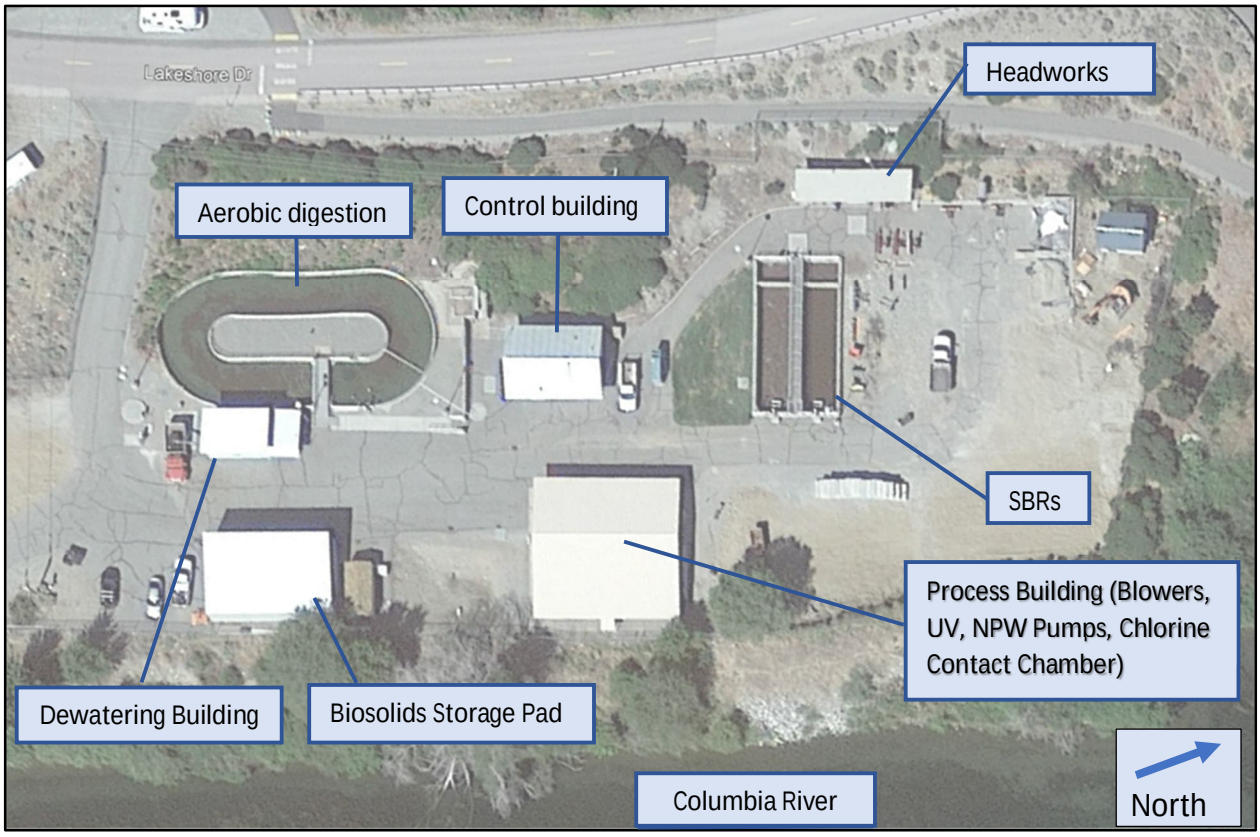
Process Description

Figure 1 provides an aerial overview of the WWTP. Flow from the collection system is measured at a Parshall flume in a metering manhole. Flow then enters the headworks, where it passes through a mechanical bar screen and grit vortex. A gravity flow splitter then divides flow between two continuous inflow SBRs. The SBRs provide secondary treatment of the wastewater and periodically decant supernatant from the reactors to allow for effluent discharge. Effluent from each SBR combines before entering the UV disinfection system and discharging through a submerged outfall in the Columbia River.

Waste debris collected on the headworks screen is compacted and discharged to a dumpster. Grit collected in the grit chamber also is removed into a dumpster. The compacted screening and grit are disposed of at a local landfill.

Waste activated sludge (WAS) from the SBRs is stabilized in an aerobic digester. A belt filter press then dewaters the digested biosolids, which are hauled to a composting facility owned and operated by the City.

Figure 1
WWTP Aerial Overview



Regulatory Requirements

Permit Issuance

National Pollutant Discharge Elimination System (NPDES) waste discharge permit No.WA0051276 was issued for the WWTP on June 21, 2017. A permit renewal application was accepted as complete by Ecology on August 24, 2021, but a renewed permit has not yet been issued. On October 10, 2022, Ecology issued an Administrative Extension extending the 2017 permit expiration date (originally set as July 31, 2022) until the renewed permit is issued.

Influent Loading Design Criteria

Table 6 summarizes the current maximum month influent flow and loading, as well as the WWTP maximum month design criteria from the NPDES permit.

Table 6

WWTP Maximum Month Average Day Influent Loading and Permitted Design Criteria

Parameter	Existing	Design Criteria	Capacity Utilized
Flow (MGD)	0.098	0.15	66 percent
BOD (ppd)	202	250	81 percent
TSS (ppd)	144	250	58 percent

ppd = pounds per day

The permit requires the City to submit plans and a schedule for continuing to maintain capacity, in the form of an Engineering Report, if the following conditions are met:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria (Table 6) for 3 consecutive months.
2. The projected plant flow or loading would reach design capacity within 5 years.

Since the WWTP is approaching 85 percent of its capacity for biochemical oxygen demand (BOD) loading per Table 6, it is anticipated that an Engineering Report will soon be needed to identify WWTP upgrades.

Effluent Limits and Capacity

The waste discharge limitations established in the 2017 NPDES permit are listed in Table 7.

Table 7
NPDES Permit Effluent Limits

Parameter	Average Monthly [a]	Average Weekly [b]
Biochemical Oxygen Demand (5-day) (BOD_5)	30 mg/L, 38 lbs/day 85% removal of influent BOD_5	45 mg/L, 56 lbs/day
Total Suspended Solids (TSS)	30 mg/L, 38 lbs/day 85% removal of influent BOD_5	45 mg/L, 56 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.5 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100 CFU/100 milliliter (mL)	200 CFU/100 mL
a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.	
b	Average weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.	
c	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf	

The WWTP has generally met the NPDES permit requirements with infrequent exceedances.

Mixing Zone

The most recent NPDES permit fact sheet, which expired February 28, 2016, noted the following:

> At this time, Ecology believes it is appropriate to base the dilution factor on a flow rate of 0.10 mgd instead of the plant rating of 0.15 mgd. This is based on the fact that the current daily high [flows] are typically less than 0.07 mgd and the occasion when the flow[s] have been recorded near 0.10 mgd were due to equipment malfunction or unusual event in the collection system that are not representative. However, the installation of a diffuser(s) on the end of the existing outfall pipe will likely be needed in the future as flows increase. Therefore, Ecology believes a study to evaluate the outfall and potential mixing zone improvements should be performed within the next permit cycle and the cost of these improvements scheduled in the Cities capital improvement program to improve the outfall and mixing zone characteristics based on the anticipated growth of the community.

This fact sheet has been reauthorized with the current version of the NPDES permit. It is not believed that a recent mixing zone study has been completed. As influent flows are nearing 0.1 MGD, it is likely that Ecology will require such a study in the coming years. It is recommended that a budgetary allocation be established for this work.

Effluent Heat Load

In 2020, the US Environmental Protection Agency established the *Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load* (TMDL). This TMDL is expected to prompt the addition of heat load limits to the City's future NPDES permit. Table 8 shows the heat load allocation proposed in the TMDL for the Entiat WWTP.

Table 8
Effluent Heat Load Allocation per TMDL

Table 6-12 WLAs for "Minor facility" NPDES permitted facilities located on the Columbia River

Facility Name	Permit Number	Location (RM)	Flow (MGD)	Temp (°C)	WLA (kcal/day)
Avista – Kettle Falls	WA0045217	702.4	0.34	32.2	4.12E+07
Coulee Dam Electric Facility (WA)[19,20]	WA0026867	596	178.0	16.8	1.13E+10
Grand Coulee WWTP[19]	WA0044857	596.6	0.3	24.1	2.73E+07
City of Coulee Dam[19]	WA0020281	596.0	0.5	23.9	4.51E+07
Interior, Reclamation[19]	WA0024163	596.0	0.018	24.7	1.68E+06
Colville Confederated Tribes[19]	WAG130016	580.0	4.86	16.8	3.08E+08
Confederated Tribes of the Colville Reservation[19]	WAG130025	580.0	25.4	16.8	1.61E+09
Chief Joseph Dam[19,20]	WA0026891	545	92.5	18.2	6.36E+09
Chelan Fruit Cooperative Pateros South Plant	WAG435265	--	0.2	18.8	1.42E+07
Wells Fish Hatchery	WAG135009	--	36.2	17.7	2.42E+09
Bridgeport STP	WA0024066	543.7	0.36	24.2	3.33E+07
Brewster	WA0021008	529.8	0.61	26.0	5.99E+07
Pateros STP	WA0020559	524.1	0.10	24.0	8.91E+06
Wells Dam	WA0991031	515.5	28.5	35.4	3.81E+09
Chelan Fruit Cooperative Beebe Plant	WAG435270	--	0.2	23.7	1.79E+07
Chelan POTW	WA0020605	503.5	2.6	25.0	2.49E+08
Entiat STP	WA0051276	485.0	0.15	26.0	1.47E+07
Rocky Reach Dam	WA0991033	473.5	34.3	27.0	3.50E+09

The heat load allocation for the WWTP effluent is 1.47E+07 kilocalories per day (kcal/day) based on the maximum month design criteria of 0.15 MGD and an effluent temperature of 26 degrees Celsius. Heat load is derived from the following equation:

$$\text{Heat Load (kcal/day)} = \text{Flow (MGD)} \times \text{Temperature (°C)} \times 3.78\text{x}10^{6}$$

The TMDL states that "… given the modeling assumptions, permit writers may translate wasteload allocations to monthly average permit limits." Based on this information, it is expected that a future NDPES permit revision will limit the WWTP effluent heat load to 1.47E+07 kcal/day on a monthly average, which equates to an average discharge of 0.15 MGD at 26 degrees Celsius. In recent years, WWTP effluent temperatures have averaged up to 25 degrees Celsius for the month of August. At the current maximum month flow of 0.098 MGD, the associated heat load would be 9.26E+06 kcal/day, or 63 percent of the TMDL allocation.

In the absence of an NDPES permit limit for heat load, no improvements are planned related to the anticipated future heat load limits at this time. However, the impacts of such a limit should be further analyzed in a future Engineering Report, as discussed in the Secondary Treatment section.

WWTP Assessment

Site Visit Findings

RH2 Engineering, Inc., visited the WWTP on February 7, 2023 to visually review the facility and discuss operations with City staff. The intent of this visit was to identify high-level needs at the facility for the purposes of estimating major WWTP capital costs during the planning period. The items identified during this visit are discussed in this technical memorandum based on WWTP area and treatment processes.

Preliminary Treatment

Influent wastewater flows into the headworks facility by gravity. The headworks is open air and covered by a roof structure over partially below-grade cast-in-place concrete channels. The equipment includes insulation and heat tracing to maintain operation during the winter months.

Screening consists of a single mechanical bar screen installed in one channel. A second channel serves as a bypass channel, but a screen is not currently installed in this channel.

Screened influent flows into a single degritter basin. Settled grit is removed from this basin by a recessed impeller grit pump housed in a below-grade vault adjacent to the basin, allowing for flooded suction of the pump. The pump discharges to a single grit classifier.

The following needs and recommendations were identified for the preliminary treatment system:

1. The mechanical bar screen is expected to exceed its useful life between 2025 and 2030 and should be planned for replacement. Further, it appears that the existing bars have ½-inch spacing whereas 3/8-inch spacing is required for beneficial reuse of the WWTP biosolids.
2. The bypass channel requires a manual screen with 3/8-inch spacing. This should be implemented immediately.
3. Near-term improvements to the grit removal system by the City are expected to extend the life of this equipment; however, it is expected that the useful life of the grit pump and classifier will end during the planning period. It is recommended that replacement of this equipment be anticipated during the planning period.
4. The City desires to improve the headworks structure to mitigate stormwater runoff that enters the structure from the adjacent slope to the west. Full enclosure of the headworks was reviewed. However, enclosure of this structure would require significant improvements to ensure compliance with National Fire Protection Association 820 electrical and fire protection requirements. Additional improvements also would be needed to maintain accessibility and practical usage of the facility. Alternatively, it is recommended that the west, and possibly north and south ends, of the headworks be improved to protect the facility without prompting significant other improvements.

Secondary Treatment

The secondary treatment process consists of a continuous flow style SBR system with two identical reactors. The SBR process design and equipment was provided by Sanitaire, which is currently a Xylem brand. The Sanitaire design criteria states that the current SBR system was designed for a maximum month flow rate of 0.15 MGD, which matches the permitted flow value shown in Table 6. The Sanitaire design criteria states that the system was designed for a maximum month average day BOD load of 300 ppd, which is above the permitted flow value shown in Table 6.

The design criteria states that the system was designed to achieve secondary effluent standards of 30 milligrams per liter (mg/L) for BOD and total suspended solids (TSS) as well as to complete nitrification. After start up of the SBRs, Ecology noted that nitrification could not be achieved as reliably as it had been with the previous oxidation ditch. This is noted in the NPDES permit fact sheet addendum. However, it appears that in the years following the SBR upgrade, nitrification was achieved more reliably, likely by increasing the solids retention time in the SBR system by operating at elevated mixed liquor levels. However, in recent years, operators noted that nitrification appears to be periodically inhibited. It appears that this often occurs during the warm months when nitrification would be expected to be easier to achieve. The operators suspect periodic influent toxicity could be inhibiting nitrification. While there is not currently an ammonia limit included in the NPDES permit, effluent ammonia is a consideration for the mixing zone analyses, discussed in the Regulatory Requirements section.

The following major items were noted with the secondary treatment system:

1. The City should investigate the potential source of the influent toxicity immediately.
2. The continuous flow configuration relies on passive flow splitting of the influent between both SBRs via a control structure with manual gates. Operators noted that it is impossible to accurately split flow between the two SBRs, and significant mixed liquor concentration and settleability differences are common between the two reactors. This makes process control challenging and ultimately can reduce the realistic capacity of the system.
3. The SBR control system and equipment is proprietary to Xylem; and changes or modifications to the system will require assistance from the manufacturer. In the future, a non-proprietary secondary treatment system is considered desirable by the City.
4. The City is concerned with the reliability of the existing two rotary lobe aeration blowers. These may be replaced as part of a larger secondary treatment system project.
5. At the current maximum month average flow of approximately 98,000 gpd, both reactors are needed to provide sufficient treatment. However, the aeration system in the SBRs consists of a fixed diffuser grid of EPDM (ethylene propylene diene monomer) discs, which require the tanks to be drained for maintenance. It is likely that such maintenance can still occur with careful scheduling of the work during a period of low influent flow. However, as growth occurs in the system, the increased influent flow will make such maintenance increasingly difficult.

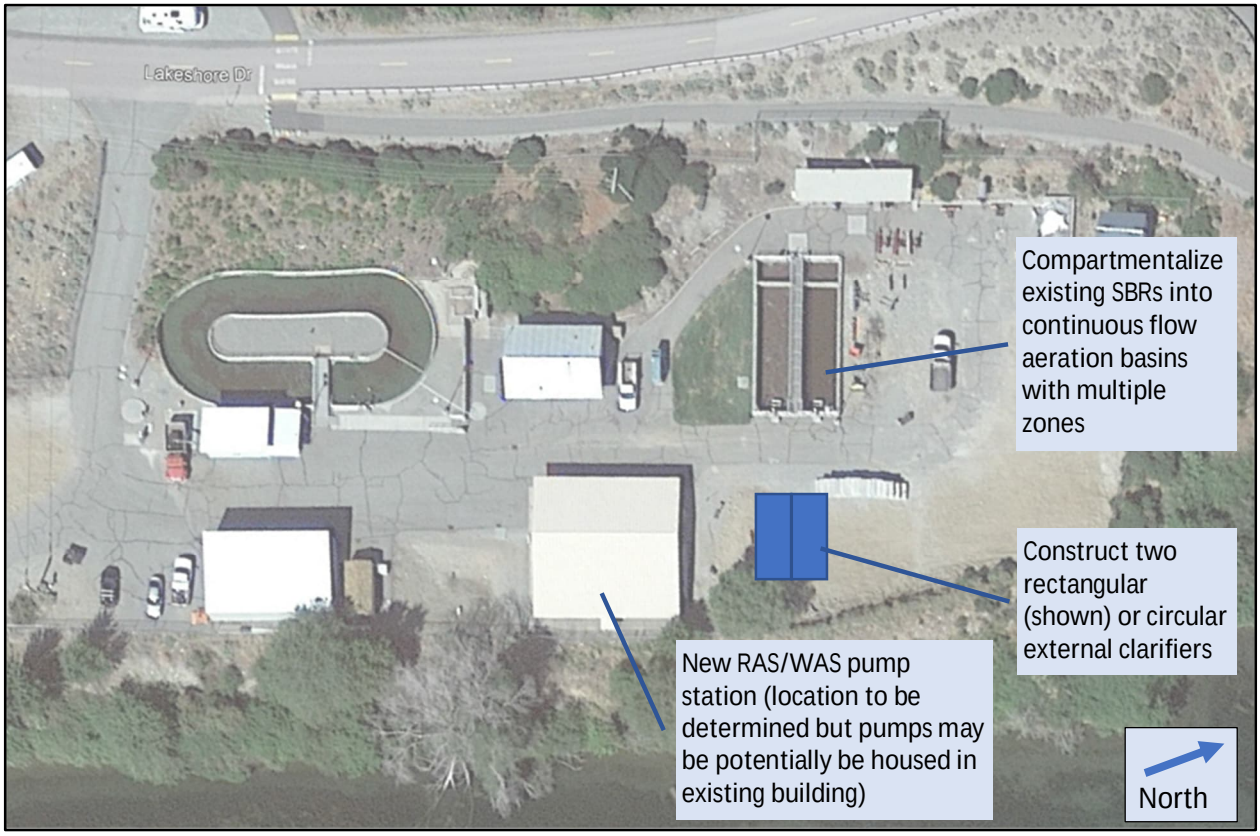
6. In addition to the near-term difficulty of maintaining the existing diffusers, the SBR system is approaching its nominal capacity (0.15 MGD, 300 ppd BOD), as seen in Table 6. The SBR system likely will exceed its current capacity in the longer term.

The 2005 Facility Plan proposed constructing additional SBR tankage north of the existing SBRs for the purposes of expanding the secondary treatment capacity. This approach would increase the capacity, but it would not necessarily alleviate some of the other issues with the SBR configuration. A future alternatives analyses, as part of an Engineering Report, would be necessary to fully evaluate the secondary treatment improvements and a budgetary allocation for this report should be established.

As part of this work, a planning-level budgetary allocation for secondary treatment system improvements is desired. For establishing this allocation, a conversion of the SBR system to a continuous flow reactor system with external clarifiers is assumed, as this approach would generally alleviate the issues noted previously. The budgetary allocation would allow for other options, such as additional SBRs, to be pursued if selected during the future Engineering Report analyses.

Figure 2 provides a conceptual configuration of the proposed continuous flow system.

Figure 2
Conceptual Configuration of Continuous Flow System



The continuous flow system would consist of the following major improvements:

1. Two external secondary clarifiers (either rectangular or circular) would be constructed likely on the riverward side of the existing SBRs. The clarifiers would be constructed

prior to other improvements and could be constructed without impacting the operation of the existing SBR system.

2. A return activated sludge (RAS)/WAS pump station would be needed to pump RAS from the clarifiers to the basins and WAS to the digester. This could be constructed near the proposed clarifier or possibly within the existing Process Building if either the unused chlorine contact chamber or the existing UV system were replaced or relocated as discussed later in this technical memorandum.
3. The existing aeration blowers likely would be replaced as part of this project. Improvements to the control of the aeration system to support the new continuous flow system also would be considered.
4. The below-grade piping would need to be reconfigured to allow for the following:
    a. Mixed liquor conveyance from the aeration basins to the secondary clarifiers.
    b. Secondary effluent conveyance from the secondary clarifiers to the effluent disinfection system.
    c. RAS conveyance from the secondary clarifiers to the aeration basins.
    d. WAS conveyance from the basins and/or secondary clarifiers to the digester.
    e. miscellaneous minor piping (scum, non-potable water, etc.).
5. The SBRs would be converted sequentially to aeration basins. During the first SBR conversion, one SBR would need to be operated as simple continuous flow reactor discharging to the new secondary clarifiers. Once the first SBR is converted to an aeration basin, that basin can be commissioned and operated while the secondary SBR is converted. The new basins will consist of multiple zones (anaerobic, anoxic, and aerobic), which would be determined during the future Engineering Report analyses. The existing aeration diffuser grid could be considered for replacement due to age and condition. An internal recycle pump would be added to return nitrified mixed liquor from the end of the oxic zone to the start of the anoxic zone. The SBR decanter would be removed and mixed liquor would continuously outfall to the secondary clarifiers.

The continuous flow system could be expanded incrementally in the future by adding either additional basins or clarifiers to the north of the existing and proposed structures.

Effluent Disinfection

Secondary effluent from the SBRs flows through below-grade piping to an effluent disinfection system consisting of two identical enclosed UV light disinfection vessels. The UV equipment is housed within the Process Building and discharges to the existing chlorine contact chamber. The chlorine contact chamber is no longer needed for chlorine disinfection and is maintained for conveyance of disinfected effluent to the outfall. The chamber also serves as a location for pumping of effluent utilized by the non-potable water system.

The following major items were noted with the effluent disinfection system:

1. The UV system control system requires component replacement. The UV system is still supported, and the City can replace components as needed.

2. The UV system location and configuration makes lamp and sleeve removal challenging. In the future, relocation of the UV system could be considered if desired by the City.
3. The UV room includes a non-potable water filter that has caused periodic flooding. The filter needs to be relocated to the existing chlorine contact chamber room, adjacent to the non-potable water (NPW) pumps, to allow any filter flushing water to return to the chlorine contact chamber.
4. The chlorine contact chamber collects settleable solids from the effluent and requires occasional cleaning via vactoring. In the future, it may be desirable to remove the chlorine contact chamber and allow a more direct discharge pathway from the UV system to the outfall, which would alleviate the labor associated with the periodic cleaning of the chlorine contact chamber.

Outfall

Treated effluent is conveyed through an enclosed pipe to a single port diffuser anchored to the streambed approximately 300 feet offshore and 75 feet below water level at low-flow conditions. As noted in the Regulatory Requirements section, a mixing zone study is expected to be required in the coming years.

Solids Handling

The existing solids handling process consists of a single aerobic digester (repurposed oxidation ditch) followed by belt filter press dewatering. The dewatered solids are transported to a City-owned and operated composting site. The City receives orchard pruning materials and similar local material that is chipped and mixed with the biosolids and stabilized in static piles. The composted material is utilized solely by the City Public Works Department.

The following major items were noted with the solids handling system:

1. The jet aeration system for the aerobic digesters operates satisfactorily. However, there is no simple method for isolating the jet pump for maintenance. It is recommended that some method of isolation be provided between the jet pump wet well and the aerobic digester to facilitate pump maintenance.
2. The belt filter press is expected to exceed its useful life between 2025 and 2030 and should be planned for replacement. The City desires dewatering equipment that can operate with less attended operation and reduced maintenance. One option for consideration in a future Engineering Report would be the replacement of the belt press with a screw press. Additionally, operators noted that the belt press needs to be operated more frequently for reduced durations to mitigate the filtrate slug loading to the secondary treatment process. An appropriately selected screw press could potentially mitigate this condition by operating largely continuously at reduced flow rates.
3. If composting is to be maintained in the long term, additional asphalt pad space is required. Alternatively, the City could consider suspending use of the composting facility. The aerobic digester and dewatering system should provide Class B biosolids that could be directly land applied, such as at the Boulder Park Project Beneficial Use

Facility on the Waterville Plateau. A future Engineering Report should perform a life-cycle cost analysis of both options to generally compare the costs of hauling and disposal of biosolids to the capital and labor costs associated with the composting system. For the purposes of establishing conservative budgetary allocations, this technical memorandum assumes that the asphalt surfacing at the existing composting facility will be approximately doubled to support continued composting through the planning period.

Miscellaneous Equipment

Mechanical and electrical equipment within municipal wastewater treatment plants periodically necessitates significant refurbishment or replacement. However, much of the existing equipment likely would be replaced as part of the aforementioned recommendations. However, for planning purposes, it is recommended that a budgetary allocation be established for the replacement of miscellaneous mechanical and electrical equipment.

Laboratory

The existing laboratory has aging equipment. The City would like to plan for minor equipment replacements in this facility and provide a budgetary allocation for general improvements to this facility.

WWTP Recommendations

The existing WWTP components are aging and various improvements are needed to rectify current conditions. Additionally, the significant development interest in the City raises concerns related to the capacity of the existing WWTP. A number of improvements to the WWTP are likely needed to support the existing needs and future growth of the City. It is recommended that the City complete an Engineering Report in accordance with WAC 173-240-060 for the WWTP. An Engineering Report must be reviewed and approved by Ecology in order to complete major improvements to the WWTP. It is likely prudent to complete the Engineering Report in conjunction with the needed General Sewer Plan as identified in the Collection System Recommendations section. The Engineering Report would analyze potential alternatives for improvements to the WWTP, recommend the proposed improvements and estimate the potential cost, schedule and major considerations for implementing the improvements.

Capital Improvements Plan

For the purpose of understanding the magnitude of the potential costs to implement the recommended collection system and WWTP improvements, Table 9 estimates the potential magnitude of cost for the major items identified in this assessment.

Table 9
Potential Magnitude of Capital Improvements Plan Costs

City Projects	Year							
Project/Item	2023	2024	2025	2026	2027	2028	2029	2030
City Hall	0	$60,000	0	0	0	0	0	0
Future Capital Pump Purchases	$15,000	$16,000	$17,000	$18,000	$19,000	$21,000	$22,000	$23,000
LS Pump Inventory & Maintenance (Whitney Equipment)	0	$11,000	$12,000	$12,000	$13,000	$14,000	$15,000	$16,000
CIP Completion	0	$11,000	$12,000	$12,000	$13,000	$14,000	$15,000	$16,000
FCS Rate Study	$45,000	0	0	0	0	0	0	0
Close RV Dump Station (Toxicity Events)	0	$10,000	0	0	0	0	0	0
WWTP - Grit Pump and Classifier Refurbish	0	0	$300,000	0	0	0	0	0
Sewer Jet/VAC Trailer*	0	$55,000	0	0	0	0	0	0
Utility Maintenance Truck*	0	$40,000	0	0	0	0	0	0
Dump Truck (Non CDL)*	0	0	0	$50,000	0	0	0	0
Mobile Back-Up Generator*	0	0	0	0	0	0	$50,000	0
Utility Maintenance Truck*	0	0	0	0	0	0	0	$50,000
Backhoe*	0	0	0	0	0	0	0	$100,000
Combined GSP and Engineering Report	0	0	$175,000	0	0	0	0	0
WWTP - Preliminary Treatment System Improvements	0	0	0	0	0	0	$400,000	$1,070,000
WWTP - Secondary Treatment System Improvements	0	0	0	$1,080,000	$1,965,000	$2,080,000	0	0
WWTP - Effluent Disinfection System Replacement	0	0	0	$180,000	$315,000	$335,000	0	0
WWTP - Solids Handling System Improvements	0	0	0	0	0	0	$440,000	$1,570,000
WWTP - Allowance for Aging Equipment Replacement or Refurbishment	0	0	0	$122,500	$130,000	$137,500	$147,500	0
WWTP - Allowance for Laboratory and Administration Building Improvements	0	0	0	0	0	0	$80,000	$250,000
Drying Beds, Double HMA pad	0	0	0	0	0	0	$460,000	0
Sewer Lift Station – Upgrades – Shadow Ridge	0	$60,000	0	$60,000	0	$70,000	0	$80,000
Sewer Lift Station – Upgrades – Stoneridge	0	$60,000	0	$60,000	0	$70,000	0	$80,000
Sewer Lift Station – Upgrades – School Lift Station	0	0	$60,000	0	$70,000	0	$80,000	0
Sewer Lift Station – Upgrades – Lakefront Lift Station	0	0	$60,000	0	$70,000	0	$80,000	0
Sewer Design & Construction Standards / GIS Update	0	0	0	0	$120,000	$30,000	0	0
Capital Preventative Maintenance (1,000' - 12" Sewer Pipe)	0	0	0	0	0	$800,000	0	0
Capital Preventative Maintenance (1,000' - 12" Sewer Pipe)	0	0	0	0	0	0	0	$900,000
TOTAL:	$45,000	$247,000	$636,000	$1,576,500	$2,696,000	$3,550,500	$1,767,500	$4,132,000

*Cost allocation for equipment purchase

The costs shown in Table 9 are provided solely for the purpose of establishing the potential order of magnitude of the capital costs. Both construction costs and indirect costs for design, permitting, and construction administration are included.

For the purposes of this level of planning, a cost of approximately $15M should be assumed for the sewer system and WWTP improvements necessary to support the projected growth. The detailed planning necessary for an Engineering Report would yield a more definitive planning-level cost estimate.

Conclusion

Based on the available information, the collection system and WWTP were analyzed with the main objective of assessing the major needs associated with these systems. The collections system analysis results show there appears to be adequate capacity in the near-term, though completion of General Sewer Plan is recommended to better understand the needs of this system and the expected growth.

The WWTP is aging and is likely to exceed its rated capacity with the currently proposed developments. Similar to the collection system, an Engineering Report is recommended to be completed in the near-term to better understand the necessary improvements to this facility.

Appendices

Appendix A – Exhibits

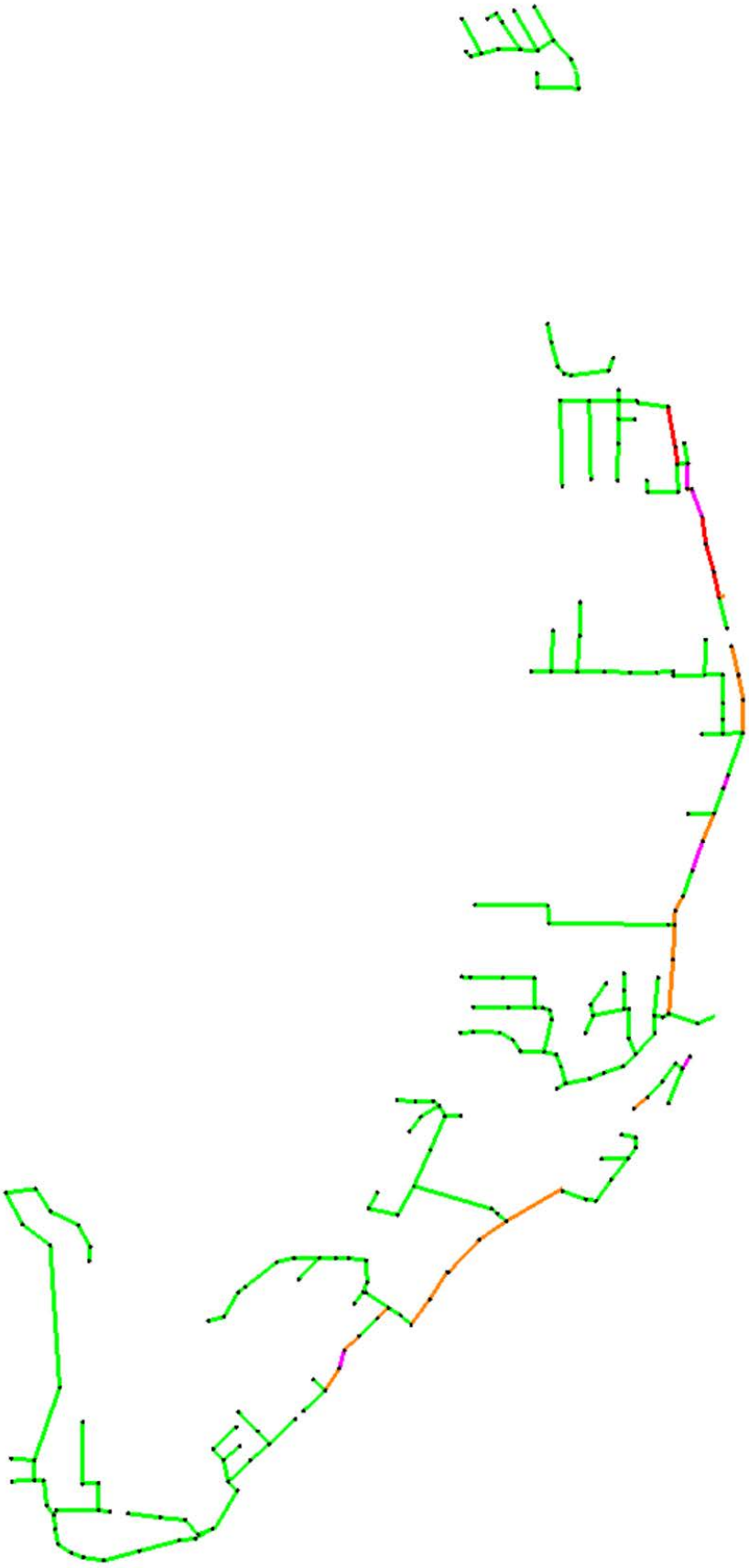
Appendix B – Design Criteria, Hydraulic Profile, and Process Flow Diagram from 2009 WWTP Upgrades

APPENDIX C

Collection System Hydraulic Model Outputs

Scenario: Existing Conditions
Scenario: Future, 20YR
Scenario: Future, 20YR with Improvements
Scenario: Future, 40YR
Scenario: Future, 40YR with Improvements
Manhole Summary Report

Scenario: Existing System



FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
40	MH-107	852.59	MH-901	830.00	410.3	0.055	Circle	8.0	0.013	5.84	2.06	0.5	8,414.55	1,272.54
47	MH-901	830.00	MH-106	849.26	109.2	0.176	Circle	8.0	0.013	3.25	2.58	0.1	4,674.75	2,277.34
49	MH-102	859.06	MH-106	849.26	75.5	0.130	Circle	8.0	0.013	3.25	2.30	0.2	4,674.75	1,954.35
50	MH-108	816.75	MH-901	830.00	183.3	0.072	Circle	8.0	0.013	9.09	2.58	0.6	13,089.30	1,458.08
51	MH-103	810.00	MH-104	808.95	111.5	0.009	Circle	8.0	0.013	1.30	0.70	0.2	1,869.90	526.29
53	MH-104	808.95	MH-105	805.70	108.4	0.030	Circle	8.0	0.013	1.30	1.06	0.1	1,869.90	938.98
56	MH-108	816.75	MH-109	794.15	226.0	0.100	Circle	8.0	0.013	9.09	2.89	0.5	13,089.30	1,715.06
57	MH-109	794.15	MH-110	770.12	177.0	0.136	Circle	8.0	0.013	10.39	3.35	0.5	14,959.20	1,998.13
60	MH-111	757.08	MH-112	739.00	269.5	0.067	Circle	8.0	0.013	14.28	2.88	1.0	20,568.90	1,404.69
68	MH-902	752.00	MH-903	750.00	143.1	0.014	Circle	8.0	0.013	0.65	0.66	0.1	934.95	641.10
69	MH-903	750.00	MH-113	745.55	419.7	0.011	Circle	8.0	0.013	0.65	0.60	0.1	934.95	558.44
72	MH-905	772.00	MH-110	770.12	477.4	0.004	Circle	8.0	0.013	2.60	0.64	0.8	3,739.80	340.34
73	MH-110	770.12	MH-111	757.08	196.7	0.066	Circle	8.0	0.013	12.99	2.78	0.9	18,699.00	1,396.26
75	MH-904	759.00	MH-111	757.08	397.2	0.005	Circle	8.0	0.013	1.30	0.56	0.3	1,869.90	377.06
86	MH-114	760.41	MH-115	758.40	195.6	0.010	Circle	8.0	0.013	5.84	1.14	1.1	8,414.55	549.80
87	MH-115	758.40	MH-116	756.62	256.4	0.007	Circle	8.0	0.013	5.84	1.01	1.3	8,414.55	451.89
88	MH-116	756.62	MH-117	757.26	100.3	0.006	Circle	8.0	0.013	12.34	1.22	2.8	17,764.05	433.18
89	MH-117	757.26	MH-118	757.63	75.7	0.005	Circle	8.0	0.013	5.84	0.89	1.5	8,414.55	379.10
90	MH-118	757.63	MH-119	761.52	385.0	0.010	Circle	8.0	0.013	5.84	1.13	1.1	8,414.55	545.13
91	MH-119	761.52	MH-312	764.51	139.1	0.021	Circle	8.0	0.013	5.84	1.48	0.7	8,414.55	795.11
97	MH-133	766.99	MH-132	766.62	109.1	0.003	Circle	12.0	0.013	100.00	1.73	10.7	144,000.00	931.29
98	MH-132	766.62	MH-123	767.58	305.1	0.003	Circle	12.0	0.013	43.50	1.31	4.9	62,641.65	896.88
99	MH-123	767.58	MH-122	768.54	297.4	0.003	Circle	12.0	0.013	31.81	1.21	3.5	45,812.55	908.46
116	MH-132	766.62	MH-130	767.75	191.8	0.006	Circle	8.0	0.013	12.34	1.18	3.0	17,764.05	416.31
117	MH-130	767.75	MH-131	768.95	169.9	0.007	Circle	8.0	0.013	3.25	0.84	0.7	4,674.75	455.85
123	MH-140	774.14	MH-141	773.74	118.0	0.003	Circle	8.0	0.013	4.54	0.72	1.4	6,544.65	315.78
124	MH-141	773.74	MH-136	764.49	311.8	0.030	Circle	8.0	0.013	4.54	1.54	0.5	6,544.65	934.12
129	MH-130	767.75	MH-129	772.17	249.4	0.018	Circle	8.0	0.013	9.09	1.60	1.3	13,089.30	721.97
130	MH-129	772.17	MH-127	782.55	386.6	0.027	Circle	8.0	0.013	9.09	1.82	1.0	13,089.30	888.64
132	MH-139	757.13	MH-906	756.00	49.4	0.023	Circle	8.0	0.013	342.97	5.00	41.8	493,874.12	819.86
139	MH-144	747.76	MH-143	749.22	275.3	0.005	Circle	8.0	0.013	344.66	2.84	87.3	496,313.11	394.93
140	MH-143	749.22	MH-608	751.00	299.6	0.006	Circle	8.0	0.013	344.66	2.98	82.4	496,313.11	418.05
141	MH-608	751.00	MH-142	752.59	281.8	0.006	Circle	8.0	0.013	342.97	2.92	84.2	493,874.12	407.35
142	MH-142	752.59	MH-906	756.00	307.2	0.011	Circle	8.0	0.013	342.97	3.81	60.0	493,874.12	571.43
152	MH-167	768.98	MH-168	766.70	365.5	0.006	Circle	8.0	0.013	7.14	1.03	1.7	10,284.45	428.35
154	MH-168	766.70	MH-173	760.64	188.4	0.032	Circle	8.0	0.013	39.61	3.04	4.1	57,031.95	972.75
156	MH-173	760.64	MH-172	759.48	289.0	0.004	Circle	8.0	0.013	39.61	1.46	11.5	57,031.95	343.60
157	MH-172	759.48	MH-171	758.80	168.9	0.004	Circle	8.0	0.013	43.50	1.50	12.6	62,641.65	344.15

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
158	MH-171	758.80	MH-170	758.21	148.7	0.004	Circle	8.0	0.013	43.50	1.49	12.7	62,641.65	341.64
160	MH-145	756.61	MH-144	747.76	321.4	0.028	Circle	8.0	0.013	0.00	0.00	0.0	0.00	899.90
165	MH-148	757.37	MH-147	758.83	342.2	0.004	Circle	8.0	0.013	170.19	2.24	48.0	245,079.61	354.24
166	MH-147	758.83	MH-609	760.98	259.4	0.008	Circle	8.0	0.013	166.95	2.84	33.8	240,404.84	493.78
178	MH-161	793.17	MH-158	797.80	267.0	0.017	Circle	8.0	0.013	20.13	2.00	2.8	28,983.45	714.23
179	MH-158	797.80	MH-156	805.99	208.0	0.039	Circle	8.0	0.013	9.74	2.13	0.9	14,024.25	1,076.19
180	MH-158	797.80	MH-157	814.25	421.3	0.039	Circle	8.0	0.013	10.39	2.16	1.0	14,959.20	1,071.68
181	MH-161	793.17	MH-162	785.71	275.4	0.027	Circle	8.0	0.013	31.81	2.69	3.6	45,812.55	892.60
182	MH-162	785.71	MH-163	776.29	268.0	0.035	Circle	8.0	0.013	31.81	2.95	3.1	45,812.55	1,016.77
183	MH-163	776.29	MH-164	769.50	272.1	0.025	Circle	8.0	0.013	31.81	2.61	3.7	45,812.55	856.71
184	MH-164	769.50	MH-165	768.87	171.8	0.004	Circle	8.0	0.013	31.81	1.33	9.7	45,812.55	328.38
185	MH-165	768.87	MH-166	768.66	43.7	0.005	Circle	8.0	0.013	31.81	1.46	8.5	45,812.55	375.86
187	MH-161	793.17	MH-160	803.35	369.4	0.028	Circle	8.0	0.013	11.69	2.01	1.3	16,829.10	900.27
188	MH-160	803.35	MH-159	808.04	346.3	0.014	Circle	8.0	0.013	11.69	1.56	1.9	16,829.10	631.13
192	MH-148	757.37	MH-149	754.58	463.3	0.006	Circle	10.0	0.013	215.64	2.68	28.3	310,526.10	763.06
193	MH-149	754.58	MH-150	754.79	143.1	-0.001	Circle	10.0	0.013	218.89	0.89	58.1	315,200.85	376.75
194	MH-150	754.79	MH-151	752.48	274.7	0.008	Circle	10.0	0.013	218.89	3.04	24.3	315,200.85	901.78
196	MH-152	759.52	MH-151	752.48	267.1	0.026	Circle	10.0	0.013	0.00	0.00	0.0	0.00	1,596.42
200	MH-155	747.11	MH-154	750.36	280.3	0.012	Circle	10.0	0.013	222.28	3.42	21.0	320,078.85	1,058.77
201	MH-154	750.36	MH-153	750.86	320.1	0.002	Circle	10.0	0.013	222.28	1.64	57.2	320,078.85	388.65
202	MH-153	750.86	MH-151	752.48	310.7	0.005	Circle	10.0	0.013	222.28	2.57	31.3	320,078.85	710.05
222	MH-177	843.22	MH-619	838.22	184.8	0.027	Circle	8.0	0.013	32.46	2.70	3.6	46,747.50	891.98
233	MH-595	804.35	MH-194	800.98	274.3	0.012	Circle	8.0	0.013	5.19	1.17	0.9	7,479.60	601.18
234	MH-194	800.98	MH-596	797.19	111.2	0.034	Circle	8.0	0.013	5.19	1.68	0.5	7,479.60	1,001.12
243	MH-203	784.23	MH-202	782.69	52.2	0.030	Circle	8.0	0.013	11.04	2.00	1.2	15,894.15	931.55
244	MH-202	782.69	MH-201	779.42	305.3	0.011	Circle	8.0	0.013	11.04	1.41	2.0	15,894.15	561.31
245	MH-201	779.42	MH-617	775.43	177.1	0.023	Circle	8.0	0.013	11.88	1.88	1.5	17,113.65	813.95
246	MH-596	797.19	MH-203	784.23	322.0	0.040	Circle	8.0	0.013	8.44	2.05	0.8	12,154.35	1,088.08
257	MH-166	768.66	MH-168	766.70	326.5	0.006	Circle	8.0	0.013	32.46	1.59	7.7	46,747.50	420.19
258	MH-134	765.21	MH-135	764.51	419.0	0.002	Circle	8.0	0.013	300.68	1.92	135.6	432,980.23	221.69
262	MH-132	766.62	MH-907	766.13	183.9	0.003	Circle	12.0	0.013	155.84	1.80	18.8	224,405.69	827.97
263	MH-907	766.13	MH-908	766.04	31.9	0.003	Circle	12.0	0.013	159.08	1.82	19.1	229,080.46	833.51
264	MH-908	766.04	MH-134	765.21	310.3	0.003	Circle	12.0	0.013	159.08	1.81	19.2	229,080.46	826.96
270	MH-181	860.73	MH-182	859.09	139.7	0.012	Circle	8.0	0.013	3.25	1.00	0.6	4,674.75	587.56
271	MH-182	859.09	MH-183	850.42	267.9	0.032	Circle	8.0	0.013	3.25	1.45	0.3	4,674.75	975.73
272	MH-183	850.42	MH-184	846.42	154.0	0.026	Circle	8.0	0.013	3.25	1.33	0.4	4,674.75	874.11
273	MH-184	846.42	MH-185	842.34	139.5	0.029	Circle	8.0	0.013	3.25	1.39	0.3	4,674.75	927.57
274	MH-185	842.34	MH-186	833.21	244.6	0.037	Circle	8.0	0.013	3.25	1.49	0.3	4,674.75	1,047.87

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
275	MH-186	833.21	MH-187	830.10	129.9	0.024	Circle	8.0	0.013	21.43	2.28	2.6	30,853.35	839.14
276	MH-187	830.10	MH-195	819.50	131.4	0.081	Circle	8.0	0.013	21.43	3.50	1.4	30,853.35	1,540.27
278	MH-195	819.50	MH-197	816.33	180.3	0.018	Circle	8.0	0.013	21.43	2.05	3.0	30,853.35	719.10
285	MH-180	883.74	MH-179	880.24	86.1	0.041	Circle	8.0	0.013	9.09	2.10	0.8	13,089.30	1,093.29
286	MH-179	880.24	MH-178	855.67	333.6	0.074	Circle	8.0	0.013	9.09	2.60	0.6	13,089.30	1,471.93
287	MH-178	855.67	MH-909	850.00	327.4	0.017	Circle	8.0	0.013	9.09	1.58	1.3	13,089.30	713.70
288	MH-909	850.00	MH-191	840.51	304.1	0.031	Circle	8.0	0.013	9.09	1.92	0.9	13,089.30	958.07
289	MH-191	840.51	MH-190	836.55	86.1	0.046	Circle	8.0	0.013	14.93	2.59	1.3	21,503.85	1,163.30
290	MH-190	836.55	MH-189	835.06	75.6	0.020	Circle	8.0	0.013	14.93	1.91	2.0	21,503.85	761.49
291	MH-189	835.06	MH-188	834.65	91.1	0.005	Circle	8.0	0.013	14.93	1.14	4.1	21,503.85	363.89
292	MH-188	834.65	MH-186	833.21	349.4	0.004	Circle	8.0	0.013	14.93	1.10	4.3	21,503.85	348.15
293	MH-191	840.51	MH-192	850.45	272.9	0.036	Circle	8.0	0.013	5.84	1.78	0.6	8,414.55	1,035.01
294	MH-192	850.45	MH-193	868.55	358.5	0.050	Circle	8.0	0.013	5.84	2.00	0.5	8,414.55	1,218.59
295	MH-597	800.82	MH-596	797.19	197.4	0.018	Circle	8.0	0.013	3.25	1.16	0.4	4,674.75	735.39
297	MH-207	746.89	MH-206	758.13	88.1	0.128	Circle	12.0	0.013	39.15	4.62	0.7	56,381.55	5,711.08
298	MH-206	758.13	MH-910	765.00	184.6	0.037	Circle	8.0	0.013	39.15	3.19	3.7	56,381.55	1,046.12
299	MH-910	765.00	MH-617	775.43	290.7	0.036	Circle	8.0	0.013	39.15	3.15	3.8	56,381.55	1,027.29
303	MH-197	816.33	MH-198	800.78	249.5	0.062	Circle	8.0	0.013	23.37	3.27	1.7	33,658.20	1,353.94
304	MH-198	800.78	MH-199	793.14	161.8	0.047	Circle	8.0	0.013	23.37	2.97	2.0	33,658.20	1,178.47
305	MH-199	793.14	MH-200	783.36	208.4	0.047	Circle	8.0	0.013	23.37	2.96	2.0	33,658.20	1,174.92
306	MH-200	783.36	MH-617	775.43	180.0	0.044	Circle	8.0	0.013	27.27	3.04	2.4	39,267.90	1,138.45
307	MH-618	766.12	MH-206	758.13	393.8	0.020	Circle	8.0	0.013	0.00	0.00	0.0	0.00	772.49
313	MH-135	764.51	MH-606	764.25	181.0	0.001	Circle	8.0	0.013	300.68	1.92	146.3	432,980.23	205.55
314	MH-606	764.25	MH-136	764.49	286.5	0.001	Circle	8.0	0.013	4.54	0.44	2.9	6,544.65	156.98
315	MH-607	759.77	MH-139	757.13	260.7	0.010	Circle	8.0	0.013	342.97	3.68	62.8	493,874.12	545.80
324	MH-213	736.84	MH-212	734.79	91.0	0.023	Circle	10.0	0.013	410.00	5.16	27.8	590,399.99	1,476.25
326	MH-212	734.79	MH-616	734.54	150.3	0.002	Circle	12.0	0.013	410.00	1.95	62.9	590,399.99	652.18
335	MH-213	736.84	MH-214	745.26	226.0	0.037	Circle	10.0	0.013	410.00	6.19	21.6	590,399.99	1,898.16
336	MH-214	745.26	MH-215	754.15	219.3	0.041	Circle	10.0	0.013	410.00	6.38	20.7	590,399.99	1,979.71
337	MH-215	754.15	MH-216	756.53	187.2	0.013	Circle	10.0	0.013	410.00	4.19	37.0	590,399.99	1,108.68
338	MH-230	740.80	MH-212	734.79	388.1	0.015	Circle	12.0	0.013	0.00	0.00	0.0	0.00	1,989.88
339	MH-221	738.18	MH-220	729.85	148.1	0.056	Circle	8.0	0.013	5.19	2.00	0.4	7,479.60	1,286.05
340	MH-220	729.85	MH-219	720.88	105.8	0.085	Circle	8.0	0.013	5.19	2.34	0.3	7,479.60	1,579.40
341	MH-219	720.88	MH-217	718.19	136.6	0.020	Circle	8.0	0.013	5.19	1.38	0.7	7,479.60	761.02
343	MH-217	718.19	MH-218	734.26	271.0	0.059	Circle	8.0	0.013	2.60	1.67	0.2	3,739.80	1,320.75
346	MH-217	718.19	MH-222	716.15	283.0	0.007	Circle	8.0	0.013	7.79	1.11	1.7	11,219.40	460.45
348	MH-222	716.15	MH-223	714.15	266.8	0.007	Circle	8.0	0.013	7.79	1.12	1.7	11,219.40	469.59
350	MH-223	714.15	MH-224	713.70	111.4	0.004	Circle	8.0	0.013	8.44	0.05	2.4	12,154.35	344.76

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
352	MH-224	713.70	MH-225	715.01	251.4	-0.005	Circle	8.0	0.013	8.44	0.05	2.2	12,154.35	391.51
361	MH-612	717.24	MH-613	716.88	15.6	0.023	Circle	10.0	0.013	286.27	4.70	19.2	412,235.26	1,491.59
362	MH-613	716.88	MH-614	714.86	462.0	0.004	Circle	10.0	0.013	286.27	2.57	44.0	412,235.26	650.20
363	MH-614	714.86	MH-615	711.78	334.6	0.009	Circle	10.0	0.013	286.27	3.38	30.3	412,235.26	943.48
364	MH-615	711.78	MH-227	725.52	122.7	0.112	Circle	12.0	0.013	40.90	4.52	0.8	58,901.85	5,349.88
365	MH-227	725.52	MH-226	727.68	74.2	0.029	Circle	12.0	0.013	40.90	2.82	1.5	58,901.85	2,728.20
372	MH-250	835.64	MH-589	833.00	109.7	0.024	Circle	8.0	0.013	29.22	2.51	3.5	42,072.75	841.52
373	MH-589	833.00	MH-592	835.00	150.2	0.013	Circle	8.0	0.013	1.95	0.89	0.3	2,804.85	625.91
374	MH-589	833.00	MH-590	831.78	29.9	0.041	Circle	8.0	0.013	31.16	3.08	2.8	44,877.60	1,094.97
375	MH-590	831.78	MH-229	745.29	277.0	0.312	Circle	8.0	0.013	32.46	6.30	1.1	46,747.50	3,030.64
377	MH-229	745.29	MH-228	737.46	150.2	0.052	Circle	8.0	0.013	282.46	6.41	22.8	406,747.51	1,238.37
379	MH-228	737.46	MH-610	720.24	142.0	0.121	Circle	8.0	0.013	282.46	8.66	15.0	406,747.51	1,888.64
381	MH-610	720.24	MH-611	718.55	325.4	0.005	Circle	10.0	0.013	286.27	2.74	40.4	412,235.26	708.70
382	MH-611	718.55	MH-612	717.24	332.3	0.004	Circle	10.0	0.013	286.27	2.48	46.4	412,235.26	617.44
397	MH-242	962.56	MH-243	956.31	170.3	0.037	Circle	8.0	0.013	16.23	2.44	1.6	23,373.75	1,038.99
398	MH-243	956.31	MH-244	950.66	290.4	0.019	Circle	8.0	0.013	17.53	2.00	2.3	25,243.65	756.43
399	MH-244	950.66	MH-245	949.82	91.6	0.009	Circle	8.0	0.013	17.53	1.54	3.4	25,243.65	519.43
400	MH-245	949.82	MH-246	899.54	416.1	0.121	Circle	8.0	0.013	17.53	3.75	0.9	25,243.65	1,885.36
401	MH-246	899.54	MH-247	884.56	181.6	0.082	Circle	8.0	0.013	17.53	3.29	1.1	25,243.65	1,557.68
402	MH-247	884.56	MH-248	860.45	257.7	0.094	Circle	8.0	0.013	19.48	3.55	1.2	28,048.50	1,658.85
403	MH-248	860.45	MH-249	855.67	172.6	0.028	Circle	8.0	0.013	22.72	2.44	2.5	32,723.25	902.53
404	MH-249	855.67	MH-588	852.86	127.4	0.022	Circle	8.0	0.013	22.72	2.26	2.8	32,723.25	805.40
406	MH-588	852.86	MH-911	840.00	183.4	0.070	Circle	8.0	0.013	22.72	3.39	1.6	32,723.25	1,436.23
407	MH-911	840.00	MH-250	835.64	226.8	0.019	Circle	8.0	0.013	29.22	2.32	3.9	42,072.75	751.93
408	MH-593	862.50	MH-248	860.45	304.6	0.007	Circle	8.0	0.013	3.25	0.82	0.7	4,674.75	444.96
411	MH-591	767.77	MH-251	748.08	256.2	0.077	Circle	8.0	0.013	250.00	7.10	16.6	359,999.99	1,503.40
412	MH-251	748.08	MH-229	745.29	161.1	0.017	Circle	8.0	0.013	250.00	4.16	35.0	359,999.99	713.79
418	MH-591	767.77	MH-252	769.88	213.9	0.010	Circle	8.0	0.013	250.00	3.38	46.4	359,999.99	538.65
419	MH-252	769.88	MH-253	771.09	193.4	0.006	Circle	8.0	0.013	250.00	2.84	58.3	359,999.99	429.01
420	MH-253	771.09	MH-254	776.92	271.3	0.021	Circle	8.0	0.013	250.00	4.50	31.4	359,999.99	795.08
421	MH-254	776.92	MH-255	787.91	304.9	0.036	Circle	8.0	0.013	250.00	5.43	24.3	359,999.99	1,029.69
428	MH-258	811.13	MH-259	786.64	279.4	0.088	Circle	8.0	0.013	4.54	2.24	0.3	6,544.65	1,605.60
429	MH-259	786.64	MH-260	775.02	181.8	0.064	Circle	8.0	0.013	4.54	2.03	0.3	6,544.65	1,371.27
430	MH-302	795.80	MH-303	768.59	331.0	0.082	Circle	8.0	0.013	4.54	2.19	0.3	6,544.65	1,555.01
433	MH-303	768.59	MH-304	764.34	154.3	0.028	Circle	8.0	0.013	4.54	1.50	0.5	6,544.65	900.15
434	MH-304	764.34	MH-506	777.79	218.2	0.062	Circle	8.0	0.013	2.60	1.70	0.2	3,739.80	1,346.49
438	MH-304	764.34	MH-301	754.33	233.0	0.043	Circle	8.0	0.013	7.14	2.00	0.6	10,284.45	1,124.03
439	MH-301	754.33	MH-305	771.45	315.5	0.054	Circle	8.0	0.013	11.69	2.51	0.9	16,829.10	1,263.32

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
440	MH-301	754.33	MH-300	737.84	130.0	0.127	Circle	8.0	0.013	18.83	3.90	1.0	27,113.55	1,931.54
457	MH-282	749.68	MH-299	731.93	158.1	0.112	Circle	8.0	0.013	13.40	3.38	0.7	19,300.62	1,817.11
458	MH-299	731.93	MH-298	739.67	201.6	0.038	Circle	8.0	0.013	64.93	3.75	6.1	93,495.00	1,062.65
459	MH-298	739.67	MH-297	741.72	170.1	0.012	Circle	8.0	0.013	64.93	2.49	10.9	93,495.00	595.33
460	MH-297	741.72	MH-296	752.22	422.2	0.025	Circle	8.0	0.013	64.93	3.22	7.6	93,495.00	855.30
461	MH-296	752.22	MH-295	758.15	374.6	0.016	Circle	8.0	0.013	64.93	2.74	9.5	93,495.00	682.38
462	MH-295	758.15	MH-294	759.10	218.0	0.004	Circle	8.0	0.013	63.63	1.73	17.8	91,625.10	358.04
463	MH-294	759.10	MH-293	759.94	131.6	0.006	Circle	8.0	0.013	63.63	1.98	14.7	91,625.10	433.26
464	MH-293	759.94	MH-292	760.33	162.8	0.002	Circle	8.0	0.013	63.63	1.39	24.0	91,625.10	265.42
465	MH-292	760.33	MH-291	761.28	161.2	0.006	Circle	8.0	0.013	61.68	1.90	14.8	88,820.25	416.32
466	MH-291	761.28	MH-290	760.95	143.6	-0.002	Circle	8.0	0.013	61.68	0.39	23.7	88,820.25	260.03
468	MH-290	760.95	MH-289	762.16	123.5	0.010	Circle	8.0	0.013	48.70	2.13	9.1	70,121.25	536.82
474	MH-288	767.03	MH-287	773.58	435.3	0.015	Circle	8.0	0.013	12.99	1.67	2.0	18,699.00	665.27
475	MH-287	773.58	MH-286	780.70	116.1	0.061	Circle	8.0	0.013	0.00	0.00	0.0	0.00	1,343.13
477	MH-285	784.47	MH-284	779.28	334.0	0.016	Circle	8.0	0.013	3.90	1.17	0.6	5,609.70	676.01
478	MH-284	779.28	MH-283	768.56	256.0	0.042	Circle	8.0	0.013	3.90	1.66	0.4	5,609.70	1,109.81
479	MH-283	768.56	MH-282	749.68	203.3	0.093	Circle	8.0	0.013	10.81	2.96	0.7	15,560.82	1,652.86
480	MH-256	784.75	MH-260	775.02	375.1	0.026	Circle	8.0	0.013	1.95	1.13	0.2	2,804.85	873.50
491	MH-311	786.88	MH-281	774.50	167.2	0.074	Circle	8.0	0.013	8.44	2.55	0.6	12,154.35	1,475.98
492	MH-281	774.50	MH-287	773.58	284.3	0.003	Circle	8.0	0.013	8.44	0.86	2.7	12,154.35	308.51
503	MH-261	1,026.74	MH-263	1,036.86	254.7	-0.040	Circle	8.0	0.013	16.88	0.11	1.6	24,308.70	1,081.06
504	MH-263	1,036.86	MH-264	1,046.42	319.5	-0.030	Circle	8.0	0.013	18.18	0.12	1.9	26,178.60	938.21
505	MH-264	1,046.42	MH-265	1,066.01	278.3	-0.070	Circle	8.0	0.013	18.18	0.12	1.3	26,178.60	1,438.83
506	MH-265	1,066.01	MH-266	1,038.25	313.4	0.089	Circle	8.0	0.013	20.78	3.59	1.3	29,918.40	1,614.17
507	MH-266	1,038.25	MH-267	1,011.60	368.7	0.072	Circle	8.0	0.013	24.67	3.51	1.7	35,528.10	1,458.06
508	MH-267	1,011.60	MH-268	965.00	355.6	0.131	Circle	8.0	0.013	24.67	4.34	1.3	35,528.10	1,963.21
526	MH-278	801.12	MH-277	787.73	239.2	0.056	Circle	8.0	0.013	7.14	2.20	0.6	10,284.45	1,283.19
530	MH-277	787.73	MH-280	770.54	206.2	0.083	Circle	8.0	0.013	44.80	4.41	2.9	64,511.55	1,566.09
531	MH-280	770.54	MH-911	768.00	95.3	0.027	Circle	8.0	0.013	48.70	3.03	5.5	70,121.25	885.54
532	MH-911	768.00	MH-289	762.16	261.0	0.022	Circle	8.0	0.013	48.70	2.85	6.0	70,121.25	811.19
534	MH-280	770.54	MH-279	783.28	234.3	0.054	Circle	8.0	0.013	3.90	1.80	0.3	5,609.70	1,264.69
545	MH-594	870.28	MH-231	856.83	190.7	0.071	Circle	12.0	0.013	8.44	2.35	0.2	12,154.35	4,246.78
546	MH-231	856.83	MH-232	851.99	180.3	0.027	Circle	12.0	0.013	8.44	1.68	0.3	12,154.35	2,620.03
547	MH-232	851.99	MH-235	848.81	81.7	0.039	Circle	12.0	0.013	8.44	1.92	0.3	12,154.35	3,153.75
549	MH-235	848.81	MH-236	840.64	125.1	0.065	Circle	12.0	0.013	14.93	2.75	0.4	21,503.85	4,087.05
550	MH-236	840.64	MH-306	849.34	162.4	0.054	Circle	12.0	0.013	3.90	1.71	0.1	5,609.70	3,700.77
551	MH-236	840.64	MH-237	836.12	377.9	0.012	Circle	12.0	0.013	18.83	1.64	1.1	27,113.55	1,748.69
552	MH-237	836.12	MH-239	834.72	409.8	0.003	Circle	12.0	0.013	26.62	1.17	2.8	38,332.95	934.56

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
553	MH-239	834.72	MH-238	840.75	341.7	0.018	Circle	12.0	0.013	14.28	1.71	0.7	20,568.90	2,124.28
554	MH-238	840.75	MH-241	854.90	305.7	0.046	Circle	12.0	0.013	14.28	2.38	0.4	20,568.90	3,440.07
558	MH-235	848.81	MH-234	850.23	221.8	0.006	Circle	12.0	0.013	6.49	0.95	0.5	9,349.50	1,279.28
559	MH-234	850.23	MH-233	854.29	195.8	0.021	Circle	12.0	0.013	6.49	1.43	0.3	9,349.50	2,302.54
561	MH-105	805.70	MH-109	794.15	341.2	0.034	Circle	8.0	0.013	1.30	1.10	0.1	1,869.90	997.77
563	MH-205	787.21	MH-204	7.58	177.0	4.404	Circle	8.0	0.013	2.60	7.25	0.0	3,739.80	11,380.96
564	MH-204	7.58	MH-203	784.23	193.2	-4.020	Circle	8.0	0.013	2.60	0.02	0.0	3,739.80	10,873.37
567	MH-137	761.45	MH-607	759.77	211.8	0.008	Circle	8.0	0.013	36.90	1.82	7.6	53,129.70	482.97
568	MH-606	764.25	MH-607	759.77	106.5	0.042	Circle	8.0	0.013	306.07	6.05	27.5	440,744.41	1,112.23
571	MH-146	762.94	MH-609	760.98	304.3	0.006	Circle	8.0	0.013	166.95	2.60	38.4	240,404.84	435.26
573	MH-912	767.00	MH-170	758.21	210.7	0.042	Circle	8.0	0.013	1.95	1.32	0.2	2,804.85	1,107.68
574	MH-170	758.21	MH-148	757.37	209.6	0.004	Circle	8.0	0.013	45.45	1.52	13.2	65,446.50	343.35
582	MH-196	823.67	MH-197	816.33	105.6	0.069	Circle	8.0	0.013	1.95	1.60	0.1	2,804.85	1,429.56
583	MH-241	854.90	MH-240	858.97	189.1	0.022	Circle	12.0	0.013	14.28	1.83	0.6	20,568.90	2,345.88
584	MH-305	771.45	MH-260	775.02	259.1	0.014	Circle	8.0	0.013	11.69	1.57	1.8	16,829.10	636.60
586	MH-257	804.18	MH-254	776.92	167.7	0.163	Circle	8.0	0.013	0.00	0.00	0.0	0.00	2,186.46
587	MH-261	1,026.74	MH-262	1,011.32	146.5	-0.105	Circle	8.0	0.013	16.88	0.11	1.0	24,308.70	1,759.28
588	MH-288	767.03	MH-290	760.95	52.9	0.115	Circle	8.0	0.013	12.99	3.37	0.7	18,699.00	1,838.58
593	MH-225	715.01	Lakefront LS	705.00	25.1	0.398	Circle	8.0	0.013	8.44	4.57	0.2	12,154.35	3,422.84
594	MH-615	711.78	Lakefront LS	705.00	665.8	0.010	Circle	10.0	0.013	328.03	3.64	33.1	472,356.59	992.31
596	MH-299	731.93	School St. LS	725.00	21.5	0.322	Circle	8.0	0.013	78.33	8.36	2.5	112,795.62	3,079.44
597	MH-300	737.84	School St. LS	725.00	464.6	0.028	Circle	8.0	0.013	21.43	2.40	2.4	30,853.35	901.61
599	MH-144	747.76	Shamel St. LS	745.00	68.9	0.040	Circle	8.0	0.013	344.66	6.16	31.8	496,313.11	1,085.40
601	MH-112	739.00	Shadow Ridge LS	735.00	124.0	0.032	Circle	8.0	0.013	15.58	2.30	1.6	22,438.80	973.99
602	MH-113	745.55	Shadow Ridge LS	735.00	186.8	0.056	Circle	8.0	0.013	0.65	1.08	0.1	934.95	1,289.02
604	MH-207	746.89	MH-278	743.64	70.8	0.046	Circle	12.0	0.013	39.15	3.25	1.1	56,381.55	3,425.02
605	MH-278	743.64	MH-210	740.27	310.4	0.011	Circle	12.0	0.013	295.19	3.57	17.7	425,077.79	1,666.02
607	MH-279	745.21	MH-278	743.64	559.0	0.003	Circle	10.0	0.013	256.04	2.12	49.1	368,696.24	521.12
610	MH-155	747.11	MH-280	746.64	168.8	0.003	Circle	10.0	0.013	222.28	2.04	42.8	320,078.85	518.90
612	MH-280	746.64	MH-281	746.22	146.9	0.003	Circle	10.0	0.013	222.28	2.06	42.3	320,078.85	525.75
613	MH-281	746.22	MH-279	745.21	359.0	0.003	Circle	10.0	0.013	256.04	2.12	49.1	368,696.24	521.55
614	MH-209	758.11	MH-281	746.22	63.8	0.186	Circle	8.0	0.013	33.76	5.38	1.4	48,617.40	2,341.77

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
615	MH-120	790.95	MH-122	768.54	877.7	0.026	Circle	8.0	0.013	28.57	2.55	3.3	41,137.80	866.62
616	MH-128	782.17	MH-123	767.58	805.8	0.018	Circle	8.0	0.013	11.69	1.73	1.6	16,829.10	729.78
618	MH-239	834.72	MH-226	727.68	833.8	0.128	Circle	12.0	0.013	40.90	4.69	0.7	58,901.85	5,729.31
621	MH-210	740.27	Jet Pump	735.00	195.5	0.027	Circle	12.0	0.013	295.19	4.93	11.2	425,077.79	2,625.00
625	O-7	730.00	MH-616	734.54	16.9	0.268	Circle	12.0	0.013	410.00	12.21	5.0	590,399.99	8,281.34
626	MH-174	874.93	MH-177	843.22	753.6	0.042	Circle	8.0	0.013	32.46	3.15	2.9	46,747.50	1,112.54
627	MH-619	838.22	MH-209	758.11	1,229.9	0.065	Circle	8.0	0.013	33.76	3.71	2.4	48,617.40	1,384.18
629	MH-268	965.00	MH-274	840.00	1,471.4	0.085	Circle	8.0	0.013	30.52	3.94	1.9	43,942.65	1,580.75
630	MH-274	840.00	MH-277	787.73	791.1	0.066	Circle	8.0	0.013	37.66	3.85	2.7	54,227.10	1,394.05
631	MH-307	841.25	MH-311	786.88	634.1	0.086	Circle	8.0	0.013	0.65	1.26	0.0	934.95	1,588.08
633	MH-116	756.62	O-8	750.00	24.3	0.272	Circle	8.0	0.013	18.18	5.05	0.6	26,178.60	2,828.90

Scenario: Future, 20-Year



FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
40	MH-107	852.59	MH-901	830.00	410.3	0.055	Circle	8.0	0.013	15.63	2.76	1.2	22,514.24
47	MH-901	830.00	MH-106	849.26	109.2	0.176	Circle	8.0	0.013	3.40	2.62	0.1	4,894.40
49	MH-102	859.06	MH-106	849.26	75.5	0.130	Circle	8.0	0.013	3.40	2.32	0.2	4,894.40
50	MH-108	816.75	MH-901	830.00	183.3	0.072	Circle	8.0	0.013	19.03	3.26	1.3	27,408.64
51	MH-103	810.00	MH-104	808.95	111.5	0.009	Circle	8.0	0.013	1.36	0.71	0.3	1,957.76
53	MH-104	808.95	MH-105	805.70	108.4	0.030	Circle	8.0	0.013	1.36	1.07	0.1	1,957.76
56	MH-108	816.75	MH-109	794.15	226.0	0.100	Circle	8.0	0.013	19.03	3.61	1.1	27,408.64
57	MH-109	794.15	MH-110	770.12	177.0	0.136	Circle	8.0	0.013	20.39	4.09	1.0	29,366.40
60	MH-111	757.08	MH-112	739.00	269.5	0.067	Circle	8.0	0.013	24.47	3.40	1.7	35,239.68
68	MH-902	752.00	MH-903	750.00	143.1	0.014	Circle	8.0	0.013	0.68	0.67	0.1	978.88
69	MH-903	750.00	MH-113	745.55	419.7	0.011	Circle	8.0	0.013	0.68	0.61	0.1	978.88
72	MH-905	772.00	MH-110	770.12	477.4	0.004	Circle	8.0	0.013	2.72	0.65	0.8	3,915.52
73	MH-110	770.12	MH-111	757.08	196.7	0.066	Circle	8.0	0.013	23.11	3.34	1.7	33,281.92
75	MH-904	759.00	MH-111	757.08	397.2	0.005	Circle	8.0	0.013	1.36	0.57	0.4	1,957.76
86	MH-114	760.41	MH-115	758.40	195.6	0.010	Circle	8.0	0.013	6.12	1.16	1.1	8,809.92
87	MH-115	758.40	MH-116	756.62	256.4	0.007	Circle	8.0	0.013	6.12	1.02	1.4	8,809.92
88	MH-116	756.62	MH-117	757.26	100.3	0.006	Circle	8.0	0.013	12.92	1.23	3.0	18,598.72
89	MH-117	757.26	MH-118	757.63	75.7	0.005	Circle	8.0	0.013	6.12	0.90	1.6	8,809.92
90	MH-118	757.63	MH-119	761.52	385.0	0.010	Circle	8.0	0.013	6.12	1.15	1.1	8,809.92
91	MH-119	761.52	MH-312	764.51	139.1	0.021	Circle	8.0	0.013	6.12	1.50	0.8	8,809.92
97	MH-133	766.99	MH-132	766.62	109.1	0.003	Circle	12.0	0.013	100.00	1.73	10.7	144,000.00
98	MH-132	766.62	MH-123	767.58	305.1	0.003	Circle	12.0	0.013	106.73	1.71	11.9	153,684.16
99	MH-123	767.58	MH-122	768.54	297.4	0.003	Circle	12.0	0.013	94.49	1.67	10.4	136,064.32
116	MH-132	766.62	MH-130	767.75	191.8	0.006	Circle	8.0	0.013	12.92	1.20	3.1	18,598.72
117	MH-130	767.75	MH-131	768.95	169.9	0.007	Circle	8.0	0.013	3.40	0.85	0.7	4,894.40
123	MH-140	774.14	MH-141	773.74	118.0	0.003	Circle	8.0	0.013	4.76	0.73	1.5	6,852.16
124	MH-141	773.74	MH-136	764.49	311.8	0.030	Circle	8.0	0.013	4.76	1.56	0.5	6,852.16
129	MH-130	767.75	MH-129	772.17	249.4	0.018	Circle	8.0	0.013	9.52	1.62	1.3	13,704.32
130	MH-129	772.17	MH-127	782.55	386.6	0.027	Circle	8.0	0.013	9.52	1.85	1.1	13,704.32
132	MH-139	757.13	MH-906	756.00	49.4	0.023	Circle	8.0	0.013	423.48	5.28	51.7	609,815.06
139	MH-144	747.76	MH-143	749.22	275.3	0.005	Circle	8.0	0.013	425.26	2.71	107.7	612,368.63
140	MH-143	749.22	MH-608	751.00	299.6	0.006	Circle	8.0	0.013	425.26	3.04	101.7	612,368.63
141	MH-608	751.00	MH-142	752.59	281.8	0.006	Circle	8.0	0.013	423.48	2.95	104.0	609,815.06
142	MH-142	752.59	MH-906	756.00	307.2	0.011	Circle	8.0	0.013	423.48	3.99	74.1	609,815.06
152	MH-167	768.98	MH-168	766.70	365.5	0.006	Circle	8.0	0.013	7.48	1.04	1.7	10,767.68
154	MH-168	766.70	MH-173	760.64	188.4	0.032	Circle	8.0	0.013	109.44	4.11	11.3	157,599.68
156	MH-173	760.64	MH-172	759.48	289.0	0.004	Circle	8.0	0.013	109.44	1.95	31.9	157,599.68
157	MH-172	759.48	MH-171	758.80	168.9	0.004	Circle	8.0	0.013	113.52	1.97	33.0	163,472.96

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
158	MH-171	758.80	MH-170	758.21	148.7	0.004	Circle	8.0	0.013	113.52	1.96	33.2	163,472.96
160	MH-145	756.61	MH-144	747.76	321.4	0.028	Circle	8.0	0.013	0.00	0.00	0.0	0.00
165	MH-148	757.37	MH-147	758.83	342.2	0.004	Circle	8.0	0.013	170.44	2.24	48.1	245,431.04
166	MH-147	758.83	MH-609	760.98	259.4	0.008	Circle	8.0	0.013	167.04	2.84	33.8	240,536.63
178	MH-161	793.17	MH-158	797.80	267.0	0.017	Circle	8.0	0.013	89.05	3.11	12.5	128,233.28
179	MH-158	797.80	MH-156	805.99	208.0	0.039	Circle	8.0	0.013	78.17	4.00	7.3	112,571.20
180	MH-158	797.80	MH-157	814.25	421.3	0.039	Circle	8.0	0.013	10.88	2.19	1.0	15,662.08
181	MH-161	793.17	MH-162	785.71	275.4	0.027	Circle	8.0	0.013	101.29	3.78	11.3	145,853.12
182	MH-162	785.71	MH-163	776.29	268.0	0.035	Circle	8.0	0.013	101.29	4.15	10.0	145,853.12
183	MH-163	776.29	MH-164	769.50	272.1	0.025	Circle	8.0	0.013	101.29	3.68	11.8	145,853.12
184	MH-164	769.50	MH-165	768.87	171.8	0.004	Circle	8.0	0.013	101.29	1.85	30.8	145,853.12
185	MH-165	768.87	MH-166	768.66	43.7	0.005	Circle	8.0	0.013	101.29	2.03	26.9	145,853.12
187	MH-161	793.17	MH-160	803.35	369.4	0.028	Circle	8.0	0.013	12.24	2.03	1.4	17,619.84
188	MH-160	803.35	MH-159	808.04	346.3	0.014	Circle	8.0	0.013	12.24	1.58	1.9	17,619.84
192	MH-148	757.37	MH-149	754.58	463.3	0.006	Circle	10.0	0.013	286.00	2.89	37.5	411,840.62
193	MH-149	754.58	MH-150	754.79	143.1	-0.001	Circle	10.0	0.013	289.40	1.18	76.8	416,735.03
194	MH-150	754.79	MH-151	752.48	274.7	0.008	Circle	10.0	0.013	289.40	3.28	32.1	416,735.03
196	MH-152	759.52	MH-151	752.48	267.1	0.026	Circle	10.0	0.013	0.00	0.00	0.0	0.00
200	MH-155	747.11	MH-154	750.36	280.3	0.012	Circle	10.0	0.013	292.95	3.70	27.7	421,842.24
201	MH-154	750.36	MH-153	750.86	320.1	0.002	Circle	10.0	0.013	292.95	1.74	75.4	421,842.24
202	MH-153	750.86	MH-151	752.48	310.7	0.005	Circle	10.0	0.013	292.95	2.76	41.3	421,842.24
222	MH-177	843.22	MH-619	838.22	184.8	0.027	Circle	8.0	0.013	101.97	3.78	11.4	146,832.00
233	MH-595	804.35	MH-194	800.98	274.3	0.012	Circle	8.0	0.013	5.44	1.19	0.9	7,831.04
234	MH-194	800.98	MH-596	797.19	111.2	0.034	Circle	8.0	0.013	5.44	1.70	0.5	7,831.04
243	MH-203	784.23	MH-202	782.69	52.2	0.030	Circle	8.0	0.013	11.56	2.02	1.2	16,640.96
244	MH-202	782.69	MH-201	779.42	305.3	0.011	Circle	8.0	0.013	11.56	1.43	2.1	16,640.96
245	MH-201	779.42	MH-617	775.43	177.1	0.023	Circle	8.0	0.013	12.44	1.90	1.5	17,917.76
246	MH-596	797.19	MH-203	784.23	322.0	0.040	Circle	8.0	0.013	8.84	2.08	0.8	12,725.44
257	MH-166	768.66	MH-168	766.70	326.5	0.006	Circle	8.0	0.013	101.97	2.21	24.3	146,832.00
258	MH-134	765.21	MH-135	764.51	419.0	0.002	Circle	8.0	0.013	364.76	2.33	164.5	525,252.81
262	MH-132	766.62	MH-907	766.13	183.9	0.003	Circle	12.0	0.013	219.64	1.98	26.5	316,282.88
263	MH-907	766.13	MH-908	766.04	31.9	0.003	Circle	12.0	0.013	223.04	0.63	26.8	321,177.29
264	MH-908	766.04	MH-134	765.21	310.3	0.003	Circle	12.0	0.013	223.04	0.63	27.0	321,177.29
270	MH-181	860.73	MH-182	859.09	139.7	0.012	Circle	8.0	0.013	53.02	2.33	9.0	76,352.64
271	MH-182	859.09	MH-183	850.42	267.9	0.032	Circle	8.0	0.013	53.02	3.33	5.4	76,352.64
272	MH-183	850.42	MH-184	846.42	154.0	0.026	Circle	8.0	0.013	53.02	3.08	6.1	76,352.64
273	MH-184	846.42	MH-185	842.34	139.5	0.029	Circle	8.0	0.013	53.02	3.21	5.7	76,352.64
274	MH-185	842.34	MH-186	833.21	244.6	0.037	Circle	8.0	0.013	53.02	3.50	5.1	76,352.64

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
275	MH-186	833.21	MH-187	830.10	129.9	0.024	Circle	8.0	0.013	140.03	3.98	16.7	201,649.29
276	MH-187	830.10	MH-195	819.50	131.4	0.081	Circle	8.0	0.013	140.03	6.11	9.1	201,649.29
278	MH-195	819.50	MH-197	816.33	180.3	0.018	Circle	8.0	0.013	140.03	3.56	19.5	201,649.29
285	MH-180	883.74	MH-179	880.24	86.1	0.041	Circle	8.0	0.013	77.49	4.03	7.1	111,592.32
286	MH-179	880.24	MH-178	855.67	333.6	0.074	Circle	8.0	0.013	77.49	4.97	5.3	111,592.32
287	MH-178	855.67	MH-909	850.00	327.4	0.017	Circle	8.0	0.013	77.49	2.98	10.9	111,592.32
288	MH-909	850.00	MH-191	840.51	304.1	0.031	Circle	8.0	0.013	77.49	3.67	8.1	111,592.32
289	MH-191	840.51	MH-190	836.55	86.1	0.046	Circle	8.0	0.013	83.61	4.31	7.2	120,402.24
290	MH-190	836.55	MH-189	835.06	75.6	0.020	Circle	8.0	0.013	83.61	3.19	11.0	120,402.24
291	MH-189	835.06	MH-188	834.65	91.1	0.005	Circle	8.0	0.013	83.61	1.89	23.0	120,402.24
292	MH-188	834.65	MH-186	833.21	349.4	0.004	Circle	8.0	0.013	83.61	1.83	24.0	120,402.24
293	MH-191	840.51	MH-192	850.45	272.9	0.036	Circle	8.0	0.013	6.12	1.80	0.6	8,809.92
294	MH-192	850.45	MH-193	868.55	358.5	0.050	Circle	8.0	0.013	6.12	2.02	0.5	8,809.92
295	MH-597	800.82	MH-596	797.19	197.4	0.018	Circle	8.0	0.013	3.40	1.19	0.5	4,894.40
297	MH-207	746.89	MH-206	758.13	88.1	0.128	Circle	12.0	0.013	158.60	7.08	2.8	228,376.96
298	MH-206	758.13	MH-910	765.00	184.6	0.037	Circle	8.0	0.013	158.60	4.82	15.2	228,376.96
299	MH-910	765.00	MH-617	775.43	290.7	0.036	Circle	8.0	0.013	158.60	4.76	15.4	228,376.96
303	MH-197	816.33	MH-198	800.78	249.5	0.062	Circle	8.0	0.013	142.07	5.61	10.5	204,585.92
304	MH-198	800.78	MH-199	793.14	161.8	0.047	Circle	8.0	0.013	142.07	5.08	12.1	204,585.92
305	MH-199	793.14	MH-200	783.36	208.4	0.047	Circle	8.0	0.013	142.07	5.08	12.1	204,585.92
306	MH-200	783.36	MH-617	775.43	180.0	0.044	Circle	8.0	0.013	146.15	4.99	12.8	210,459.21
307	MH-618	766.12	MH-206	758.13	393.8	0.020	Circle	8.0	0.013	0.00	0.00	0.0	0.00
313	MH-135	764.51	MH-606	764.25	181.0	0.001	Circle	8.0	0.013	364.76	2.33	177.5	525,252.81
314	MH-606	764.25	MH-136	764.49	286.5	0.001	Circle	8.0	0.013	4.76	0.45	3.0	6,852.16
315	MH-607	759.77	MH-139	757.13	260.7	0.010	Circle	8.0	0.013	423.48	3.85	77.6	609,815.06
324	MH-213	736.84	MH-212	734.79	91.0	0.023	Circle	10.0	0.013	410.00	5.16	27.8	590,399.99
326	MH-212	734.79	MH-616	734.54	150.3	0.002	Circle	12.0	0.013	410.00	1.95	62.9	590,399.99
335	MH-213	736.84	MH-214	745.26	226.0	0.037	Circle	10.0	0.013	410.00	6.19	21.6	590,399.99
336	MH-214	745.26	MH-215	754.15	219.3	0.041	Circle	10.0	0.013	410.00	6.38	20.7	590,399.99
337	MH-215	754.15	MH-216	756.53	187.2	0.013	Circle	10.0	0.013	410.00	4.19	37.0	590,399.99
338	MH-230	740.80	MH-212	734.79	388.1	0.015	Circle	12.0	0.013	0.00	0.00	0.0	0.00
339	MH-221	738.18	MH-220	729.85	148.1	0.056	Circle	8.0	0.013	5.44	2.04	0.4	7,831.04
340	MH-220	729.85	MH-219	720.88	105.8	0.085	Circle	8.0	0.013	5.44	2.36	0.3	7,831.04
341	MH-219	720.88	MH-217	718.19	136.6	0.020	Circle	8.0	0.013	5.44	1.40	0.7	7,831.04
343	MH-217	718.19	MH-218	734.26	271.0	0.059	Circle	8.0	0.013	2.72	1.69	0.2	3,915.52
346	MH-217	718.19	MH-222	716.15	283.0	0.007	Circle	8.0	0.013	8.16	1.12	1.8	11,746.56
348	MH-222	716.15	MH-223	714.15	266.8	0.007	Circle	8.0	0.013	8.16	1.14	1.7	11,746.56
350	MH-223	714.15	MH-224	713.70	111.4	0.004	Circle	8.0	0.013	8.84	0.06	2.6	12,725.44

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
352	MH-224	713.70	MH-225	715.01	251.4	-0.005	Circle	8.0	0.013	8.84	0.06	2.3	12,725.44
361	MH-612	717.24	MH-613	716.88	15.6	0.023	Circle	10.0	0.013	328.77	4.89	22.0	473,422.38
362	MH-613	716.88	MH-614	714.86	462.0	0.004	Circle	10.0	0.013	328.77	2.66	50.6	473,422.38
363	MH-614	714.86	MH-615	711.78	334.6	0.009	Circle	10.0	0.013	328.77	3.51	34.8	473,422.38
364	MH-615	711.78	MH-227	725.52	122.7	0.112	Circle	12.0	0.013	83.61	5.59	1.6	120,402.24
365	MH-227	725.52	MH-226	727.68	74.2	0.029	Circle	12.0	0.013	83.61	3.49	3.1	120,402.24
372	MH-250	835.64	MH-589	833.00	109.7	0.024	Circle	8.0	0.013	71.38	3.27	8.5	102,782.40
373	MH-589	833.00	MH-592	835.00	150.2	0.013	Circle	8.0	0.013	2.04	0.92	0.3	2,936.64
374	MH-589	833.00	MH-590	831.78	29.9	0.041	Circle	8.0	0.013	73.42	3.97	6.7	105,719.04
375	MH-590	831.78	MH-229	745.29	277.0	0.312	Circle	8.0	0.013	74.78	8.16	2.5	107,676.80
377	MH-229	745.29	MH-228	737.46	150.2	0.052	Circle	8.0	0.013	324.78	6.65	26.2	467,676.80
379	MH-228	737.46	MH-610	720.24	142.0	0.121	Circle	8.0	0.013	324.78	9.02	17.2	467,676.80
381	MH-610	720.24	MH-611	718.55	325.4	0.005	Circle	10.0	0.013	328.77	2.84	46.4	473,422.38
382	MH-611	718.55	MH-612	717.24	332.3	0.004	Circle	10.0	0.013	328.77	2.56	53.2	473,422.38
397	MH-242	962.56	MH-243	956.31	170.3	0.037	Circle	8.0	0.013	57.78	3.57	5.6	83,204.80
398	MH-243	956.31	MH-244	950.66	290.4	0.019	Circle	8.0	0.013	59.14	2.88	7.8	85,162.56
399	MH-244	950.66	MH-245	949.82	91.6	0.009	Circle	8.0	0.013	59.14	2.20	11.4	85,162.56
400	MH-245	949.82	MH-246	899.54	416.1	0.121	Circle	8.0	0.013	59.14	5.47	3.1	85,162.56
401	MH-246	899.54	MH-247	884.56	181.6	0.082	Circle	8.0	0.013	59.14	4.77	3.8	85,162.56
402	MH-247	884.56	MH-248	860.45	257.7	0.094	Circle	8.0	0.013	61.18	5.04	3.7	88,099.20
403	MH-248	860.45	MH-249	855.67	172.6	0.028	Circle	8.0	0.013	64.58	3.34	7.2	92,993.60
404	MH-249	855.67	MH-588	852.86	127.4	0.022	Circle	8.0	0.013	64.58	3.09	8.0	92,993.60
406	MH-588	852.86	MH-911	840.00	183.4	0.070	Circle	8.0	0.013	64.58	4.62	4.5	92,993.60
407	MH-911	840.00	MH-250	835.64	226.8	0.019	Circle	8.0	0.013	71.38	3.02	9.5	102,782.40
408	MH-593	862.50	MH-248	860.45	304.6	0.007	Circle	8.0	0.013	3.40	0.84	0.8	4,894.40
411	MH-591	767.77	MH-251	748.08	256.2	0.077	Circle	8.0	0.013	250.00	7.10	16.6	359,999.99
412	MH-251	748.08	MH-229	745.29	161.1	0.017	Circle	8.0	0.013	250.00	4.16	35.0	359,999.99
418	MH-591	767.77	MH-252	769.88	213.9	0.010	Circle	8.0	0.013	250.00	3.38	46.4	359,999.99
419	MH-252	769.88	MH-253	771.09	193.4	0.006	Circle	8.0	0.013	250.00	2.84	58.3	359,999.99
420	MH-253	771.09	MH-254	776.92	271.3	0.021	Circle	8.0	0.013	250.00	4.50	31.4	359,999.99
421	MH-254	776.92	MH-255	787.91	304.9	0.036	Circle	8.0	0.013	250.00	5.43	24.3	359,999.99
428	MH-258	811.13	MH-259	786.64	279.4	0.088	Circle	8.0	0.013	4.76	2.26	0.3	6,852.16
429	MH-259	786.64	MH-260	775.02	181.8	0.064	Circle	8.0	0.013	4.76	2.05	0.3	6,852.16
430	MH-302	795.80	MH-303	768.59	331.0	0.082	Circle	8.0	0.013	4.76	2.21	0.3	6,852.16
433	MH-303	768.59	MH-304	764.34	154.3	0.028	Circle	8.0	0.013	4.76	1.52	0.5	6,852.16
434	MH-304	764.34	MH-506	777.79	218.2	0.062	Circle	8.0	0.013	2.72	1.72	0.2	3,915.52
438	MH-304	764.34	MH-301	754.33	233.0	0.043	Circle	8.0	0.013	7.48	2.03	0.7	10,767.68
439	MH-301	754.33	MH-305	771.45	315.5	0.054	Circle	8.0	0.013	12.24	2.55	1.0	17,619.84

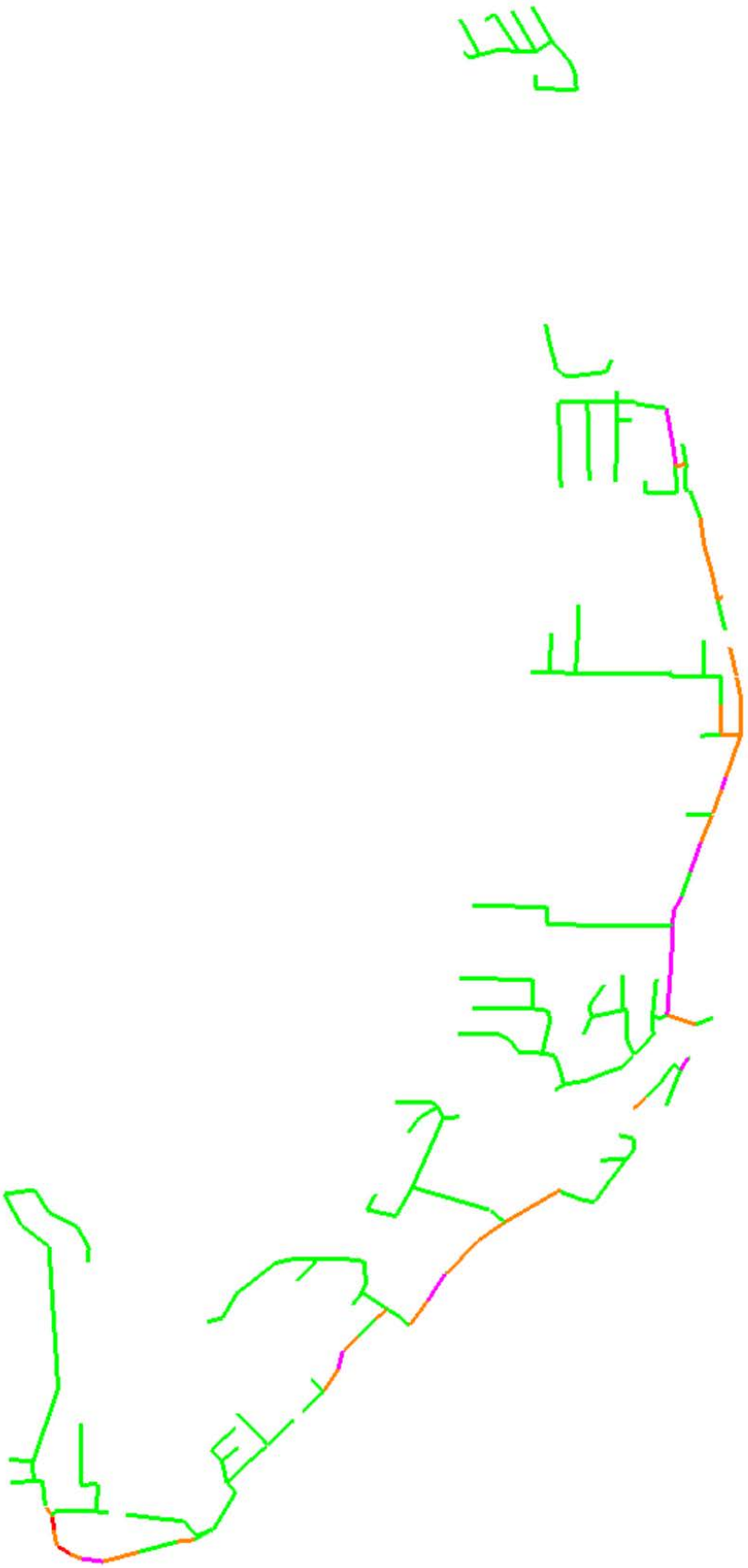
FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
440	MH-301	754.33	MH-300	737.84	130.0	0.127	Circle	8.0	0.013	19.71	3.96	1.0	28,387.52
457	MH-282	749.68	MH-299	731.93	158.1	0.112	Circle	8.0	0.013	14.03	3.42	0.8	20,207.49
458	MH-299	731.93	MH-298	739.67	201.6	0.038	Circle	8.0	0.013	224.33	5.37	21.1	323,030.40
459	MH-298	739.67	MH-297	741.72	170.1	0.012	Circle	8.0	0.013	224.33	3.53	37.7	323,030.40
460	MH-297	741.72	MH-296	752.22	422.2	0.025	Circle	8.0	0.013	224.33	4.59	26.2	323,030.40
461	MH-296	752.22	MH-295	758.15	374.6	0.016	Circle	8.0	0.013	224.33	3.90	32.9	323,030.40
462	MH-295	758.15	MH-294	759.10	218.0	0.004	Circle	8.0	0.013	222.97	2.41	62.3	321,072.64
463	MH-294	759.10	MH-293	759.94	131.6	0.006	Circle	8.0	0.013	222.97	2.79	51.5	321,072.64
464	MH-293	759.94	MH-292	760.33	162.8	0.002	Circle	8.0	0.013	222.97	1.90	84.0	321,072.64
465	MH-292	760.33	MH-291	761.28	161.2	0.006	Circle	8.0	0.013	220.93	2.70	53.1	318,135.99
466	MH-291	761.28	MH-290	760.95	143.6	-0.002	Circle	8.0	0.013	220.93	1.41	85.0	318,135.99
468	MH-290	760.95	MH-289	762.16	123.5	0.010	Circle	8.0	0.013	207.33	3.21	38.6	298,558.40
474	MH-288	767.03	MH-287	773.58	435.3	0.015	Circle	8.0	0.013	13.60	1.69	2.0	19,577.60
475	MH-287	773.58	MH-286	780.70	116.1	0.061	Circle	8.0	0.013	0.00	0.00	0.0	0.00
477	MH-285	784.47	MH-284	779.28	334.0	0.016	Circle	8.0	0.013	4.08	1.18	0.6	5,873.28
478	MH-284	779.28	MH-283	768.56	256.0	0.042	Circle	8.0	0.013	4.08	1.68	0.4	5,873.28
479	MH-283	768.56	MH-282	749.68	203.3	0.093	Circle	8.0	0.013	11.31	3.00	0.7	16,291.97
480	MH-256	784.75	MH-260	775.02	375.1	0.026	Circle	8.0	0.013	2.04	1.15	0.2	2,936.64
491	MH-311	786.88	MH-281	774.50	167.2	0.074	Circle	8.0	0.013	8.84	2.58	0.6	12,725.44
492	MH-281	774.50	MH-287	773.58	284.3	0.003	Circle	8.0	0.013	8.84	0.87	2.9	12,725.44
503	MH-261	1,026.74	MH-263	1,036.86	254.7	-0.040	Circle	8.0	0.013	133.24	0.85	12.3	191,860.47
504	MH-263	1,036.86	MH-264	1,046.42	319.5	-0.030	Circle	8.0	0.013	134.60	0.86	14.3	193,818.23
505	MH-264	1,046.42	MH-265	1,066.01	278.3	-0.070	Circle	8.0	0.013	134.60	0.86	9.4	193,818.23
506	MH-265	1,066.01	MH-266	1,038.25	313.4	0.089	Circle	8.0	0.013	137.32	6.28	8.5	197,733.76
507	MH-266	1,038.25	MH-267	1,011.60	368.7	0.072	Circle	8.0	0.013	141.39	5.90	9.7	203,607.03
508	MH-267	1,011.60	MH-268	977.27	355.6	0.097	Circle	8.0	0.013	141.39	6.53	8.4	203,607.03
526	MH-278	801.12	MH-277	787.73	239.2	0.056	Circle	8.0	0.013	48.26	3.92	3.8	69,500.48
530	MH-277	787.73	MH-280	770.54	206.2	0.083	Circle	8.0	0.013	203.25	6.89	13.0	292,685.12
531	MH-280	770.54	MH-911	768.00	95.3	0.027	Circle	8.0	0.013	207.33	4.61	23.4	298,558.40
532	MH-911	768.00	MH-289	762.16	261.0	0.022	Circle	8.0	0.013	207.33	4.33	25.6	298,558.40
534	MH-280	770.54	MH-279	783.28	234.3	0.054	Circle	8.0	0.013	4.08	1.81	0.3	5,873.28
545	MH-594	870.28	MH-231	856.83	190.7	0.071	Circle	12.0	0.013	49.62	4.05	1.2	71,458.24
546	MH-231	856.83	MH-232	851.99	180.3	0.027	Circle	12.0	0.013	49.62	2.89	1.9	71,458.24
547	MH-232	851.99	MH-235	848.81	81.7	0.039	Circle	12.0	0.013	49.62	3.30	1.6	71,458.24
549	MH-235	848.81	MH-236	840.64	125.1	0.065	Circle	12.0	0.013	56.42	4.12	1.4	81,247.04
550	MH-236	840.64	MH-306	849.34	162.4	0.054	Circle	12.0	0.013	4.08	1.74	0.1	5,873.28
551	MH-236	840.64	MH-237	836.12	377.9	0.012	Circle	12.0	0.013	60.50	2.32	3.5	87,120.32
552	MH-237	836.12	MH-239	834.72	409.8	0.003	Circle	12.0	0.013	68.66	1.55	7.3	98,866.88

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
553	MH-239	834.72	MH-238	840.75	341.7	0.018	Circle	12.0	0.013	14.96	1.73	0.7	21,535.36
554	MH-238	840.75	MH-241	854.90	305.7	0.046	Circle	12.0	0.013	14.96	2.42	0.4	21,535.36
558	MH-235	848.81	MH-234	850.23	221.8	0.006	Circle	12.0	0.013	6.80	0.96	0.5	9,788.80
559	MH-234	850.23	MH-233	854.29	195.8	0.021	Circle	12.0	0.013	6.80	1.45	0.3	9,788.80
561	MH-105	805.70	MH-109	794.15	341.2	0.034	Circle	8.0	0.013	1.36	1.12	0.1	1,957.76
563	MH-205	787.21	MH-204	7.58	177.0	4.404	Circle	8.0	0.013	2.72	7.37	0.0	3,915.52
564	MH-204	7.58	MH-203	784.23	193.2	-4.020	Circle	8.0	0.013	2.72	0.02	0.0	3,915.52
567	MH-137	761.45	MH-607	759.77	211.8	0.008	Circle	8.0	0.013	53.08	2.03	11.0	76,433.28
568	MH-606	764.25	MH-607	759.77	106.5	0.042	Circle	8.0	0.013	370.40	6.38	33.3	533,381.76
571	MH-146	762.94	MH-609	760.98	304.3	0.006	Circle	8.0	0.013	167.04	2.60	38.4	240,536.63
573	MH-912	767.00	MH-170	758.21	210.7	0.042	Circle	8.0	0.013	2.04	1.34	0.2	2,936.64
574	MH-170	758.21	MH-148	757.37	209.6	0.004	Circle	8.0	0.013	115.56	1.97	33.7	166,409.60
582	MH-196	823.67	MH-197	816.33	105.6	0.069	Circle	8.0	0.013	2.04	1.62	0.1	2,936.64
583	MH-241	854.90	MH-240	858.97	189.1	0.022	Circle	12.0	0.013	14.96	1.86	0.6	21,535.36
584	MH-305	771.45	MH-260	775.02	259.1	0.014	Circle	8.0	0.013	12.24	1.58	1.9	17,619.84
586	MH-257	804.18	MH-254	776.92	167.7	0.163	Circle	8.0	0.013	0.00	0.00	0.0	0.00
587	MH-261	1,026.74	MH-262	1,011.32	146.5	-0.105	Circle	8.0	0.013	133.24	0.85	7.6	191,860.47
588	MH-288	767.03	MH-290	760.95	52.9	0.115	Circle	8.0	0.013	13.60	3.42	0.7	19,577.60
593	MH-225	715.01	Lakefront LS	705.00	25.1	0.398	Circle	8.0	0.013	8.84	4.64	0.3	12,725.44
594	MH-615	711.78	Lakefront LS	705.00	665.8	0.010	Circle	10.0	0.013	413.26	3.87	41.6	595,101.44
596	MH-299	731.93	School St. LS	725.00	21.5	0.322	Circle	8.0	0.013	238.36	11.65	7.7	343,237.88
597	MH-300	737.84	School St. LS	725.00	464.6	0.028	Circle	8.0	0.013	22.43	2.43	2.5	32,303.04
599	MH-144	747.76	Shamel St. LS	745.00	68.9	0.040	Circle	8.0	0.013	425.26	6.51	39.2	612,368.63
601	MH-112	739.00	Shadow Ridge LS	735.00	124.0	0.032	Circle	8.0	0.013	25.83	2.68	2.7	37,197.44
602	MH-113	745.55	Shadow Ridge LS	735.00	186.8	0.056	Circle	8.0	0.013	0.68	1.09	0.1	978.88
604	MH-207	746.89	MH-278	743.64	70.8	0.046	Circle	12.0	0.013	158.60	4.95	4.6	228,376.96
605	MH-278	743.64	MH-210	740.27	310.4	0.011	Circle	12.0	0.013	554.87	4.25	33.3	799,008.95
607	MH-279	745.21	MH-278	743.64	559.0	0.003	Circle	10.0	0.013	396.27	2.34	76.0	570,632.01
610	MH-155	747.11	MH-280	746.64	168.8	0.003	Circle	10.0	0.013	292.95	2.18	56.5	421,842.24
612	MH-280	746.64	MH-281	746.22	146.9	0.003	Circle	10.0	0.013	292.95	2.21	55.7	421,842.24
613	MH-281	746.22	MH-279	745.21	359.0	0.003	Circle	10.0	0.013	396.27	2.34	76.0	570,632.01
614	MH-209	758.11	MH-281	746.22	63.8	0.186	Circle	8.0	0.013	103.33	7.53	4.4	148,789.76

Scenario: Future, 20-Year with Improvements



Bentley Systems, Inc. Haestad Methods Solution Center
76 Watertown Road, Suite 2D Thomaston, CT 06787
USA +1-203-755-1666

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
40	MH-107	852.59	MH-901	830.00	410.3	0.055	Circle	8.0	0.013	14.55	2.70	1.1	20,953.69	1,272.54
47	MH-901	830.00	MH-106	849.26	109.2	0.176	Circle	8.0	0.013	3.16	2.56	0.1	4,555.15	2,277.34
49	MH-102	859.06	MH-106	849.26	75.5	0.130	Circle	8.0	0.013	3.16	2.29	0.2	4,555.15	1,954.35
50	MH-108	816.75	MH-901	830.00	183.3	0.072	Circle	8.0	0.013	17.71	3.15	1.2	25,508.84	1,458.08
51	MH-103	810.00	MH-104	808.95	111.5	0.009	Circle	8.0	0.013	1.27	0.70	0.2	1,822.06	526.29
53	MH-104	808.95	MH-105	805.70	108.4	0.030	Circle	8.0	0.013	1.27	1.05	0.1	1,822.06	938.98
56	MH-108	816.75	MH-109	794.15	226.0	0.100	Circle	8.0	0.013	17.71	3.53	1.0	25,508.84	1,715.06
57	MH-109	794.15	MH-110	770.12	177.0	0.136	Circle	8.0	0.013	18.98	4.01	0.9	27,330.90	1,998.13
60	MH-111	757.08	MH-112	739.00	269.5	0.067	Circle	8.0	0.013	22.78	3.34	1.6	32,797.08	1,404.69
68	MH-902	752.00	MH-903	750.00	143.1	0.014	Circle	8.0	0.013	0.63	0.66	0.1	911.03	641.10
69	MH-903	750.00	MH-113	745.55	419.7	0.011	Circle	8.0	0.013	0.63	0.59	0.1	911.03	558.44
72	MH-905	772.00	MH-110	770.12	477.4	0.004	Circle	8.0	0.013	2.53	0.63	0.7	3,644.12	340.34
73	MH-110	770.12	MH-111	757.08	196.7	0.066	Circle	8.0	0.013	21.51	3.27	1.5	30,975.02	1,396.26
75	MH-904	759.00	MH-111	757.08	397.2	0.005	Circle	8.0	0.013	1.27	0.56	0.3	1,822.06	377.06
86	MH-114	760.41	MH-115	758.40	195.6	0.010	Circle	8.0	0.013	5.69	1.13	1.0	8,199.27	549.80
87	MH-115	758.40	MH-116	756.62	256.4	0.007	Circle	8.0	0.013	5.69	1.00	1.3	8,199.27	451.89
88	MH-116	756.62	MH-117	757.26	100.3	0.006	Circle	8.0	0.013	12.02	1.21	2.8	17,309.57	433.18
89	MH-117	757.26	MH-118	757.63	75.7	0.005	Circle	8.0	0.013	5.69	0.88	1.5	8,199.27	379.10
90	MH-118	757.63	MH-119	761.52	385.0	0.010	Circle	8.0	0.013	5.69	1.13	1.0	8,199.27	545.13
91	MH-119	761.52	MH-312	764.51	139.1	0.021	Circle	8.0	0.013	5.69	1.46	0.7	8,199.27	795.11
97	MH-133	766.99	MH-132	766.62	109.1	0.003	Circle	12.0	0.013	100.00	1.73	10.7	144,000.00	931.29
98	MH-132	766.62	MH-123	767.58	305.1	0.003	Circle	12.0	0.013	99.33	1.68	11.1	143,031.71	896.88
99	MH-123	767.58	MH-122	768.54	297.4	0.003	Circle	12.0	0.013	87.94	1.63	9.7	126,633.17	908.46
116	MH-132	766.62	MH-130	767.75	191.8	0.006	Circle	8.0	0.013	12.02	1.17	2.9	17,309.57	416.31
117	MH-130	767.75	MH-131	768.95	169.9	0.007	Circle	8.0	0.013	3.16	0.83	0.7	4,555.15	455.85
123	MH-140	774.14	MH-141	773.74	118.0	0.003	Circle	8.0	0.013	4.43	0.72	1.4	6,377.21	315.78
124	MH-141	773.74	MH-136	764.49	311.8	0.030	Circle	8.0	0.013	4.43	1.52	0.5	6,377.21	934.12
129	MH-130	767.75	MH-129	772.17	249.4	0.018	Circle	8.0	0.013	8.86	1.56	1.2	12,754.42	721.97
130	MH-129	772.17	MH-127	782.55	386.6	0.027	Circle	8.0	0.013	8.86	1.81	1.0	12,754.42	888.64
132	MH-139	757.13	MH-906	756.00	49.4	0.023	Circle	12.0	0.013	414.09	5.13	17.1	596,292.24	2,417.23
139	MH-144	747.76	MH-143	749.22	275.3	0.005	Circle	12.0	0.013	415.74	3.03	35.7	598,668.83	1,164.38
140	MH-143	749.22	MH-608	751.00	299.6	0.006	Circle	12.0	0.013	415.74	3.15	33.7	598,668.83	1,232.55
141	MH-608	751.00	MH-142	752.59	281.8	0.006	Circle	12.0	0.013	414.09	3.09	34.5	596,292.24	1,201.02
142	MH-142	752.59	MH-906	756.00	307.2	0.011	Circle	12.0	0.013	414.09	3.95	24.6	596,292.24	1,684.78
152	MH-167	768.98	MH-168	766.70	365.5	0.006	Circle	8.0	0.013	6.96	1.02	1.6	10,021.33	428.35
154	MH-168	766.70	MH-173	760.64	188.4	0.032	Circle	8.0	0.013	101.86	4.02	10.5	146,675.83	972.75
156	MH-173	760.64	MH-172	759.48	289.0	0.004	Circle	8.0	0.013	101.86	1.91	29.6	146,675.83	343.60
157	MH-172	759.48	MH-171	758.80	168.9	0.004	Circle	8.0	0.013	105.65	1.93	30.7	152,142.01	344.15

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
158	MH-171	758.80	MH-170	758.21	148.7	0.004	Circle	8.0	0.013	105.65	1.92	30.9	152,142.01	341.64
160	MH-145	756.61	MH-144	747.76	321.4	0.028	Circle	8.0	0.013	0.00	0.00	0.0	0.00	899.90
165	MH-148	757.37	MH-147	758.83	342.2	0.004	Circle	8.0	0.013	170.06	2.24	48.0	244,888.24	354.24
166	MH-147	758.83	MH-609	760.98	259.4	0.008	Circle	8.0	0.013	166.90	2.84	33.8	240,333.09	493.78
178	MH-161	793.17	MH-158	797.80	267.0	0.017	Circle	8.0	0.013	82.88	3.04	11.6	119,344.93	714.23
179	MH-158	797.80	MH-156	805.99	208.0	0.039	Circle	8.0	0.013	72.76	3.92	6.8	104,768.45	1,076.19
180	MH-158	797.80	MH-157	814.25	421.3	0.039	Circle	8.0	0.013	10.12	2.14	0.9	14,576.48	1,071.68
181	MH-161	793.17	MH-162	785.71	275.4	0.027	Circle	8.0	0.013	94.27	3.70	10.6	135,743.47	892.60
182	MH-162	785.71	MH-163	776.29	268.0	0.035	Circle	8.0	0.013	94.27	4.06	9.3	135,743.47	1,016.77
183	MH-163	776.29	MH-164	769.50	272.1	0.025	Circle	8.0	0.013	94.27	3.60	11.0	135,743.47	856.71
184	MH-164	769.50	MH-165	768.87	171.8	0.004	Circle	8.0	0.013	94.27	1.81	28.7	135,743.47	328.38
185	MH-165	768.87	MH-166	768.66	43.7	0.005	Circle	8.0	0.013	94.27	1.99	25.1	135,743.47	375.86
187	MH-161	793.17	MH-160	803.35	369.4	0.028	Circle	8.0	0.013	11.39	1.99	1.3	16,398.54	900.27
188	MH-160	803.35	MH-159	808.04	346.3	0.014	Circle	8.0	0.013	11.39	1.55	1.8	16,398.54	631.13
192	MH-148	757.37	MH-149	754.58	463.3	0.006	Circle	10.0	0.013	277.61	2.87	36.4	399,763.35	763.06
193	MH-149	754.58	MH-150	754.79	143.1	-0.001	Circle	10.0	0.013	280.78	1.15	74.5	404,318.49	376.75
194	MH-150	754.79	MH-151	752.48	274.7	0.008	Circle	10.0	0.013	280.78	3.26	31.1	404,318.49	901.78
196	MH-152	759.52	MH-151	752.48	267.1	0.026	Circle	10.0	0.013	0.00	0.00	0.0	0.00	1,596.42
200	MH-155	747.11	MH-154	750.36	280.3	0.012	Circle	10.0	0.013	284.08	3.67	26.8	409,071.71	1,058.77
201	MH-154	750.36	MH-153	750.86	320.1	0.002	Circle	10.0	0.013	284.08	1.73	73.1	409,071.71	388.65
202	MH-153	750.86	MH-151	752.48	310.7	0.005	Circle	10.0	0.013	284.08	2.74	40.0	409,071.71	710.05
222	MH-177	843.22	MH-619	838.22	184.8	0.027	Circle	8.0	0.013	94.90	3.71	10.6	136,654.50	891.98
233	MH-595	804.35	MH-194	800.98	274.3	0.012	Circle	8.0	0.013	5.06	1.16	0.8	7,288.24	601.18
234	MH-194	800.98	MH-596	797.19	111.2	0.034	Circle	8.0	0.013	5.06	1.67	0.5	7,288.24	1,001.12
243	MH-203	784.23	MH-202	782.69	52.2	0.030	Circle	8.0	0.013	10.76	1.98	1.2	15,487.51	931.55
244	MH-202	782.69	MH-201	779.42	305.3	0.011	Circle	8.0	0.013	10.76	1.39	1.9	15,487.51	561.31
245	MH-201	779.42	MH-617	775.43	177.1	0.023	Circle	8.0	0.013	11.58	1.86	1.4	16,675.81	813.95
246	MH-596	797.19	MH-203	784.23	322.0	0.040	Circle	8.0	0.013	8.22	2.04	0.8	11,843.39	1,088.08
257	MH-166	768.66	MH-168	766.70	326.5	0.006	Circle	8.0	0.013	94.90	2.17	22.6	136,654.50	420.19
258	MH-134	765.21	MH-135	764.51	419.0	0.002	Circle	12.0	0.013	356.04	1.89	54.5	512,700.54	653.61
262	MH-132	766.62	MH-907	766.13	183.9	0.003	Circle	12.0	0.013	211.35	1.96	25.5	304,341.27	827.97
263	MH-907	766.13	MH-908	766.04	31.9	0.003	Circle	12.0	0.013	214.51	1.98	25.7	308,896.42	833.51
264	MH-908	766.04	MH-134	765.21	310.3	0.003	Circle	12.0	0.013	214.51	1.97	25.9	308,896.42	826.96
270	MH-181	860.73	MH-182	859.09	139.7	0.012	Circle	8.0	0.013	49.35	2.28	8.4	71,060.34	587.56
271	MH-182	859.09	MH-183	850.42	267.9	0.032	Circle	8.0	0.013	49.35	3.26	5.1	71,060.34	975.73
272	MH-183	850.42	MH-184	846.42	154.0	0.026	Circle	8.0	0.013	49.35	3.01	5.6	71,060.34	874.11
273	MH-184	846.42	MH-185	842.34	139.5	0.029	Circle	8.0	0.013	49.35	3.14	5.3	71,060.34	927.57
274	MH-185	842.34	MH-186	833.21	244.6	0.037	Circle	8.0	0.013	49.35	3.42	4.7	71,060.34	1,047.87

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
275	MH-186	833.21	MH-187	830.10	129.9	0.024	Circle	8.0	0.013	130.33	3.89	15.5	187,672.18	839.14
276	MH-187	830.10	MH-195	819.50	131.4	0.081	Circle	8.0	0.013	130.33	5.99	8.5	187,672.18	1,540.27
278	MH-195	819.50	MH-197	816.33	180.3	0.018	Circle	8.0	0.013	130.33	3.49	18.1	187,672.18	719.10
285	MH-180	883.74	MH-179	880.24	86.1	0.041	Circle	8.0	0.013	72.12	3.95	6.6	103,857.42	1,093.29
286	MH-179	880.24	MH-178	855.67	333.6	0.074	Circle	8.0	0.013	72.12	4.87	4.9	103,857.42	1,471.93
287	MH-178	855.67	MH-909	850.00	327.4	0.017	Circle	8.0	0.013	72.12	2.92	10.1	103,857.42	713.70
288	MH-909	850.00	MH-191	840.51	304.1	0.031	Circle	8.0	0.013	72.12	3.60	7.5	103,857.42	958.07
289	MH-191	840.51	MH-190	836.55	86.1	0.046	Circle	8.0	0.013	77.82	4.22	6.7	112,056.69	1,163.30
290	MH-190	836.55	MH-189	835.06	75.6	0.020	Circle	8.0	0.013	77.82	3.13	10.2	112,056.69	761.49
291	MH-189	835.06	MH-188	834.65	91.1	0.005	Circle	8.0	0.013	77.82	1.85	21.4	112,056.69	363.89
292	MH-188	834.65	MH-186	833.21	349.4	0.004	Circle	8.0	0.013	77.82	1.79	22.4	112,056.69	348.15
293	MH-191	840.51	MH-192	850.45	272.9	0.036	Circle	8.0	0.013	5.69	1.77	0.6	8,199.27	1,035.01
294	MH-192	850.45	MH-193	868.55	358.5	0.050	Circle	8.0	0.013	5.69	1.98	0.5	8,199.27	1,218.59
295	MH-597	800.82	MH-596	797.19	197.4	0.018	Circle	8.0	0.013	3.16	1.16	0.4	4,555.15	735.39
297	MH-207	746.89	MH-206	758.13	88.1	0.128	Circle	12.0	0.013	147.60	6.93	2.6	212,547.26	5,711.08
298	MH-206	758.13	MH-910	765.00	184.6	0.037	Circle	8.0	0.013	147.60	4.72	14.1	212,547.26	1,046.12
299	MH-910	765.00	MH-617	775.43	290.7	0.036	Circle	8.0	0.013	147.60	4.66	14.4	212,547.26	1,027.29
303	MH-197	816.33	MH-198	800.78	249.5	0.062	Circle	8.0	0.013	132.23	5.49	9.8	190,405.27	1,353.94
304	MH-198	800.78	MH-199	793.14	161.8	0.047	Circle	8.0	0.013	132.23	4.97	11.2	190,405.27	1,178.47
305	MH-199	793.14	MH-200	783.36	208.4	0.047	Circle	8.0	0.013	132.23	4.96	11.3	190,405.27	1,174.92
306	MH-200	783.36	MH-617	775.43	180.0	0.044	Circle	8.0	0.013	136.02	4.90	11.9	195,871.46	1,138.45
307	MH-618	766.12	MH-206	758.13	393.8	0.020	Circle	8.0	0.013	0.00	0.00	0.0	0.00	772.49
313	MH-135	764.51	MH-606	764.25	181.0	0.001	Circle	12.0	0.013	356.04	1.79	58.7	512,700.54	606.04
314	MH-606	764.25	MH-136	764.49	286.5	0.001	Circle	8.0	0.013	4.43	0.44	2.8	6,377.21	156.98
315	MH-607	759.77	MH-139	757.13	260.7	0.010	Circle	12.0	0.013	414.09	3.83	25.7	596,292.24	1,609.21
324	MH-213	736.84	MH-212	734.79	91.0	0.023	Circle	10.0	0.013	410.00	5.16	27.8	590,399.99	1,476.25
326	MH-212	734.79	MH-616	734.54	150.3	0.002	Circle	12.0	0.013	410.00	1.95	62.9	590,399.99	652.18
335	MH-213	736.84	MH-214	745.26	226.0	0.037	Circle	10.0	0.013	410.00	6.19	21.6	590,399.99	1,898.16
336	MH-214	745.26	MH-215	754.15	219.3	0.041	Circle	10.0	0.013	410.00	6.38	20.7	590,399.99	1,979.71
337	MH-215	754.15	MH-216	756.53	187.2	0.013	Circle	10.0	0.013	410.00	4.19	37.0	590,399.99	1,108.68
338	MH-230	740.80	MH-212	734.79	388.1	0.015	Circle	12.0	0.013	0.00	0.00	0.0	0.00	1,989.88
339	MH-221	738.18	MH-220	729.85	148.1	0.056	Circle	8.0	0.013	5.06	1.99	0.4	7,288.24	1,286.05
340	MH-220	729.85	MH-219	720.88	105.8	0.085	Circle	8.0	0.013	5.06	2.26	0.3	7,288.24	1,579.40
341	MH-219	720.88	MH-217	718.19	136.6	0.020	Circle	8.0	0.013	5.06	1.37	0.7	7,288.24	761.02
343	MH-217	718.19	MH-218	734.26	271.0	0.059	Circle	8.0	0.013	2.53	1.66	0.2	3,644.12	1,320.75
346	MH-217	718.19	MH-222	716.15	283.0	0.007	Circle	8.0	0.013	7.59	1.10	1.6	10,932.36	460.45
348	MH-222	716.15	MH-223	714.15	266.8	0.007	Circle	8.0	0.013	7.59	1.11	1.6	10,932.36	469.59
350	MH-223	714.15	MH-224	713.70	111.4	0.004	Circle	8.0	0.013	8.22	0.05	2.4	11,843.39	344.76

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
352	MH-224	713.70	MH-225	715.01	251.4	-0.005	Circle	8.0	0.013	8.22	0.05	2.1	11,843.39	391.51
361	MH-612	717.24	MH-613	716.88	15.6	0.023	Circle	10.0	0.013	323.31	4.87	21.7	465,560.66	1,491.59
362	MH-613	716.88	MH-614	714.86	462.0	0.004	Circle	10.0	0.013	323.31	2.65	49.7	465,560.66	650.20
363	MH-614	714.86	MH-615	711.78	334.6	0.009	Circle	10.0	0.013	323.31	3.49	34.3	465,560.66	943.48
364	MH-615	711.78	MH-227	725.52	122.7	0.112	Circle	12.0	0.013	77.82	5.47	1.5	112,056.69	5,349.88
365	MH-227	725.52	MH-226	727.68	74.2	0.029	Circle	12.0	0.013	77.82	3.41	2.9	112,056.69	2,728.20
372	MH-250	835.64	MH-589	833.00	109.7	0.024	Circle	8.0	0.013	66.43	3.21	7.9	95,658.15	841.52
373	MH-589	833.00	MH-592	835.00	150.2	0.013	Circle	8.0	0.013	1.90	0.89	0.3	2,733.09	625.91
374	MH-589	833.00	MH-590	831.78	29.9	0.041	Circle	8.0	0.013	68.33	3.89	6.2	98,391.24	1,094.97
375	MH-590	831.78	MH-229	745.29	277.0	0.312	Circle	8.0	0.013	69.59	7.98	2.3	100,213.30	3,030.64
377	MH-229	745.29	MH-228	737.46	150.2	0.052	Circle	8.0	0.013	319.59	6.62	25.8	460,213.29	1,238.37
379	MH-228	737.46	MH-610	720.24	142.0	0.121	Circle	8.0	0.013	319.59	8.99	16.9	460,213.29	1,888.64
381	MH-610	720.24	MH-611	718.55	325.4	0.005	Circle	10.0	0.013	323.31	2.83	45.6	465,560.66	708.70
382	MH-611	718.55	MH-612	717.24	332.3	0.004	Circle	10.0	0.013	323.31	2.55	52.4	465,560.66	617.44
397	MH-242	962.56	MH-243	956.31	170.3	0.037	Circle	8.0	0.013	53.78	3.49	5.2	77,437.55	1,038.99
398	MH-243	956.31	MH-244	950.66	290.4	0.019	Circle	8.0	0.013	55.04	2.81	7.3	79,259.61	756.43
399	MH-244	950.66	MH-245	949.82	91.6	0.009	Circle	8.0	0.013	55.04	2.16	10.6	79,259.61	519.43
400	MH-245	949.82	MH-246	899.54	416.1	0.121	Circle	8.0	0.013	55.04	5.34	2.9	79,259.61	1,885.36
401	MH-246	899.54	MH-247	884.56	181.6	0.082	Circle	8.0	0.013	55.04	4.68	3.5	79,259.61	1,557.68
402	MH-247	884.56	MH-248	860.45	257.7	0.094	Circle	8.0	0.013	56.94	4.94	3.4	81,992.70	1,658.85
403	MH-248	860.45	MH-249	855.67	172.6	0.028	Circle	8.0	0.013	60.10	3.27	6.7	86,547.85	902.53
404	MH-249	855.67	MH-588	852.86	127.4	0.022	Circle	8.0	0.013	60.10	3.03	7.5	86,547.85	805.40
406	MH-588	852.86	MH-911	840.00	183.4	0.070	Circle	8.0	0.013	60.10	4.54	4.2	86,547.85	1,436.23
407	MH-911	840.00	MH-250	835.64	226.8	0.019	Circle	8.0	0.013	66.43	2.96	8.8	95,658.15	751.93
408	MH-593	862.50	MH-248	860.45	304.6	0.007	Circle	8.0	0.013	3.16	0.82	0.7	4,555.15	444.96
411	MH-591	767.77	MH-251	748.08	256.2	0.077	Circle	8.0	0.013	250.00	7.10	16.6	359,999.99	1,503.40
412	MH-251	748.08	MH-229	745.29	161.1	0.017	Circle	8.0	0.013	250.00	4.16	35.0	359,999.99	713.79
418	MH-591	767.77	MH-252	769.88	213.9	0.010	Circle	8.0	0.013	250.00	3.38	46.4	359,999.99	538.65
419	MH-252	769.88	MH-253	771.09	193.4	0.006	Circle	8.0	0.013	250.00	2.84	58.3	359,999.99	429.01
420	MH-253	771.09	MH-254	776.92	271.3	0.021	Circle	8.0	0.013	250.00	4.50	31.4	359,999.99	795.08
421	MH-254	776.92	MH-255	787.91	304.9	0.036	Circle	8.0	0.013	250.00	5.43	24.3	359,999.99	1,029.69
428	MH-258	811.13	MH-259	786.64	279.4	0.088	Circle	8.0	0.013	4.43	2.22	0.3	6,377.21	1,605.60
429	MH-259	786.64	MH-260	775.02	181.8	0.064	Circle	8.0	0.013	4.43	1.97	0.3	6,377.21	1,371.27
430	MH-302	795.80	MH-303	768.59	331.0	0.082	Circle	8.0	0.013	4.43	2.17	0.3	6,377.21	1,555.01
433	MH-303	768.59	MH-304	764.34	154.3	0.028	Circle	8.0	0.013	4.43	1.49	0.5	6,377.21	900.15
434	MH-304	764.34	MH-506	777.79	218.2	0.062	Circle	8.0	0.013	2.53	1.63	0.2	3,644.12	1,346.49
438	MH-304	764.34	MH-301	754.33	233.0	0.043	Circle	8.0	0.013	6.96	1.98	0.6	10,021.33	1,124.03
439	MH-301	754.33	MH-305	771.45	315.5	0.054	Circle	8.0	0.013	11.39	2.49	0.9	16,398.54	1,263.32

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
440	MH-301	754.33	MH-300	737.84	130.0	0.127	Circle	8.0	0.013	18.35	3.87	0.9	26,419.87	1,931.54
457	MH-282	749.68	MH-299	731.93	158.1	0.112	Circle	8.0	0.013	13.06	3.35	0.7	18,806.83	1,817.11
458	MH-299	731.93	MH-298	739.67	201.6	0.038	Circle	8.0	0.013	208.78	5.27	19.6	300,639.90	1,062.65
459	MH-298	739.67	MH-297	741.72	170.1	0.012	Circle	8.0	0.013	208.78	3.47	35.1	300,639.90	595.33
460	MH-297	741.72	MH-296	752.22	422.2	0.025	Circle	8.0	0.013	208.78	4.51	24.4	300,639.90	855.30
461	MH-296	752.22	MH-295	758.15	374.6	0.016	Circle	8.0	0.013	208.78	3.83	30.6	300,639.90	682.38
462	MH-295	758.15	MH-294	759.10	218.0	0.004	Circle	8.0	0.013	207.51	2.37	58.0	298,817.83	358.04
463	MH-294	759.10	MH-293	759.94	131.6	0.006	Circle	8.0	0.013	207.51	2.74	47.9	298,817.83	433.26
464	MH-293	759.94	MH-292	760.33	162.8	0.002	Circle	8.0	0.013	207.51	1.87	78.2	298,817.83	265.42
465	MH-292	760.33	MH-291	761.28	161.2	0.006	Circle	8.0	0.013	205.61	2.65	49.4	296,084.75	416.32
466	MH-291	761.28	MH-290	760.95	143.6	-0.002	Circle	8.0	0.013	205.61	1.31	79.1	296,084.75	260.03
468	MH-290	760.95	MH-289	762.16	123.5	0.010	Circle	8.0	0.013	192.96	3.15	35.9	277,864.16	536.82
474	MH-288	767.03	MH-287	773.58	435.3	0.015	Circle	8.0	0.013	12.65	1.65	1.9	18,220.60	665.27
475	MH-287	773.58	MH-286	780.70	116.1	0.061	Circle	8.0	0.013	0.00	0.00	0.0	0.00	1,343.13
477	MH-285	784.47	MH-284	779.28	334.0	0.016	Circle	8.0	0.013	3.80	1.16	0.6	5,466.18	676.01
478	MH-284	779.28	MH-283	768.56	256.0	0.042	Circle	8.0	0.013	3.80	1.65	0.3	5,466.18	1,109.81
479	MH-283	768.56	MH-282	749.68	203.3	0.093	Circle	8.0	0.013	10.53	2.94	0.6	15,162.71	1,652.86
480	MH-256	784.75	MH-260	775.02	375.1	0.026	Circle	8.0	0.013	1.90	1.12	0.2	2,733.09	873.50
491	MH-311	786.88	MH-281	774.50	167.2	0.074	Circle	8.0	0.013	8.22	2.53	0.6	11,843.39	1,475.98
492	MH-281	774.50	MH-287	773.58	284.3	0.003	Circle	8.0	0.013	8.22	0.85	2.7	11,843.39	308.51
503	MH-261	1,026.74	MH-263	1,036.86	254.7	-0.040	Circle	8.0	0.013	124.00	0.79	11.5	178,561.87	1,081.06
504	MH-263	1,036.86	MH-264	1,046.42	319.5	-0.030	Circle	8.0	0.013	125.27	0.80	13.4	180,383.94	938.21
505	MH-264	1,046.42	MH-265	1,066.01	278.3	-0.070	Circle	8.0	0.013	125.27	0.80	8.7	180,383.94	1,438.83
506	MH-265	1,066.01	MH-266	1,038.25	313.4	0.089	Circle	8.0	0.013	127.80	6.16	7.9	184,028.07	1,614.17
507	MH-266	1,038.25	MH-267	1,011.60	368.7	0.072	Circle	8.0	0.013	131.59	5.77	9.0	189,494.24	1,458.06
508	MH-267	1,011.60	MH-268	977.27	355.6	0.097	Circle	8.0	0.013	131.59	6.40	7.8	189,494.24	1,685.04
526	MH-278	801.12	MH-277	787.73	239.2	0.056	Circle	8.0	0.013	44.92	3.84	3.5	64,683.13	1,283.19
530	MH-277	787.73	MH-280	770.54	206.2	0.083	Circle	8.0	0.013	189.17	6.76	12.1	272,397.96	1,566.09
531	MH-280	770.54	MH-911	768.00	95.3	0.027	Circle	8.0	0.013	192.96	4.52	21.8	277,864.16	885.54
532	MH-911	768.00	MH-289	762.16	261.0	0.022	Circle	8.0	0.013	192.96	4.25	23.8	277,864.16	811.19
534	MH-280	770.54	MH-279	783.28	234.3	0.054	Circle	8.0	0.013	3.80	1.79	0.3	5,466.18	1,264.69
545	MH-594	870.28	MH-231	856.83	190.7	0.071	Circle	12.0	0.013	46.18	3.98	1.1	66,505.19	4,246.78
546	MH-231	856.83	MH-232	851.99	180.3	0.027	Circle	12.0	0.013	46.18	2.83	1.8	66,505.19	2,620.03
547	MH-232	851.99	MH-235	848.81	81.7	0.039	Circle	12.0	0.013	46.18	3.23	1.5	66,505.19	3,153.75
549	MH-235	848.81	MH-236	840.64	125.1	0.065	Circle	12.0	0.013	52.51	4.00	1.3	75,615.49	4,087.05
550	MH-236	840.64	MH-306	849.34	162.4	0.054	Circle	12.0	0.013	3.80	1.70	0.1	5,466.18	3,700.77
551	MH-236	840.64	MH-237	836.12	377.9	0.012	Circle	12.0	0.013	56.31	2.27	3.2	81,081.67	1,748.69
552	MH-237	836.12	MH-239	834.72	409.8	0.003	Circle	12.0	0.013	63.90	1.52	6.8	92,014.03	934.56

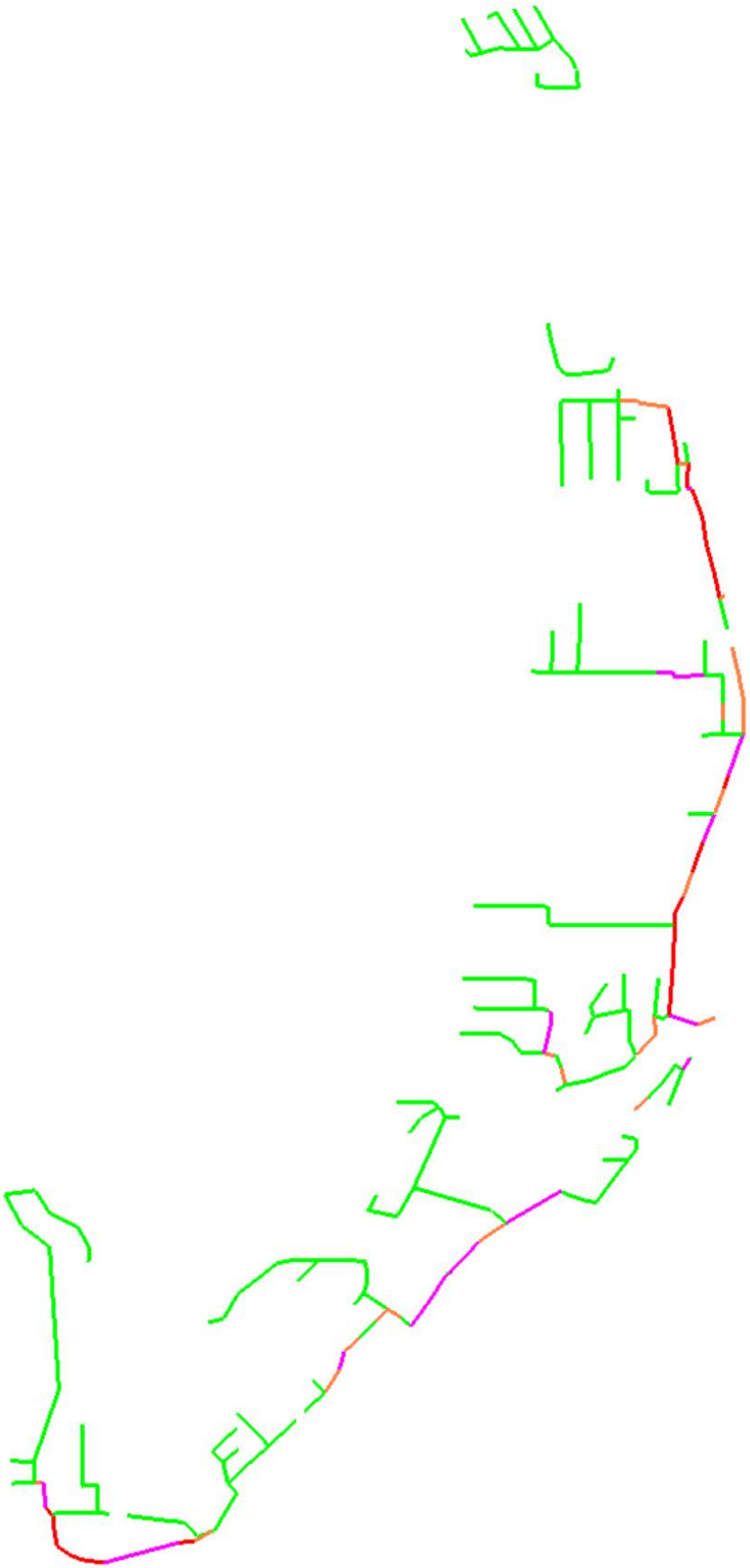
FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
553	MH-239	834.72	MH-238	840.75	341.7	0.018	Circle	12.0	0.013	13.92	1.69	0.7	20,042.66	2,124.28
554	MH-238	840.75	MH-241	854.90	305.7	0.046	Circle	12.0	0.013	13.92	2.38	0.4	20,042.66	3,440.07
558	MH-235	848.81	MH-234	850.23	221.8	0.006	Circle	12.0	0.013	6.33	0.94	0.5	9,110.30	1,279.28
559	MH-234	850.23	MH-233	854.29	195.8	0.021	Circle	12.0	0.013	6.33	1.41	0.3	9,110.30	2,302.54
561	MH-105	805.70	MH-109	794.15	341.2	0.034	Circle	8.0	0.013	1.27	1.09	0.1	1,822.06	997.77
563	MH-205	787.21	MH-204	7.58	177.0	4.404	Circle	8.0	0.013	2.53	7.18	0.0	3,644.12	11,380.96
564	MH-204	7.58	MH-203	784.23	193.2	-4.020	Circle	8.0	0.013	2.53	0.02	0.0	3,644.12	10,873.37
567	MH-137	761.45	MH-607	759.77	211.8	0.008	Circle	8.0	0.013	52.80	2.02	10.9	76,026.18	482.97
568	MH-606	764.25	MH-607	759.77	106.5	0.042	Circle	8.0	0.013	361.30	6.35	32.5	520,266.06	1,112.23
571	MH-146	762.94	MH-609	760.98	304.3	0.006	Circle	8.0	0.013	166.90	2.60	38.3	240,333.09	435.26
573	MH-912	767.00	MH-170	758.21	210.7	0.042	Circle	8.0	0.013	1.90	1.31	0.2	2,733.09	1,107.68
574	MH-170	758.21	MH-148	757.37	209.6	0.004	Circle	8.0	0.013	107.55	1.94	31.3	154,875.10	343.35
582	MH-196	823.67	MH-197	816.33	105.6	0.069	Circle	8.0	0.013	1.90	1.59	0.1	2,733.09	1,429.56
583	MH-241	854.90	MH-240	858.97	189.1	0.022	Circle	12.0	0.013	13.92	1.82	0.6	20,042.66	2,345.88
584	MH-305	771.45	MH-260	775.02	259.1	0.014	Circle	8.0	0.013	11.39	1.56	1.8	16,398.54	636.60
586	MH-257	804.18	MH-254	776.92	167.7	0.163	Circle	8.0	0.013	0.00	0.00	0.0	0.00	2,186.46
587	MH-261	1,026.74	MH-262	1,011.32	146.5	-0.105	Circle	8.0	0.013	124.00	0.79	7.0	178,561.87	1,759.28
588	MH-288	767.03	MH-290	760.95	52.9	0.115	Circle	8.0	0.013	12.65	3.35	0.7	18,220.60	1,838.58
593	MH-225	715.01	Lakefront LS	705.00	25.1	0.398	Circle	8.0	0.013	8.22	4.53	0.2	11,843.39	3,422.84
594	MH-615	711.78	Lakefront LS	705.00	665.8	0.010	Circle	10.0	0.013	401.95	3.84	40.5	578,805.65	992.31
596	MH-299	731.93	School St. LS	725.00	21.5	0.322	Circle	8.0	0.013	221.84	11.41	7.2	319,446.74	3,079.44
597	MH-300	737.84	School St. LS	725.00	464.6	0.028	Circle	8.0	0.013	20.88	2.38	2.3	30,063.99	901.61
599	MH-144	747.76	Shamel St. LS	745.00	68.9	0.040	Circle	8.0	0.013	415.74	6.47	38.3	598,668.83	1,085.40
601	MH-112	739.00	Shadow Ridge LS	735.00	124.0	0.032	Circle	8.0	0.013	24.04	2.62	2.5	34,619.14	973.99
602	MH-113	745.55	Shadow Ridge LS	735.00	186.8	0.056	Circle	8.0	0.013	0.63	1.07	0.0	911.03	1,289.02
604	MH-207	746.89	MH-278	743.64	70.8	0.046	Circle	12.0	0.013	147.60	4.85	4.3	212,547.26	3,425.02
605	MH-278	743.64	MH-210	740.27	310.4	0.011	Circle	12.0	0.013	527.84	4.19	31.7	760,095.53	1,666.02
607	MH-279	745.21	MH-278	743.64	559.0	0.003	Circle	10.0	0.013	380.24	2.32	73.0	547,548.24	521.12
610	MH-155	747.11	MH-280	746.64	168.8	0.003	Circle	10.0	0.013	284.08	2.17	54.7	409,071.71	518.90
612	MH-280	746.64	MH-281	746.22	146.9	0.003	Circle	10.0	0.013	284.08	2.19	54.0	409,071.71	525.75
613	MH-281	746.22	MH-279	745.21	359.0	0.003	Circle	10.0	0.013	380.24	2.32	72.9	547,548.24	521.55
614	MH-209	758.11	MH-281	746.22	63.8	0.186	Circle	8.0	0.013	96.16	7.33	4.1	138,476.56	2,341.77

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
615	MH-120	790.95	MH-122	768.54	877.7	0.026	Circle	8.0	0.013	84.78	3.51	9.8	122,078.02	866.62
616	MH-128	782.17	MH-123	767.58	805.8	0.018	Circle	8.0	0.013	11.39	1.71	1.6	16,398.54	729.78
618	MH-239	834.72	MH-226	727.68	833.8	0.128	Circle	12.0	0.013	77.82	5.70	1.4	112,056.69	5,729.31
621	MH-210	740.27	Jet Pump	735.00	195.5	0.027	Circle	12.0	0.013	527.84	5.82	20.1	760,095.53	2,625.00
625	O-7	730.00	MH-616	734.54	16.9	0.268	Circle	12.0	0.013	410.00	12.21	5.0	590,399.99	8,281.34
626	MH-174	874.93	MH-177	843.22	753.6	0.042	Circle	8.0	0.013	94.90	4.33	8.5	136,654.50	1,112.54
627	MH-619	838.22	MH-209	758.11	1,229.9	0.065	Circle	8.0	0.013	96.16	5.08	6.9	138,476.56	1,384.18
629	MH-268	977.27	MH-274	860.00	1,471.4	0.080	Circle	8.0	0.013	137.29	6.05	9.0	197,693.50	1,531.09
630	MH-274	860.00	MH-277	787.73	791.1	0.091	Circle	8.0	0.013	144.25	6.44	8.8	207,714.83	1,639.20
631	MH-307	841.25	MH-311	786.88	634.1	0.086	Circle	8.0	0.013	0.63	1.25	0.0	911.03	1,588.08
633	MH-116	756.62	O-8	750.00	24.3	0.272	Circle	8.0	0.013	17.71	5.01	0.6	25,508.84	2,828.90

Scenario: Future, 40-Year



FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
40	MH-107	852.59	MH-901	830.00	410.3	0.055	Circle	8.0	0.013	14.06	2.67	1.1	20,244.83
47	MH-901	830.00	MH-106	849.26	109.2	0.176	Circle	8.0	0.013	18.95	4.39	0.8	27,286.51
49	MH-102	859.06	MH-106	849.26	75.5	0.130	Circle	8.0	0.013	18.95	3.94	1.0	27,286.51
50	MH-108	816.75	MH-901	830.00	183.3	0.072	Circle	8.0	0.013	33.01	3.82	2.3	47,531.34
51	MH-103	810.00	MH-104	808.95	111.5	0.009	Circle	8.0	0.013	1.22	0.69	0.2	1,760.42
53	MH-104	808.95	MH-105	805.70	108.4	0.030	Circle	8.0	0.013	1.22	1.04	0.1	1,760.42
56	MH-108	816.75	MH-109	794.15	226.0	0.100	Circle	8.0	0.013	33.01	4.27	1.9	47,531.34
57	MH-109	794.15	MH-110	770.12	177.0	0.136	Circle	8.0	0.013	34.23	4.82	1.7	49,291.76
60	MH-111	757.08	MH-112	739.00	269.5	0.067	Circle	8.0	0.013	37.90	3.88	2.7	54,573.02
68	MH-902	752.00	MH-903	750.00	143.1	0.014	Circle	8.0	0.013	0.61	0.65	0.1	880.21
69	MH-903	750.00	MH-113	745.55	419.7	0.011	Circle	8.0	0.013	0.61	0.59	0.1	880.21
72	MH-905	772.00	MH-110	770.12	477.4	0.004	Circle	8.0	0.013	2.45	0.63	0.7	3,520.84
73	MH-110	770.12	MH-111	757.08	196.7	0.066	Circle	8.0	0.013	36.68	3.83	2.6	52,812.60
75	MH-904	759.00	MH-111	757.08	397.2	0.005	Circle	8.0	0.013	1.22	0.54	0.3	1,760.42
86	MH-114	760.41	MH-115	758.40	195.6	0.010	Circle	8.0	0.013	44.62	2.11	8.1	64,255.33
87	MH-115	758.40	MH-116	756.62	256.4	0.007	Circle	8.0	0.013	44.62	1.84	9.9	64,255.33
88	MH-116	756.62	MH-117	757.26	100.3	0.006	Circle	8.0	0.013	11.61	1.20	2.7	16,723.99
89	MH-117	757.26	MH-118	757.63	75.7	0.005	Circle	8.0	0.013	5.50	0.87	1.5	7,921.89
90	MH-118	757.63	MH-119	761.52	385.0	0.010	Circle	8.0	0.013	5.50	1.11	1.0	7,921.89
91	MH-119	761.52	MH-312	764.51	139.1	0.021	Circle	8.0	0.013	5.50	1.45	0.7	7,921.89
97	MH-133	766.99	MH-132	766.62	109.1	0.003	Circle	12.0	0.013	100.00	0.28	10.7	144,000.00
98	MH-132	766.62	MH-123	767.58	305.1	0.003	Circle	12.0	0.013	157.09	1.91	17.5	226,213.96
99	MH-123	767.58	MH-122	768.54	297.4	0.003	Circle	12.0	0.013	146.09	1.89	16.1	210,370.20
116	MH-132	766.62	MH-130	767.75	191.8	0.006	Circle	8.0	0.013	11.61	0.07	2.8	16,723.99
117	MH-130	767.75	MH-131	768.95	169.9	0.007	Circle	8.0	0.013	3.06	0.82	0.7	4,401.05
123	MH-140	774.14	MH-141	773.74	118.0	0.003	Circle	8.0	0.013	4.28	0.71	1.4	6,161.47
124	MH-141	773.74	MH-136	764.49	311.8	0.030	Circle	8.0	0.013	4.28	1.51	0.5	6,161.47
129	MH-130	767.75	MH-129	772.17	249.4	0.018	Circle	8.0	0.013	8.56	1.55	1.2	12,322.94
130	MH-129	772.17	MH-127	782.55	386.6	0.027	Circle	8.0	0.013	8.56	1.79	1.0	12,322.94
132	MH-139	757.13	MH-906	756.00	49.4	0.023	Circle	8.0	0.013	500.95	3.20	61.1	721,370.64
139	MH-144	747.76	MH-143	749.22	275.3	0.005	Circle	8.0	0.013	502.55	3.21	127.2	723,666.87
140	MH-143	749.22	MH-608	751.00	299.6	0.006	Circle	8.0	0.013	502.55	3.21	120.2	723,666.87
141	MH-608	751.00	MH-142	752.59	281.8	0.006	Circle	8.0	0.013	500.95	3.20	123.0	721,370.64
142	MH-142	752.59	MH-906	756.00	307.2	0.011	Circle	8.0	0.013	500.95	3.20	87.7	721,370.64
152	MH-167	768.98	MH-168	766.70	365.5	0.006	Circle	8.0	0.013	6.72	0.04	1.6	9,682.31
154	MH-168	766.70	MH-173	839.81	188.4	-0.388	Circle	8.0	0.013	220.66	1.41	6.5	317,755.81
156	MH-173	839.81	MH-172	774.62	289.0	0.226	Circle	8.0	0.013	220.66	10.05	8.6	317,755.81
157	MH-172	774.62	MH-171	771.58	168.9	0.018	Circle	8.0	0.013	224.33	4.09	30.8	323,037.07

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
158	MH-171	771.58	MH-170	766.63	148.7	0.033	Circle	8.0	0.013	224.33	5.11	22.7	323,037.07
160	MH-145	756.61	MH-144	747.76	321.4	0.028	Circle	8.0	0.013	0.00	0.00	0.0	0.00
165	MH-148	757.37	MH-147	758.83	342.2	0.004	Circle	8.0	0.013	169.89	2.24	48.0	244,641.67
166	MH-147	758.83	MH-609	760.98	259.4	0.008	Circle	8.0	0.013	166.83	2.84	33.8	240,240.64
178	MH-161	793.17	MH-158	797.80	267.0	0.017	Circle	8.0	0.013	202.33	3.92	28.3	291,349.52
179	MH-158	797.80	MH-156	805.99	208.0	0.039	Circle	8.0	0.013	192.55	5.20	17.9	277,266.16
180	MH-158	797.80	MH-157	814.25	421.3	0.039	Circle	8.0	0.013	9.78	2.12	0.9	14,083.36
181	MH-161	793.17	MH-162	785.71	275.4	0.027	Circle	8.0	0.013	213.33	4.68	23.9	307,193.28
182	MH-162	785.71	MH-163	776.29	268.0	0.035	Circle	8.0	0.013	213.33	5.13	21.0	307,193.28
183	MH-163	776.29	MH-164	769.50	272.1	0.025	Circle	8.0	0.013	213.33	1.36	24.9	307,193.28
184	MH-164	769.50	MH-165	768.87	171.8	0.004	Circle	8.0	0.013	213.33	1.36	65.0	307,193.28
185	MH-165	768.87	MH-166	768.66	43.7	0.005	Circle	8.0	0.013	213.33	1.36	56.8	307,193.28
187	MH-161	793.17	MH-160	803.35	369.4	0.028	Circle	8.0	0.013	11.00	1.95	1.2	15,843.78
188	MH-160	803.35	MH-159	808.04	346.3	0.014	Circle	8.0	0.013	11.00	1.53	1.7	15,843.78
192	MH-148	757.37	MH-149	754.58	463.3	0.006	Circle	10.0	0.013	396.06	3.15	51.9	570,319.39
193	MH-149	754.58	MH-150	754.79	143.1	-0.001	Circle	10.0	0.013	399.11	1.63	105.9	574,720.43
194	MH-150	754.79	MH-151	752.48	274.7	0.008	Circle	10.0	0.013	399.11	3.57	44.3	574,720.43
196	MH-152	759.52	MH-151	752.48	267.1	0.026	Circle	10.0	0.013	0.00	0.00	0.0	0.00
200	MH-155	747.11	MH-154	750.36	280.3	0.012	Circle	10.0	0.013	402.30	4.03	38.0	579,312.82
201	MH-154	750.36	MH-153	750.86	320.1	0.002	Circle	10.0	0.013	402.30	1.80	103.5	579,312.82
202	MH-153	750.86	MH-151	752.48	310.7	0.005	Circle	10.0	0.013	402.30	2.99	56.7	579,312.82
222	MH-177	843.22	MH-619	838.22	184.8	0.027	Circle	8.0	0.013	213.94	4.68	24.0	308,073.51
233	MH-595	804.35	MH-194	800.98	274.3	0.012	Circle	8.0	0.013	4.89	1.15	0.8	7,041.68
234	MH-194	800.98	MH-596	797.19	111.2	0.034	Circle	8.0	0.013	4.89	1.65	0.5	7,041.68
243	MH-203	784.23	MH-202	782.69	52.2	0.030	Circle	8.0	0.013	10.39	1.96	1.1	14,963.57
244	MH-202	782.69	MH-201	779.42	305.3	0.011	Circle	8.0	0.013	10.39	1.38	1.9	14,963.57
245	MH-201	779.42	MH-617	775.43	177.1	0.023	Circle	8.0	0.013	11.19	1.84	1.4	16,111.67
246	MH-596	797.19	MH-203	784.23	322.0	0.040	Circle	8.0	0.013	7.95	2.02	0.7	11,442.73
257	MH-166	768.66	MH-168	766.70	326.5	0.006	Circle	8.0	0.013	213.94	1.37	50.9	308,073.51
258	MH-134	765.21	MH-135	764.51	419.0	0.002	Circle	8.0	0.013	413.21	2.64	186.4	595,019.84
262	MH-132	766.62	MH-907	766.13	183.9	0.003	Circle	12.0	0.013	268.71	0.76	32.5	386,937.96
263	MH-907	766.13	MH-908	766.04	31.9	0.003	Circle	12.0	0.013	271.76	0.77	32.6	391,339.00
264	MH-908	766.04	MH-134	765.21	310.3	0.003	Circle	12.0	0.013	271.76	0.77	32.9	391,339.00
270	MH-181	860.73	MH-182	859.09	139.7	0.012	Circle	8.0	0.013	108.80	2.86	18.5	156,677.38
271	MH-182	859.09	MH-183	850.42	267.9	0.032	Circle	8.0	0.013	108.80	4.11	11.2	156,677.38
272	MH-183	850.42	MH-184	846.42	154.0	0.026	Circle	8.0	0.013	108.80	3.81	12.4	156,677.38
273	MH-184	846.42	MH-185	842.34	139.5	0.029	Circle	8.0	0.013	108.80	3.97	11.7	156,677.38
274	MH-185	842.34	MH-186	833.21	244.6	0.037	Circle	8.0	0.013	108.80	4.33	10.4	156,677.38

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
275	MH-186	833.21	MH-187	830.10	129.9	0.024	Circle	8.0	0.013	298.29	4.91	35.5	429,542.47
276	MH-187	830.10	MH-195	819.50	131.4	0.081	Circle	8.0	0.013	298.29	7.60	19.4	429,542.47
278	MH-195	819.50	MH-197	816.33	180.3	0.018	Circle	8.0	0.013	298.29	4.38	41.5	429,542.47
285	MH-180	883.74	MH-179	880.24	86.1	0.041	Circle	8.0	0.013	130.81	4.70	12.0	188,364.95
286	MH-179	880.24	MH-178	855.67	333.6	0.074	Circle	8.0	0.013	130.81	5.80	8.9	188,364.95
287	MH-178	855.67	MH-909	850.00	327.4	0.017	Circle	8.0	0.013	130.81	3.46	18.3	188,364.95
288	MH-909	850.00	MH-191	840.51	304.1	0.031	Circle	8.0	0.013	130.81	4.28	13.7	188,364.95
289	MH-191	840.51	MH-190	836.55	86.1	0.046	Circle	8.0	0.013	186.43	5.44	16.0	268,464.04
290	MH-190	836.55	MH-189	835.06	75.6	0.020	Circle	8.0	0.013	186.43	4.02	24.5	268,464.04
291	MH-189	835.06	MH-188	834.65	91.1	0.005	Circle	8.0	0.013	186.43	2.34	51.2	268,464.04
292	MH-188	834.65	MH-186	833.21	349.4	0.004	Circle	8.0	0.013	186.43	2.26	53.5	268,464.04
293	MH-191	840.51	MH-192	850.45	272.9	0.036	Circle	8.0	0.013	55.62	3.52	5.4	80,099.11
294	MH-192	850.45	MH-193	868.55	358.5	0.050	Circle	8.0	0.013	55.62	3.94	4.6	80,099.11
295	MH-597	800.82	MH-596	797.19	197.4	0.018	Circle	8.0	0.013	3.06	1.15	0.4	4,401.05
297	MH-207	746.89	MH-206	758.13	88.1	0.128	Circle	12.0	0.013	314.98	8.69	5.5	453,576.04
298	MH-206	758.13	MH-910	765.00	184.6	0.037	Circle	8.0	0.013	314.98	5.84	30.1	453,576.04
299	MH-910	765.00	MH-617	775.43	290.7	0.036	Circle	8.0	0.013	314.98	5.77	30.7	453,576.04
303	MH-197	816.33	MH-198	800.78	249.5	0.062	Circle	8.0	0.013	300.13	6.94	22.2	432,183.10
304	MH-198	800.78	MH-199	793.14	161.8	0.047	Circle	8.0	0.013	300.13	6.28	25.5	432,183.10
305	MH-199	793.14	MH-200	783.36	208.4	0.047	Circle	8.0	0.013	300.13	6.26	25.5	432,183.10
306	MH-200	783.36	MH-617	775.43	180.0	0.044	Circle	8.0	0.013	303.79	6.15	26.7	437,464.37
307	MH-618	766.12	MH-206	758.13	393.8	0.020	Circle	8.0	0.013	0.00	0.00	0.0	0.00
313	MH-135	764.51	MH-606	764.25	181.0	0.001	Circle	8.0	0.013	413.21	2.64	201.0	595,019.84
314	MH-606	764.25	MH-136	764.49	286.5	0.001	Circle	8.0	0.013	4.28	0.44	2.7	6,161.47
315	MH-607	759.77	MH-139	757.13	260.7	0.010	Circle	8.0	0.013	500.95	3.20	91.8	721,370.64
324	MH-213	736.84	MH-212	734.79	91.0	0.023	Circle	10.0	0.013	410.00	5.16	27.8	590,399.99
326	MH-212	734.79	MH-616	734.54	150.3	0.002	Circle	12.0	0.013	410.00	1.95	62.9	590,399.99
335	MH-213	736.84	MH-214	745.26	226.0	0.037	Circle	10.0	0.013	410.00	6.19	21.6	590,399.99
336	MH-214	745.26	MH-215	754.15	219.3	0.041	Circle	10.0	0.013	410.00	6.38	20.7	590,399.99
337	MH-215	754.15	MH-216	756.53	187.2	0.013	Circle	10.0	0.013	410.00	4.19	37.0	590,399.99
338	MH-230	740.80	MH-212	734.79	388.1	0.015	Circle	12.0	0.013	0.00	0.00	0.0	0.00
339	MH-221	738.18	MH-220	729.85	148.1	0.056	Circle	8.0	0.013	4.89	1.97	0.4	7,041.68
340	MH-220	729.85	MH-219	720.88	105.8	0.085	Circle	8.0	0.013	4.89	2.25	0.3	7,041.68
341	MH-219	720.88	MH-217	718.19	136.6	0.020	Circle	8.0	0.013	4.89	1.36	0.6	7,041.68
343	MH-217	718.19	MH-218	734.26	271.0	0.059	Circle	8.0	0.013	2.45	1.59	0.2	3,520.84
346	MH-217	718.19	MH-222	716.15	283.0	0.007	Circle	8.0	0.013	7.34	1.09	1.6	10,562.52
348	MH-222	716.15	MH-223	714.15	266.8	0.007	Circle	8.0	0.013	7.34	1.10	1.6	10,562.52
350	MH-223	714.15	MH-224	713.70	111.4	0.004	Circle	8.0	0.013	7.95	0.05	2.3	11,442.73

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
352	MH-224	713.70	MH-225	715.01	251.4	-0.005	Circle	8.0	0.013	7.95	0.05	2.0	11,442.73
361	MH-612	717.24	MH-613	716.88	15.6	0.023	Circle	10.0	0.013	394.18	5.14	26.4	567,614.74
362	MH-613	716.88	MH-614	714.86	462.0	0.004	Circle	10.0	0.013	394.18	2.78	60.6	567,614.74
363	MH-614	714.86	MH-615	711.78	334.6	0.009	Circle	10.0	0.013	394.18	3.68	41.8	567,614.74
364	MH-615	711.78	MH-227	725.52	122.7	0.112	Circle	12.0	0.013	136.31	6.46	2.5	196,286.84
365	MH-227	725.52	MH-226	727.68	74.2	0.029	Circle	12.0	0.013	136.31	4.03	5.0	196,286.84
372	MH-250	835.64	MH-589	833.00	109.7	0.024	Circle	8.0	0.013	137.53	3.95	16.3	198,047.25
373	MH-589	833.00	MH-592	835.00	150.2	0.013	Circle	8.0	0.013	1.83	0.88	0.3	2,640.63
374	MH-589	833.00	MH-590	831.78	29.9	0.041	Circle	8.0	0.013	139.37	4.79	12.7	200,687.88
375	MH-590	831.78	MH-229	745.29	277.0	0.312	Circle	8.0	0.013	140.59	9.86	4.6	202,448.30
377	MH-229	745.29	MH-228	737.46	150.2	0.052	Circle	8.0	0.013	390.59	7.01	31.5	562,448.31
379	MH-228	737.46	MH-610	720.24	142.0	0.121	Circle	8.0	0.013	390.59	9.50	20.7	562,448.31
381	MH-610	720.24	MH-611	718.55	325.4	0.005	Circle	10.0	0.013	394.18	2.97	55.6	567,614.74
382	MH-611	718.55	MH-612	717.24	332.3	0.004	Circle	10.0	0.013	394.18	2.67	63.8	567,614.74
397	MH-242	962.56	MH-243	956.31	170.3	0.037	Circle	8.0	0.013	125.31	4.48	12.1	180,443.05
398	MH-243	956.31	MH-244	950.66	290.4	0.019	Circle	8.0	0.013	126.53	3.59	16.7	182,203.46
399	MH-244	950.66	MH-245	949.82	91.6	0.009	Circle	8.0	0.013	126.53	2.74	24.4	182,203.46
400	MH-245	949.82	MH-246	899.54	416.1	0.121	Circle	8.0	0.013	126.53	6.85	6.7	182,203.46
401	MH-246	899.54	MH-247	884.56	181.6	0.082	Circle	8.0	0.013	126.53	5.97	8.1	182,203.46
402	MH-247	884.56	MH-248	860.45	257.7	0.094	Circle	8.0	0.013	128.36	6.27	7.7	184,844.09
403	MH-248	860.45	MH-249	855.67	172.6	0.028	Circle	8.0	0.013	131.42	4.11	14.6	189,245.15
404	MH-249	855.67	MH-588	852.86	127.4	0.022	Circle	8.0	0.013	131.42	3.78	16.3	189,245.15
406	MH-588	852.86	MH-911	840.00	183.4	0.070	Circle	8.0	0.013	131.42	5.71	9.2	189,245.15
407	MH-911	840.00	MH-250	835.64	226.8	0.019	Circle	8.0	0.013	137.53	3.65	18.3	198,047.25
408	MH-593	862.50	MH-248	860.45	304.6	0.007	Circle	8.0	0.013	3.06	0.81	0.7	4,401.05
411	MH-591	767.77	MH-251	748.08	256.2	0.077	Circle	8.0	0.013	250.00	7.10	16.6	359,999.99
412	MH-251	748.08	MH-229	745.29	161.1	0.017	Circle	8.0	0.013	250.00	4.16	35.0	359,999.99
418	MH-591	767.77	MH-252	769.88	213.9	0.010	Circle	8.0	0.013	250.00	3.38	46.4	359,999.99
419	MH-252	769.88	MH-253	771.09	193.4	0.006	Circle	8.0	0.013	250.00	2.84	58.3	359,999.99
420	MH-253	771.09	MH-254	776.92	271.3	0.021	Circle	8.0	0.013	250.00	4.50	31.4	359,999.99
421	MH-254	776.92	MH-255	787.91	304.9	0.036	Circle	8.0	0.013	250.00	5.43	24.3	359,999.99
428	MH-258	811.13	MH-259	786.64	279.4	0.088	Circle	8.0	0.013	4.28	2.20	0.3	6,161.47
429	MH-259	786.64	MH-260	775.02	181.8	0.064	Circle	8.0	0.013	4.28	1.95	0.3	6,161.47
430	MH-302	795.80	MH-303	768.59	331.0	0.082	Circle	8.0	0.013	4.28	2.15	0.3	6,161.47
433	MH-303	768.59	MH-304	764.34	154.3	0.028	Circle	8.0	0.013	4.28	1.47	0.5	6,161.47
434	MH-304	764.34	MH-506	777.79	218.2	0.062	Circle	8.0	0.013	2.45	1.62	0.2	3,520.84
438	MH-304	764.34	MH-301	754.33	233.0	0.043	Circle	8.0	0.013	6.72	1.96	0.6	9,682.31
439	MH-301	754.33	MH-305	771.45	315.5	0.054	Circle	8.0	0.013	11.00	2.47	0.9	15,843.78

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
440	MH-301	754.33	MH-300	737.84	130.0	0.127	Circle	8.0	0.013	17.73	3.83	0.9	25,526.09
457	MH-282	749.68	MH-299	731.93	158.1	0.112	Circle	8.0	0.013	12.62	3.32	0.7	18,170.60
458	MH-299	731.93	MH-298	739.67	201.6	0.038	Circle	8.0	0.013	458.44	6.54	43.1	660,157.51
459	MH-298	739.67	MH-297	741.72	170.1	0.012	Circle	8.0	0.013	458.44	4.19	77.0	660,157.51
460	MH-297	741.72	MH-296	752.22	422.2	0.025	Circle	8.0	0.013	458.44	5.55	53.6	660,157.51
461	MH-296	752.22	MH-295	758.15	374.6	0.016	Circle	8.0	0.013	458.44	4.67	67.2	660,157.51
462	MH-295	758.15	MH-294	759.10	218.0	0.004	Circle	8.0	0.013	457.22	2.92	127.7	658,397.07
463	MH-294	759.10	MH-293	759.94	131.6	0.006	Circle	8.0	0.013	457.22	2.92	105.5	658,397.07
464	MH-293	759.94	MH-292	760.33	162.8	0.002	Circle	8.0	0.013	457.22	2.92	172.3	658,397.07
465	MH-292	760.33	MH-291	761.28	161.2	0.006	Circle	8.0	0.013	455.39	2.91	109.4	655,756.44
466	MH-291	761.28	MH-290	760.95	143.6	-0.002	Circle	8.0	0.013	455.39	2.91	175.1	655,756.44
468	MH-290	760.95	MH-289	762.16	123.5	0.010	Circle	8.0	0.013	412.60	2.63	76.9	594,141.74
474	MH-288	767.03	MH-287	773.58	435.3	0.015	Circle	8.0	0.013	42.79	2.39	6.4	61,614.70
475	MH-287	773.58	MH-286	780.70	116.1	0.061	Circle	8.0	0.013	0.00	0.00	0.0	0.00
477	MH-285	784.47	MH-284	779.28	334.0	0.016	Circle	8.0	0.013	3.67	1.15	0.5	5,281.26
478	MH-284	779.28	MH-283	768.56	256.0	0.042	Circle	8.0	0.013	3.67	1.64	0.3	5,281.26
479	MH-283	768.56	MH-282	749.68	203.3	0.093	Circle	8.0	0.013	10.17	2.91	0.6	14,649.76
480	MH-256	784.75	MH-260	775.02	375.1	0.026	Circle	8.0	0.013	1.83	1.10	0.2	2,640.63
491	MH-311	786.88	MH-281	774.50	167.2	0.074	Circle	8.0	0.013	38.51	4.04	2.6	55,453.23
492	MH-281	774.50	MH-287	773.58	284.3	0.003	Circle	8.0	0.013	38.51	1.35	12.5	55,453.23
503	MH-261	1,026.74	MH-263	1,036.86	254.7	-0.040	Circle	8.0	0.013	254.28	1.62	23.5	366,167.37
504	MH-263	1,036.86	MH-264	1,046.42	319.5	-0.030	Circle	8.0	0.013	255.51	1.63	27.2	367,927.78
505	MH-264	1,046.42	MH-265	1,066.01	278.3	-0.070	Circle	8.0	0.013	255.51	1.63	17.8	367,927.78
506	MH-265	1,066.01	MH-266	1,038.25	313.4	0.089	Circle	8.0	0.013	257.95	7.54	16.0	371,448.63
507	MH-266	1,038.25	MH-267	1,011.60	368.7	0.072	Circle	8.0	0.013	261.62	7.06	17.9	376,729.89
508	MH-267	1,011.60	MH-268	977.27	355.6	0.097	Circle	8.0	0.013	261.62	7.81	15.5	376,729.89
526	MH-278	801.12	MH-277	787.73	239.2	0.056	Circle	8.0	0.013	135.09	5.32	10.5	194,526.41
530	MH-277	787.73	MH-280	770.54	206.2	0.083	Circle	8.0	0.013	408.93	8.40	26.1	588,860.48
531	MH-280	770.54	MH-911	768.00	95.3	0.027	Circle	8.0	0.013	412.60	5.55	46.6	594,141.74
532	MH-911	768.00	MH-289	762.16	261.0	0.022	Circle	8.0	0.013	412.60	5.20	50.9	594,141.74
534	MH-280	770.54	MH-279	783.28	234.3	0.054	Circle	8.0	0.013	3.67	1.78	0.3	5,281.26
545	MH-594	870.28	MH-231	856.83	190.7	0.071	Circle	12.0	0.013	105.75	5.09	2.5	152,276.33
546	MH-231	856.83	MH-232	851.99	180.3	0.027	Circle	12.0	0.013	105.75	3.63	4.0	152,276.33
547	MH-232	851.99	MH-235	848.81	81.7	0.039	Circle	12.0	0.013	105.75	4.14	3.4	152,276.33
549	MH-235	848.81	MH-236	840.64	125.1	0.065	Circle	12.0	0.013	111.86	5.04	2.7	161,078.43
550	MH-236	840.64	MH-306	849.34	162.4	0.054	Circle	12.0	0.013	3.67	1.69	0.1	5,281.26
551	MH-236	840.64	MH-237	836.12	377.9	0.012	Circle	12.0	0.013	115.53	2.81	6.6	166,359.69
552	MH-237	836.12	MH-239	834.72	409.8	0.003	Circle	12.0	0.013	122.86	1.84	13.1	176,922.22

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)
553	MH-239	834.72	MH-238	840.75	341.7	0.018	Circle	12.0	0.013	13.45	1.68	0.6	19,364.62
554	MH-238	840.75	MH-241	854.90	305.7	0.046	Circle	12.0	0.013	13.45	2.36	0.4	19,364.62
558	MH-235	848.81	MH-234	850.23	221.8	0.006	Circle	12.0	0.013	6.11	0.93	0.5	8,802.10
559	MH-234	850.23	MH-233	854.29	195.8	0.021	Circle	12.0	0.013	6.11	1.40	0.3	8,802.10
561	MH-105	805.70	MH-109	794.15	341.2	0.034	Circle	8.0	0.013	1.22	1.08	0.1	1,760.42
563	MH-205	787.21	MH-204	7.58	177.0	4.404	Circle	8.0	0.013	2.45	7.09	0.0	3,520.84
564	MH-204	7.58	MH-203	784.23	193.2	-4.020	Circle	8.0	0.013	2.45	0.02	0.0	3,520.84
567	MH-137	761.45	MH-607	759.77	211.8	0.008	Circle	8.0	0.013	82.67	2.30	17.1	119,041.26
568	MH-606	764.25	MH-607	759.77	106.5	0.042	Circle	8.0	0.013	418.28	6.60	37.6	602,329.41
571	MH-146	762.94	MH-609	760.98	304.3	0.006	Circle	8.0	0.013	166.83	2.60	38.3	240,240.64
573	MH-912	767.00	MH-170	766.63	210.7	0.002	Circle	8.0	0.013	1.83	0.43	0.8	2,640.63
574	MH-170	766.63	MH-148	757.37	209.6	0.044	Circle	8.0	0.013	226.17	5.67	19.8	325,677.72
582	MH-196	823.67	MH-197	816.33	105.6	0.069	Circle	8.0	0.013	1.83	1.57	0.1	2,640.63
583	MH-241	854.90	MH-240	858.97	189.1	0.022	Circle	12.0	0.013	13.45	1.80	0.6	19,364.62
584	MH-305	771.45	MH-260	775.02	259.1	0.014	Circle	8.0	0.013	11.00	1.54	1.7	15,843.78
586	MH-257	804.18	MH-254	776.92	167.7	0.163	Circle	8.0	0.013	0.00	0.00	0.0	0.00
587	MH-261	1,026.74	MH-262	1,011.32	146.5	-0.105	Circle	8.0	0.013	254.28	1.62	14.5	366,167.37
588	MH-288	767.03	MH-290	760.95	52.9	0.115	Circle	8.0	0.013	42.79	4.86	2.3	61,614.70
593	MH-225	715.01	Lakefront LS	705.00	25.1	0.398	Circle	8.0	0.013	7.95	4.48	0.2	11,442.73
594	MH-615	711.78	Lakefront LS	705.00	665.8	0.010	Circle	10.0	0.013	531.28	4.12	53.5	765,049.65
596	MH-299	731.93	School St. LS	725.00	21.5	0.322	Circle	8.0	0.013	471.06	14.22	15.3	678,328.12
597	MH-300	737.84	School St. LS	725.00	464.6	0.028	Circle	8.0	0.013	20.17	2.36	2.2	29,046.93
599	MH-144	747.76	Shamel St. LS	745.00	68.9	0.040	Circle	8.0	0.013	502.55	6.80	46.3	723,666.87
601	MH-112	739.00	Shadow Ridge LS	735.00	124.0	0.032	Circle	8.0	0.013	39.12	3.03	4.0	56,333.44
602	MH-113	745.55	Shadow Ridge LS	735.00	186.8	0.056	Circle	8.0	0.013	0.61	1.06	0.0	880.21
604	MH-207	746.89	MH-278	743.64	70.8	0.046	Circle	12.0	0.013	314.98	6.06	9.2	453,576.04
605	MH-278	743.64	MH-210	740.27	310.4	0.011	Circle	12.0	0.013	932.45	4.86	56.0	1,342,722.75
607	MH-279	745.21	MH-278	743.64	559.0	0.003	Circle	10.0	0.013	617.46	2.52	118.5	889,146.75
610	MH-155	747.11	MH-280	746.64	168.8	0.003	Circle	10.0	0.013	402.30	1.64	77.5	579,312.82
612	MH-280	746.64	MH-281	746.22	146.9	0.003	Circle	10.0	0.013	402.30	1.64	76.5	579,312.82
613	MH-281	746.22	MH-279	745.21	359.0	0.003	Circle	10.0	0.013	617.46	2.52	118.4	889,146.75
614	MH-209	758.11	MH-281	746.22	63.8	0.186	Circle	8.0	0.013	215.16	9.32	9.2	309,833.91

FlexTable: Conduit Table

Capacity (Design) (gpm)
518.90
525.75
521.55
2,341.77
866.62
729.78
5,729.31
2,625.00
8,281.34
1,112.54
1,384.18
1,531.09
1,639.20
1,588.08
2,828.90

Scenario: Future, 40-Year with Improvements



FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
40	MH-107	852.59	MH-901	830.00	410.3	0.055	Circle	8.0	0.013	14.06	2.67	1.1	20,244.83	1,272.54
47	MH-901	830.00	MH-106	849.26	109.2	0.176	Circle	8.0	0.013	18.95	4.39	0.8	27,286.51	2,277.34
49	MH-102	859.06	MH-106	849.26	75.5	0.130	Circle	8.0	0.013	18.95	3.94	1.0	27,286.51	1,954.35
50	MH-108	816.75	MH-901	830.00	183.3	0.072	Circle	8.0	0.013	33.01	3.82	2.3	47,531.34	1,458.08
51	MH-103	810.00	MH-104	808.95	111.5	0.009	Circle	8.0	0.013	1.22	0.69	0.2	1,760.42	526.29
53	MH-104	808.95	MH-105	805.70	108.4	0.030	Circle	8.0	0.013	1.22	1.04	0.1	1,760.42	938.98
56	MH-108	816.75	MH-109	794.15	226.0	0.100	Circle	8.0	0.013	33.01	4.27	1.9	47,531.34	1,715.06
57	MH-109	794.15	MH-110	770.12	177.0	0.136	Circle	8.0	0.013	34.23	4.82	1.7	49,291.76	1,998.13
60	MH-111	757.08	MH-112	739.00	269.5	0.067	Circle	8.0	0.013	37.90	3.88	2.7	54,573.02	1,404.69
68	MH-902	752.00	MH-903	750.00	143.1	0.014	Circle	8.0	0.013	0.61	0.65	0.1	880.21	641.10
69	MH-903	750.00	MH-113	745.55	419.7	0.011	Circle	8.0	0.013	0.61	0.59	0.1	880.21	558.44
72	MH-905	772.00	MH-110	770.12	477.4	0.004	Circle	8.0	0.013	2.45	0.63	0.7	3,520.84	340.34
73	MH-110	770.12	MH-111	757.08	196.7	0.066	Circle	8.0	0.013	36.68	3.83	2.6	52,812.60	1,396.26
75	MH-904	759.00	MH-111	757.08	397.2	0.005	Circle	8.0	0.013	1.22	0.54	0.3	1,760.42	377.06
86	MH-114	760.41	MH-115	758.40	195.6	0.010	Circle	8.0	0.013	44.62	2.11	8.1	64,255.33	549.80
87	MH-115	758.40	MH-116	756.62	256.4	0.007	Circle	8.0	0.013	44.62	1.84	9.9	64,255.33	451.89
88	MH-116	756.62	MH-117	757.26	100.3	0.006	Circle	8.0	0.013	11.61	1.20	2.7	16,723.99	433.18
89	MH-117	757.26	MH-118	757.63	75.7	0.005	Circle	8.0	0.013	5.50	0.87	1.5	7,921.89	379.10
90	MH-118	757.63	MH-119	761.52	385.0	0.010	Circle	8.0	0.013	5.50	1.11	1.0	7,921.89	545.13
91	MH-119	761.52	MH-312	764.51	139.1	0.021	Circle	8.0	0.013	5.50	1.45	0.7	7,921.89	795.11
97	MH-133	766.99	MH-132	766.62	109.1	0.003	Circle	12.0	0.013	100.00	1.73	10.7	144,000.00	931.29
98	MH-132	766.62	MH-123	767.58	305.1	0.003	Circle	12.0	0.013	157.09	1.91	17.5	226,213.96	896.88
99	MH-123	767.58	MH-122	768.54	297.4	0.003	Circle	12.0	0.013	146.09	1.89	16.1	210,370.20	908.46
116	MH-132	766.62	MH-130	767.75	191.8	0.006	Circle	8.0	0.013	11.61	1.16	2.8	16,723.99	416.31
117	MH-130	767.75	MH-131	768.95	169.9	0.007	Circle	8.0	0.013	3.06	0.82	0.7	4,401.05	455.85
123	MH-140	774.14	MH-141	773.74	118.0	0.003	Circle	8.0	0.013	4.28	0.71	1.4	6,161.47	315.78
124	MH-141	773.74	MH-136	764.49	311.8	0.030	Circle	8.0	0.013	4.28	1.51	0.5	6,161.47	934.12
129	MH-130	767.75	MH-129	772.17	249.4	0.018	Circle	8.0	0.013	8.56	1.55	1.2	12,322.94	721.97
130	MH-129	772.17	MH-127	782.55	386.6	0.027	Circle	8.0	0.013	8.56	1.79	1.0	12,322.94	888.64
132	MH-139	757.13	MH-906	756.00	49.4	0.023	Circle	12.0	0.013	500.95	5.41	20.7	721,370.64	2,417.23
139	MH-144	747.76	MH-143	749.22	275.3	0.005	Circle	12.0	0.013	502.55	3.18	43.2	723,666.87	1,164.38
140	MH-143	749.22	MH-608	751.00	299.6	0.006	Circle	12.0	0.013	502.55	3.32	40.8	723,666.87	1,232.55
141	MH-608	751.00	MH-142	752.59	281.8	0.006	Circle	12.0	0.013	500.95	3.25	41.7	721,370.64	1,201.02
142	MH-142	752.59	MH-906	756.00	307.2	0.011	Circle	12.0	0.013	500.95	4.17	29.7	721,370.64	1,684.78
152	MH-167	768.98	MH-168	766.70	365.5	0.006	Circle	8.0	0.013	6.72	1.01	1.6	9,682.31	428.35
154	MH-168	766.70	MH-173	760.64	188.4	0.032	Circle	8.0	0.013	220.66	5.03	22.7	317,755.81	972.75
156	MH-173	760.64	MH-172	759.48	289.0	0.004	Circle	8.0	0.013	220.66	2.33	64.2	317,755.81	343.60
157	MH-172	759.48	MH-171	758.80	168.9	0.004	Circle	8.0	0.013	224.33	2.34	65.2	323,037.07	344.15

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
158	MH-171	758.80	MH-170	758.21	148.7	0.004	Circle	8.0	0.013	224.33	2.33	65.7	323,037.07	341.64
160	MH-145	756.61	MH-144	747.76	321.4	0.028	Circle	8.0	0.013	0.00	0.00	0.0	0.00	899.90
165	MH-148	757.37	MH-147	758.83	342.2	0.004	Circle	8.0	0.013	169.89	2.24	48.0	244,641.67	354.24
166	MH-147	758.83	MH-609	760.98	259.4	0.008	Circle	8.0	0.013	166.83	2.84	33.8	240,240.64	493.78
178	MH-161	793.17	MH-158	797.80	267.0	0.017	Circle	8.0	0.013	202.33	3.92	28.3	291,349.52	714.23
179	MH-158	797.80	MH-156	805.99	208.0	0.039	Circle	8.0	0.013	192.55	5.20	17.9	277,266.16	1,076.19
180	MH-158	797.80	MH-157	814.25	421.3	0.039	Circle	8.0	0.013	9.78	2.12	0.9	14,083.36	1,071.68
181	MH-161	793.17	MH-162	785.71	275.4	0.027	Circle	8.0	0.013	213.33	4.68	23.9	307,193.28	892.60
182	MH-162	785.71	MH-163	776.29	268.0	0.035	Circle	8.0	0.013	213.33	5.13	21.0	307,193.28	1,016.77
183	MH-163	776.29	MH-164	769.50	272.1	0.025	Circle	8.0	0.013	213.33	4.53	24.9	307,193.28	856.71
184	MH-164	769.50	MH-165	768.87	171.8	0.004	Circle	8.0	0.013	213.33	2.23	65.0	307,193.28	328.38
185	MH-165	768.87	MH-166	768.66	43.7	0.005	Circle	8.0	0.013	213.33	2.48	56.8	307,193.28	375.86
187	MH-161	793.17	MH-160	803.35	369.4	0.028	Circle	8.0	0.013	11.00	1.95	1.2	15,843.78	900.27
188	MH-160	803.35	MH-159	808.04	346.3	0.014	Circle	8.0	0.013	11.00	1.53	1.7	15,843.78	631.13
192	MH-148	757.37	MH-149	754.58	463.3	0.006	Circle	10.0	0.013	396.06	3.15	51.9	570,319.39	763.06
193	MH-149	754.58	MH-150	754.79	143.1	-0.001	Circle	10.0	0.013	399.11	1.63	105.9	574,720.43	376.75
194	MH-150	754.79	MH-151	752.48	274.7	0.008	Circle	10.0	0.013	399.11	3.57	44.3	574,720.43	901.78
196	MH-152	759.52	MH-151	752.48	267.1	0.026	Circle	10.0	0.013	0.00	0.00	0.0	0.00	1,596.42
200	MH-155	747.11	MH-154	750.36	280.3	0.012	Circle	10.0	0.013	402.30	4.03	38.0	579,312.82	1,058.77
201	MH-154	750.36	MH-153	750.86	320.1	0.002	Circle	10.0	0.013	402.30	1.80	103.5	579,312.82	388.65
202	MH-153	750.86	MH-151	752.48	310.7	0.005	Circle	10.0	0.013	402.30	2.99	56.7	579,312.82	710.05
222	MH-177	843.22	MH-619	838.22	184.8	0.027	Circle	8.0	0.013	213.94	4.68	24.0	308,073.51	891.98
233	MH-595	804.35	MH-194	800.98	274.3	0.012	Circle	8.0	0.013	4.89	1.15	0.8	7,041.68	601.18
234	MH-194	800.98	MH-596	797.19	111.2	0.034	Circle	8.0	0.013	4.89	1.65	0.5	7,041.68	1,001.12
243	MH-203	784.23	MH-202	782.69	52.2	0.030	Circle	8.0	0.013	10.39	1.96	1.1	14,963.57	931.55
244	MH-202	782.69	MH-201	779.42	305.3	0.011	Circle	8.0	0.013	10.39	1.38	1.9	14,963.57	561.31
245	MH-201	779.42	MH-617	775.43	177.1	0.023	Circle	8.0	0.013	11.19	1.84	1.4	16,111.67	813.95
246	MH-596	797.19	MH-203	784.23	322.0	0.040	Circle	8.0	0.013	7.95	2.02	0.7	11,442.73	1,088.08
257	MH-166	768.66	MH-168	766.70	326.5	0.006	Circle	8.0	0.013	213.94	2.69	50.9	308,073.51	420.19
258	MH-134	765.21	MH-135	764.51	419.0	0.002	Circle	12.0	0.013	413.21	1.96	63.2	595,019.84	653.61
262	MH-132	766.62	MH-907	766.13	183.9	0.003	Circle	12.0	0.013	268.71	2.10	32.5	386,937.96	827.97
263	MH-907	766.13	MH-908	766.04	31.9	0.003	Circle	12.0	0.013	271.76	2.11	32.6	391,339.00	833.51
264	MH-908	766.04	MH-134	765.21	310.3	0.003	Circle	12.0	0.013	271.76	2.10	32.9	391,339.00	826.96
270	MH-181	860.73	MH-182	859.09	139.7	0.012	Circle	8.0	0.013	108.80	2.86	18.5	156,677.38	587.56
271	MH-182	859.09	MH-183	850.42	267.9	0.032	Circle	8.0	0.013	108.80	4.11	11.2	156,677.38	975.73
272	MH-183	850.42	MH-184	846.42	154.0	0.026	Circle	8.0	0.013	108.80	3.81	12.4	156,677.38	874.11
273	MH-184	846.42	MH-185	842.34	139.5	0.029	Circle	8.0	0.013	108.80	3.97	11.7	156,677.38	927.57
274	MH-185	842.34	MH-186	833.21	244.6	0.037	Circle	8.0	0.013	108.80	4.33	10.4	156,677.38	1,047.87

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
275	MH-186	833.21	MH-187	830.10	129.9	0.024	Circle	8.0	0.013	298.29	4.91	35.5	429,542.47	839.14
276	MH-187	830.10	MH-195	819.50	131.4	0.081	Circle	8.0	0.013	298.29	7.60	19.4	429,542.47	1,540.27
278	MH-195	819.50	MH-197	816.33	180.3	0.018	Circle	8.0	0.013	298.29	4.38	41.5	429,542.47	719.10
285	MH-180	883.74	MH-179	880.24	86.1	0.041	Circle	8.0	0.013	130.81	4.70	12.0	188,364.95	1,093.29
286	MH-179	880.24	MH-178	855.67	333.6	0.074	Circle	8.0	0.013	130.81	5.80	8.9	188,364.95	1,471.93
287	MH-178	855.67	MH-909	850.00	327.4	0.017	Circle	8.0	0.013	130.81	3.46	18.3	188,364.95	713.70
288	MH-909	850.00	MH-191	840.51	304.1	0.031	Circle	8.0	0.013	130.81	4.28	13.7	188,364.95	958.07
289	MH-191	840.51	MH-190	836.55	86.1	0.046	Circle	8.0	0.013	186.43	5.44	16.0	268,464.04	1,163.30
290	MH-190	836.55	MH-189	835.06	75.6	0.020	Circle	8.0	0.013	186.43	4.02	24.5	268,464.04	761.49
291	MH-189	835.06	MH-188	834.65	91.1	0.005	Circle	8.0	0.013	186.43	2.34	51.2	268,464.04	363.89
292	MH-188	834.65	MH-186	833.21	349.4	0.004	Circle	8.0	0.013	186.43	2.26	53.5	268,464.04	348.15
293	MH-191	840.51	MH-192	850.45	272.9	0.036	Circle	8.0	0.013	55.62	3.52	5.4	80,099.11	1,035.01
294	MH-192	850.45	MH-193	868.55	358.5	0.050	Circle	8.0	0.013	55.62	3.94	4.6	80,099.11	1,218.59
295	MH-597	800.82	MH-596	797.19	197.4	0.018	Circle	8.0	0.013	3.06	1.15	0.4	4,401.05	735.39
297	MH-207	746.89	MH-206	758.13	88.1	0.128	Circle	12.0	0.013	314.98	8.69	5.5	453,576.04	5,711.08
298	MH-206	758.13	MH-910	765.00	184.6	0.037	Circle	8.0	0.013	314.98	5.84	30.1	453,576.04	1,046.12
299	MH-910	765.00	MH-617	775.43	290.7	0.036	Circle	8.0	0.013	314.98	5.77	30.7	453,576.04	1,027.29
303	MH-197	816.33	MH-198	800.78	249.5	0.062	Circle	8.0	0.013	300.13	6.94	22.2	432,183.10	1,353.94
304	MH-198	800.78	MH-199	793.14	161.8	0.047	Circle	8.0	0.013	300.13	6.28	25.5	432,183.10	1,178.47
305	MH-199	793.14	MH-200	783.36	208.4	0.047	Circle	8.0	0.013	300.13	6.26	25.5	432,183.10	1,174.92
306	MH-200	783.36	MH-617	775.43	180.0	0.044	Circle	8.0	0.013	303.79	6.15	26.7	437,464.37	1,138.45
307	MH-618	766.12	MH-206	758.13	393.8	0.020	Circle	8.0	0.013	0.00	0.00	0.0	0.00	772.49
313	MH-135	764.51	MH-606	764.25	181.0	0.001	Circle	12.0	0.013	413.21	1.85	68.2	595,019.84	606.04
314	MH-606	764.25	MH-136	764.49	286.5	0.001	Circle	8.0	0.013	4.28	0.44	2.7	6,161.47	156.98
315	MH-607	759.77	MH-139	757.13	260.7	0.010	Circle	12.0	0.013	500.95	4.03	31.1	721,370.64	1,609.21
324	MH-213	736.84	MH-212	734.79	91.0	0.023	Circle	10.0	0.013	410.00	5.16	27.8	590,399.99	1,476.25
326	MH-212	734.79	MH-616	734.54	150.3	0.002	Circle	12.0	0.013	410.00	1.95	62.9	590,399.99	652.18
335	MH-213	736.84	MH-214	745.26	226.0	0.037	Circle	10.0	0.013	410.00	6.19	21.6	590,399.99	1,898.16
336	MH-214	745.26	MH-215	754.15	219.3	0.041	Circle	10.0	0.013	410.00	6.38	20.7	590,399.99	1,979.71
337	MH-215	754.15	MH-216	756.53	187.2	0.013	Circle	10.0	0.013	410.00	4.19	37.0	590,399.99	1,108.68
338	MH-230	740.80	MH-212	734.79	388.1	0.015	Circle	12.0	0.013	0.00	0.00	0.0	0.00	1,989.88
339	MH-221	738.18	MH-220	729.85	148.1	0.056	Circle	8.0	0.013	4.89	1.97	0.4	7,041.68	1,286.05
340	MH-220	729.85	MH-219	720.88	105.8	0.085	Circle	8.0	0.013	4.89	2.25	0.3	7,041.68	1,579.40
341	MH-219	720.88	MH-217	718.19	136.6	0.020	Circle	8.0	0.013	4.89	1.36	0.6	7,041.68	761.02
343	MH-217	718.19	MH-218	734.26	271.0	0.059	Circle	8.0	0.013	2.45	1.59	0.2	3,520.84	1,320.75
346	MH-217	718.19	MH-222	716.15	283.0	0.007	Circle	8.0	0.013	7.34	1.09	1.6	10,562.52	460.45
348	MH-222	716.15	MH-223	714.15	266.8	0.007	Circle	8.0	0.013	7.34	1.10	1.6	10,562.52	469.59
350	MH-223	714.15	MH-224	713.70	111.4	0.004	Circle	8.0	0.013	7.95	0.05	2.3	11,442.73	344.76

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
352	MH-224	713.70	MH-225	715.01	251.4	-0.005	Circle	8.0	0.013	7.95	0.05	2.0	11,442.73	391.51
361	MH-612	717.24	MH-613	716.88	15.6	0.023	Circle	10.0	0.013	394.18	5.14	26.4	567,614.74	1,491.59
362	MH-613	716.88	MH-614	714.86	462.0	0.004	Circle	10.0	0.013	394.18	2.78	60.6	567,614.74	650.20
363	MH-614	714.86	MH-615	711.78	334.6	0.009	Circle	10.0	0.013	394.18	3.68	41.8	567,614.74	943.48
364	MH-615	711.78	MH-227	725.52	122.7	0.112	Circle	12.0	0.013	136.31	6.46	2.5	196,286.84	5,349.88
365	MH-227	725.52	MH-226	727.68	74.2	0.029	Circle	12.0	0.013	136.31	4.03	5.0	196,286.84	2,728.20
372	MH-250	835.64	MH-589	833.00	109.7	0.024	Circle	8.0	0.013	137.53	3.95	16.3	198,047.25	841.52
373	MH-589	833.00	MH-592	835.00	150.2	0.013	Circle	8.0	0.013	1.83	0.88	0.3	2,640.63	625.91
374	MH-589	833.00	MH-590	831.78	29.9	0.041	Circle	8.0	0.013	139.37	4.79	12.7	200,687.88	1,094.97
375	MH-590	831.78	MH-229	745.29	277.0	0.312	Circle	8.0	0.013	140.59	9.86	4.6	202,448.30	3,030.64
377	MH-229	745.29	MH-228	737.46	150.2	0.052	Circle	8.0	0.013	390.59	7.01	31.5	562,448.31	1,238.37
379	MH-228	737.46	MH-610	720.24	142.0	0.121	Circle	8.0	0.013	390.59	9.50	20.7	562,448.31	1,888.64
381	MH-610	720.24	MH-611	718.55	325.4	0.005	Circle	10.0	0.013	394.18	2.97	55.6	567,614.74	708.70
382	MH-611	718.55	MH-612	717.24	332.3	0.004	Circle	10.0	0.013	394.18	2.67	63.8	567,614.74	617.44
397	MH-242	962.56	MH-243	956.31	170.3	0.037	Circle	8.0	0.013	125.31	4.48	12.1	180,443.05	1,038.99
398	MH-243	956.31	MH-244	950.66	290.4	0.019	Circle	8.0	0.013	126.53	3.59	16.7	182,203.46	756.43
399	MH-244	950.66	MH-245	949.82	91.6	0.009	Circle	8.0	0.013	126.53	2.74	24.4	182,203.46	519.43
400	MH-245	949.82	MH-246	899.54	416.1	0.121	Circle	8.0	0.013	126.53	6.85	6.7	182,203.46	1,885.36
401	MH-246	899.54	MH-247	884.56	181.6	0.082	Circle	8.0	0.013	126.53	5.97	8.1	182,203.46	1,557.68
402	MH-247	884.56	MH-248	860.45	257.7	0.094	Circle	8.0	0.013	128.36	6.27	7.7	184,844.09	1,658.85
403	MH-248	860.45	MH-249	855.67	172.6	0.028	Circle	8.0	0.013	131.42	4.11	14.6	189,245.15	902.53
404	MH-249	855.67	MH-588	852.86	127.4	0.022	Circle	8.0	0.013	131.42	3.78	16.3	189,245.15	805.40
406	MH-588	852.86	MH-911	840.00	183.4	0.070	Circle	8.0	0.013	131.42	5.71	9.2	189,245.15	1,436.23
407	MH-911	840.00	MH-250	835.64	226.8	0.019	Circle	8.0	0.013	137.53	3.65	18.3	198,047.25	751.93
408	MH-593	862.50	MH-248	860.45	304.6	0.007	Circle	8.0	0.013	3.06	0.81	0.7	4,401.05	444.96
411	MH-591	767.77	MH-251	748.08	256.2	0.077	Circle	8.0	0.013	250.00	7.10	16.6	359,999.99	1,503.40
412	MH-251	748.08	MH-229	745.29	161.1	0.017	Circle	8.0	0.013	250.00	4.16	35.0	359,999.99	713.79
418	MH-591	767.77	MH-252	769.88	213.9	0.010	Circle	8.0	0.013	250.00	3.38	46.4	359,999.99	538.65
419	MH-252	769.88	MH-253	771.09	193.4	0.006	Circle	8.0	0.013	250.00	2.84	58.3	359,999.99	429.01
420	MH-253	771.09	MH-254	776.92	271.3	0.021	Circle	8.0	0.013	250.00	4.50	31.4	359,999.99	795.08
421	MH-254	776.92	MH-255	787.91	304.9	0.036	Circle	8.0	0.013	250.00	5.43	24.3	359,999.99	1,029.69
428	MH-258	811.13	MH-259	786.64	279.4	0.088	Circle	8.0	0.013	4.28	2.20	0.3	6,161.47	1,605.60
429	MH-259	786.64	MH-260	775.02	181.8	0.064	Circle	8.0	0.013	4.28	1.95	0.3	6,161.47	1,371.27
430	MH-302	795.80	MH-303	768.59	331.0	0.082	Circle	8.0	0.013	4.28	2.15	0.3	6,161.47	1,555.01
433	MH-303	768.59	MH-304	764.34	154.3	0.028	Circle	8.0	0.013	4.28	1.47	0.5	6,161.47	900.15
434	MH-304	764.34	MH-506	777.79	218.2	0.062	Circle	8.0	0.013	2.45	1.62	0.2	3,520.84	1,346.49
438	MH-304	764.34	MH-301	754.33	233.0	0.043	Circle	8.0	0.013	6.72	1.96	0.6	9,682.31	1,124.03
439	MH-301	754.33	MH-305	771.45	315.5	0.054	Circle	8.0	0.013	11.00	2.47	0.9	15,843.78	1,263.32

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
440	MH-301	754.33	MH-300	737.84	130.0	0.127	Circle	8.0	0.013	17.73	3.83	0.9	25,526.09	1,931.54
457	MH-282	749.68	MH-299	731.93	158.1	0.112	Circle	8.0	0.013	12.62	3.32	0.7	18,170.60	1,817.11
458	MH-299	731.93	MH-298	739.67	201.6	0.038	Circle	8.0	0.013	458.44	6.54	43.1	660,157.51	1,062.65
459	MH-298	739.67	MH-297	741.72	170.1	0.012	Circle	8.0	0.013	458.44	4.19	77.0	660,157.51	595.33
460	MH-297	741.72	MH-296	752.22	422.2	0.025	Circle	8.0	0.013	458.44	5.55	53.6	660,157.51	855.30
461	MH-296	752.22	MH-295	758.15	374.6	0.016	Circle	8.0	0.013	458.44	4.67	67.2	660,157.51	682.38
462	MH-295	758.15	MH-294	759.10	218.0	0.004	Circle	8.0	0.013	457.22	2.92	127.7	658,397.07	358.04
463	MH-294	759.10	MH-293	759.94	131.6	0.006	Circle	8.0	0.013	457.22	2.92	105.5	658,397.07	433.26
464	MH-293	759.94	MH-292	760.33	162.8	0.002	Circle	8.0	0.013	457.22	2.92	172.3	658,397.07	265.42
465	MH-292	760.33	MH-291	761.28	161.2	0.006	Circle	8.0	0.013	455.39	2.91	109.4	655,756.44	416.32
466	MH-291	761.28	MH-290	760.95	143.6	-0.002	Circle	8.0	0.013	455.39	2.91	175.1	655,756.44	260.03
468	MH-290	760.95	MH-289	762.16	123.5	0.010	Circle	8.0	0.013	412.60	2.63	76.9	594,141.74	536.82
474	MH-288	767.03	MH-287	773.58	435.3	0.015	Circle	8.0	0.013	42.79	2.39	6.4	61,614.70	665.27
475	MH-287	773.58	MH-286	780.70	116.1	0.061	Circle	8.0	0.013	0.00	0.00	0.0	0.00	1,343.13
477	MH-285	784.47	MH-284	779.28	334.0	0.016	Circle	8.0	0.013	3.67	1.15	0.5	5,281.26	676.01
478	MH-284	779.28	MH-283	768.56	256.0	0.042	Circle	8.0	0.013	3.67	1.64	0.3	5,281.26	1,109.81
479	MH-283	768.56	MH-282	749.68	203.3	0.093	Circle	8.0	0.013	10.17	2.91	0.6	14,649.76	1,652.86
480	MH-256	784.75	MH-260	775.02	375.1	0.026	Circle	8.0	0.013	1.83	1.10	0.2	2,640.63	873.50
491	MH-311	786.88	MH-281	774.50	167.2	0.074	Circle	8.0	0.013	38.51	4.04	2.6	55,453.23	1,475.98
492	MH-281	774.50	MH-287	773.58	284.3	0.003	Circle	8.0	0.013	38.51	1.35	12.5	55,453.23	308.51
503	MH-261	1,026.74	MH-263	1,036.86	254.7	-0.040	Circle	8.0	0.013	254.28	1.62	23.5	366,167.37	1,081.06
504	MH-263	1,036.86	MH-264	1,046.42	319.5	-0.030	Circle	8.0	0.013	255.51	1.63	27.2	367,927.78	938.21
505	MH-264	1,046.42	MH-265	1,066.01	278.3	-0.070	Circle	8.0	0.013	255.51	1.63	17.8	367,927.78	1,438.83
506	MH-265	1,066.01	MH-266	1,038.25	313.4	0.089	Circle	8.0	0.013	257.95	7.54	16.0	371,448.63	1,614.17
507	MH-266	1,038.25	MH-267	1,011.60	368.7	0.072	Circle	8.0	0.013	261.62	7.06	17.9	376,729.89	1,458.06
508	MH-267	1,011.60	MH-268	977.27	355.6	0.097	Circle	8.0	0.013	261.62	7.81	15.5	376,729.89	1,685.04
526	MH-278	801.12	MH-277	787.73	239.2	0.056	Circle	8.0	0.013	135.09	5.32	10.5	194,526.41	1,283.19
530	MH-277	787.73	MH-280	770.54	206.2	0.083	Circle	8.0	0.013	408.93	8.40	26.1	588,860.48	1,566.09
531	MH-280	770.54	MH-911	768.00	95.3	0.027	Circle	8.0	0.013	412.60	5.55	46.6	594,141.74	885.54
532	MH-911	768.00	MH-289	762.16	261.0	0.022	Circle	8.0	0.013	412.60	5.20	50.9	594,141.74	811.19
534	MH-280	770.54	MH-279	783.28	234.3	0.054	Circle	8.0	0.013	3.67	1.78	0.3	5,281.26	1,264.69
545	MH-594	870.28	MH-231	856.83	190.7	0.071	Circle	12.0	0.013	105.75	5.09	2.5	152,276.33	4,246.78
546	MH-231	856.83	MH-232	851.99	180.3	0.027	Circle	12.0	0.013	105.75	3.63	4.0	152,276.33	2,620.03
547	MH-232	851.99	MH-235	848.81	81.7	0.039	Circle	12.0	0.013	105.75	4.14	3.4	152,276.33	3,153.75
549	MH-235	848.81	MH-236	840.64	125.1	0.065	Circle	12.0	0.013	111.86	5.04	2.7	161,078.43	4,087.05
550	MH-236	840.64	MH-306	849.34	162.4	0.054	Circle	12.0	0.013	3.67	1.69	0.1	5,281.26	3,700.77
551	MH-236	840.64	MH-237	836.12	377.9	0.012	Circle	12.0	0.013	115.53	2.81	6.6	166,359.69	1,748.69
552	MH-237	836.12	MH-239	834.72	409.8	0.003	Circle	12.0	0.013	122.86	1.84	13.1	176,922.22	934.56

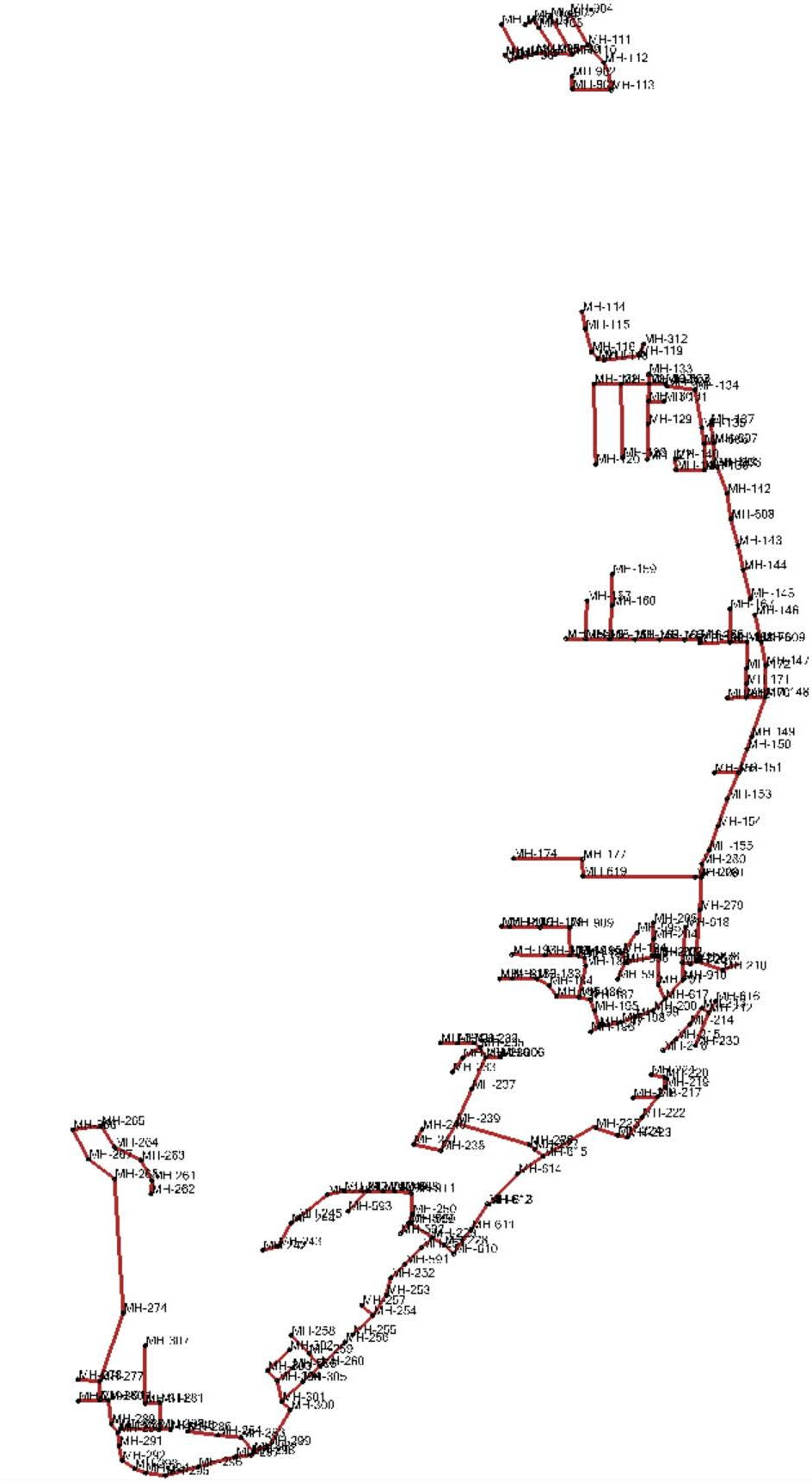
FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
553	MH-239	834.72	MH-238	840.75	341.7	0.018	Circle	12.0	0.013	13.45	1.68	0.6	19,364.62	2,124.28
554	MH-238	840.75	MH-241	854.90	305.7	0.046	Circle	12.0	0.013	13.45	2.36	0.4	19,364.62	3,440.07
558	MH-235	848.81	MH-234	850.23	221.8	0.006	Circle	12.0	0.013	6.11	0.93	0.5	8,802.10	1,279.28
559	MH-234	850.23	MH-233	854.29	195.8	0.021	Circle	12.0	0.013	6.11	1.40	0.3	8,802.10	2,302.54
561	MH-105	805.70	MH-109	794.15	341.2	0.034	Circle	8.0	0.013	1.22	1.08	0.1	1,760.42	997.77
563	MH-205	787.21	MH-204	7.58	177.0	4.404	Circle	8.0	0.013	2.45	7.09	0.0	3,520.84	11,380.96
564	MH-204	7.58	MH-203	784.23	193.2	-4.020	Circle	8.0	0.013	2.45	0.02	0.0	3,520.84	10,873.37
567	MH-137	761.45	MH-607	759.77	211.8	0.008	Circle	8.0	0.013	82.67	2.30	17.1	119,041.26	482.97
568	MH-606	764.25	MH-607	759.77	106.5	0.042	Circle	8.0	0.013	418.28	6.60	37.6	602,329.41	1,112.23
571	MH-146	762.94	MH-609	760.98	304.3	0.006	Circle	8.0	0.013	166.83	2.60	38.3	240,240.64	435.26
573	MH-912	767.00	MH-170	758.21	210.7	0.042	Circle	8.0	0.013	1.83	1.30	0.2	2,640.63	1,107.68
574	MH-170	758.21	MH-148	757.37	209.6	0.004	Circle	8.0	0.013	226.17	2.34	65.9	325,677.72	343.35
582	MH-196	823.67	MH-197	816.33	105.6	0.069	Circle	8.0	0.013	1.83	1.57	0.1	2,640.63	1,429.56
583	MH-241	854.90	MH-240	858.97	189.1	0.022	Circle	12.0	0.013	13.45	1.80	0.6	19,364.62	2,345.88
584	MH-305	771.45	MH-260	775.02	259.1	0.014	Circle	8.0	0.013	11.00	1.54	1.7	15,843.78	636.60
586	MH-257	804.18	MH-254	776.92	167.7	0.163	Circle	8.0	0.013	0.00	0.00	0.0	0.00	2,186.46
587	MH-261	1,026.74	MH-262	1,011.32	146.5	-0.105	Circle	8.0	0.013	254.28	1.62	14.5	366,167.37	1,759.28
588	MH-288	767.03	MH-290	760.95	52.9	0.115	Circle	8.0	0.013	42.79	4.86	2.3	61,614.70	1,838.58
593	MH-225	715.01	Lakefront LS	705.00	25.1	0.398	Circle	8.0	0.013	7.95	4.48	0.2	11,442.73	3,422.84
594	MH-615	711.78	Lakefront LS	705.00	665.8	0.010	Circle	10.0	0.013	531.28	4.12	53.5	765,049.65	992.31
596	MH-299	731.93	School St. LS	725.00	21.5	0.322	Circle	8.0	0.013	471.06	14.22	15.3	678,328.12	3,079.44
597	MH-300	737.84	School St. LS	725.00	464.6	0.028	Circle	8.0	0.013	20.17	2.36	2.2	29,046.93	901.61
599	MH-144	747.76	Shamel St. LS	745.00	68.9	0.040	Circle	8.0	0.013	502.55	6.80	46.3	723,666.87	1,085.40
601	MH-112	739.00	Shadow Ridge LS	735.00	124.0	0.032	Circle	8.0	0.013	39.12	3.03	4.0	56,333.44	973.99
602	MH-113	745.55	Shadow Ridge LS	735.00	186.8	0.056	Circle	8.0	0.013	0.61	1.06	0.0	880.21	1,289.02
604	MH-207	746.89	MH-278	743.64	70.8	0.046	Circle	12.0	0.013	314.98	6.06	9.2	453,576.04	3,425.02
605	MH-278	743.64	MH-210	740.27	310.4	0.011	Circle	12.0	0.013	932.45	4.86	56.0	1,342,722.75	1,666.02
607	MH-279	745.21	MH-278	743.64	559.0	0.003	Circle	10.0	0.013	617.46	2.52	118.5	889,146.75	521.12
610	MH-155	747.11	MH-280	746.64	168.8	0.003	Circle	10.0	0.013	402.30	1.64	77.5	579,312.82	518.90
612	MH-280	746.64	MH-281	746.22	146.9	0.003	Circle	10.0	0.013	402.30	1.64	76.5	579,312.82	525.75
613	MH-281	746.22	MH-279	745.21	359.0	0.003	Circle	10.0	0.013	617.46	2.52	118.4	889,146.75	521.55
614	MH-209	758.11	MH-281	746.22	63.8	0.186	Circle	8.0	0.013	215.16	9.32	9.2	309,833.91	2,341.77

FlexTable: Conduit Table

ID	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (gpm)	Velocity (ft/s)	Flow / Capacity (Design) (%)	Flow (System Sanitary) (gpd)	Capacity (Design) (gpm)
615	MH-120	790.95	MH-122	768.54	877.7	0.026	Circle	8.0	0.013	143.03	4.08	16.5	205,969.14	866.62
616	MH-128	782.17	MH-123	767.58	805.8	0.018	Circle	8.0	0.013	11.00	1.70	1.5	15,843.78	729.78
618	MH-239	834.72	MH-226	727.68	833.8	0.128	Circle	12.0	0.013	136.31	6.78	2.4	196,286.84	5,729.31
621	MH-210	740.27	Jet Pump	735.00	195.5	0.027	Circle	12.0	0.013	932.45	6.81	35.5	1,342,722.75	2,625.00
625	O-7	730.00	MH-616	734.54	16.9	0.268	Circle	12.0	0.013	410.00	12.21	5.0	590,399.99	8,281.34
626	MH-174	874.93	MH-177	843.22	753.6	0.042	Circle	8.0	0.013	213.94	5.48	19.2	308,073.51	1,112.54
627	MH-619	838.22	MH-209	758.11	1,229.9	0.065	Circle	8.0	0.013	215.16	6.42	15.5	309,833.91	1,384.18
629	MH-268	977.27	MH-274	860.00	1,471.4	0.080	Circle	8.0	0.013	267.12	7.34	17.4	384,651.78	1,531.09
630	MH-274	860.00	MH-277	787.73	791.1	0.091	Circle	8.0	0.013	273.84	7.77	16.7	394,334.09	1,639.20
631	MH-307	841.25	MH-311	786.88	634.1	0.086	Circle	8.0	0.013	31.17	3.99	2.0	44,890.71	1,588.08
633	MH-116	756.62	O-8	750.00	24.3	0.272	Circle	8.0	0.013	56.24	7.14	2.0	80,979.32	2,828.90

Scenario: Existing System Manholes



FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (System Sanitary) (gpd)	Is Ever Surcharged?	Velocity (In) (ft/s)	Depth (Structure) (ft)
MH-106	849.26	856.31	4,674.75	False	2.29	7.05
MH-108	816.75	822.61	13,089.30	False	2.58	5.86
MH-103	810.00	820.60	1,869.90	False	0.70	10.60
MH-104	808.95	813.90	1,869.90	False	0.72	4.95
MH-107	852.59	860.19	8,414.55	False	1.06	7.60
MH-901	830.00	840.00	13,089.30	False	0.42	10.00
MH-102	859.06	865.50	4,674.75	False	0.90	6.44
MH-105	805.70	813.32	1,869.90	False	1.05	7.62
MH-109	794.15	798.27	14,959.20	False	1.07	4.12
MH-110	770.12	778.50	18,699.00	False	1.04	8.38
MH-111	757.08	762.10	20,568.90	False	1.21	5.02
MH-112	739.00	749.36	22,438.80	False	1.25	10.36
MH-113	745.55	757.01	934.95	False	0.60	11.46
MH-902	752.00	762.00	934.95	False	0.60	10.00
MH-903	750.00	760.00	934.95	False	0.60	10.00
MH-905	772.00	782.00	3,739.80	False	0.64	10.00
MH-904	759.00	769.00	1,869.90	False	0.56	10.00
MH-134	765.21	772.11	432,980.23	True	0.45	6.90
MH-114	760.41	766.16	8,414.55	False	1.06	5.75
MH-115	758.40	765.48	8,414.55	False	1.01	7.08
MH-116	756.62	764.64	26,178.60	False	0.96	8.02
MH-117	757.26	764.58	17,764.05	False	0.58	7.32
MH-118	757.63	765.01	8,414.55	False	0.89	7.38
MH-119	761.52	767.38	8,414.55	False	1.47	5.86
MH-312	764.51	768.45	8,414.55	True	1.06	3.94
MH-133	766.99	771.03	144,000.00	False	1.72	4.04
MH-132	766.62	770.92	224,405.69	False	1.16	4.30
MH-123	767.58	771.60	62,641.65	False	0.44	4.02
MH-122	768.54	772.78	45,812.55	False	1.36	4.24
MH-120	790.95	797.53	41,137.80	False	1.59	6.58
MH-128	782.17	791.21	16,829.10	False	1.26	9.04
MH-131	768.95	772.57	4,674.75	True	0.84	3.62
MH-130	767.75	771.61	17,764.05	False	0.87	3.86
MH-129	772.17	776.51	13,089.30	False	1.82	4.34
MH-127	782.55	787.45	13,089.30	True	1.19	4.90
MH-140	774.14	778.11	6,544.65	False	0.72	3.97
MH-141	773.74	780.60	6,544.65	False	0.99	6.86
MH-136	764.49	775.93	6,544.65	False	0.17	11.44
MH-135	764.51	771.34	432,980.23	True	1.92	6.83
MH-137	761.45	770.93	53,129.70	False	1.71	9.48
MH-139	757.13	771.13	493,874.12	False	3.68	14.00
MH-906	756.00	766.00	493,874.12	False	5.00	10.00
MH-142	752.59	760.49	493,874.12	False	2.92	7.90
MH-608	751.00	761.00	496,313.11	False	2.96	10.00
MH-143	749.22	759.54	496,313.11	False	2.84	10.32
MH-144	747.76	761.50	496,313.11	False	0.00	13.74
MH-145	756.61	766.31	0.00	False	0.00	9.70
MH-167	768.98	773.58	10,284.45	False	1.02	4.60
MH-168	766.70	777.26	57,031.95	False	0.31	10.56

FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (System Sanitary) (gpd)	Is Ever Surcharged?	Velocity (In) (ft/s)	Depth (Structure) (ft)
MH-173	760.64	775.00	57,031.95	False	1.46	14.36
MH-609	760.98	768.18	240,404.84	False	2.63	7.20
MH-170	758.21	778.05	65,446.50	False	1.45	19.84
MH-171	758.80	780.74	62,641.65	False	1.49	21.94
MH-172	759.48	781.97	62,641.65	False	1.37	22.49
MH-147	758.83	765.45	245,079.61	False	2.20	6.62
MH-148	757.37	763.03	310,526.10	False	0.66	5.66
MH-166	768.66	776.86	46,747.50	False	1.55	8.20
MH-165	768.87	777.17	45,812.55	False	1.46	8.30
MH-164	769.50	777.88	45,812.55	False	1.33	8.38
MH-162	785.71	793.91	45,812.55	False	2.69	8.20
MH-163	776.29	785.87	45,812.55	False	2.95	9.58
MH-161	793.17	800.17	45,812.55	False	0.60	7.00
MH-158	797.80	806.80	28,983.45	False	0.71	9.00
MH-156	805.99	812.85	14,024.25	True	1.21	6.86
MH-157	814.25	823.85	14,959.20	True	1.22	9.60
MH-159	808.04	817.76	16,829.10	True	1.26	9.72
MH-160	803.35	813.00	16,829.10	False	1.56	9.65
MH-151	752.48	759.00	320,078.85	False	2.53	6.52
MH-149	754.58	759.56	315,200.85	False	0.93	4.98
MH-150	754.79	759.25	315,200.85	False	2.70	4.46
MH-152	759.52	767.44	0.00	False	0.00	7.92
MH-153	750.86	759.06	320,078.85	False	1.64	8.20
MH-154	750.36	760.06	320,078.85	False	2.71	9.70
MH-155	747.11	758.69	320,078.85	False	2.04	11.58
MH-619	838.22	843.92	48,617.40	False	1.60	5.70
MH-209	758.11	768.31	48,617.40	False	3.71	10.20
MH-177	843.22	852.27	46,747.50	False	3.15	9.05
MH-174	874.93	886.07	46,747.50	False	1.65	11.14
MH-618	766.12	770.32	0.00	False	0.00	4.20
MH-206	758.13	771.05	56,381.55	False	0.00	12.92
MH-205	787.21	798.35	3,739.80	False	0.85	11.14
MH-595	804.35	811.05	7,479.60	False	1.02	6.70
MH-194	800.98	811.16	7,479.60	False	1.17	10.18
MH-596	797.19	805.13	12,154.35	False	0.71	7.94
MH-203	784.23	789.05	15,894.15	False	0.95	4.82
MH-202	782.69	787.87	15,894.15	False	2.00	5.18
MH-201	779.42	785.42	17,113.65	False	1.18	6.00
MH-617	775.43	782.09	56,381.55	False	0.53	6.66
MH-207	746.89	763.87	56,381.55	False	4.61	16.98
MH-597	800.82	808.20	4,674.75	False	0.90	7.38
MH-195	819.50	827.60	30,853.35	False	3.50	8.10
MH-187	830.10	837.96	30,853.35	False	2.28	7.86
MH-186	833.21	843.79	30,853.35	False	1.03	10.58
MH-185	842.34	851.14	4,674.75	False	1.39	8.80
MH-184	846.42	855.22	4,674.75	False	1.33	8.80
MH-183	850.42	859.08	4,674.75	False	1.44	8.66
MH-182	859.09	872.11	4,674.75	False	1.00	13.02
MH-907	766.13	776.00	229,080.46	False	0.88	9.87

FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (System Sanitary) (gpd)	Is Ever Surcharged?	Velocity (In) (ft/s)	Depth (Structure) (ft)
MH-908	766.04	776.00	229,080.46	False	0.74	9.96
MH-179	880.24	890.98	13,089.30	False	2.10	10.74
MH-180	883.74	895.54	13,089.30	False	1.19	11.80
MH-178	855.67	869.12	13,089.30	False	2.59	13.45
MH-909	850.00	860.00	13,089.30	False	1.58	10.00
MH-181	860.73	879.17	4,674.75	False	0.90	18.44
MH-197	816.33	824.39	33,658.20	False	1.38	8.06
MH-188	834.65	844.21	21,503.85	False	1.10	9.56
MH-189	835.06	843.80	21,503.85	False	1.14	8.74
MH-190	836.55	845.41	21,503.85	False	2.59	8.86
MH-191	840.51	848.73	21,503.85	False	0.53	8.22
MH-193	868.55	877.38	8,414.55	True	1.06	8.83
MH-192	850.45	861.91	8,414.55	False	1.99	11.46
MH-910	765.00	775.00	56,381.55	False	3.15	10.00
MH-198	800.78	808.54	33,658.20	False	3.27	7.76
MH-199	793.14	798.74	33,658.20	False	2.97	5.60
MH-200	783.36	789.62	39,267.90	False	1.35	6.26
MH-606	764.25	772.91	440,744.41	False	0.05	8.66
MH-607	759.77	771.20	493,874.12	False	0.36	11.43
MH-210	740.27	754.21	425,077.79	False	3.57	13.94
MH-616	734.54	738.34	590,399.99	False	3.10	3.80
MH-213	736.84	743.30	590,399.99	False	6.19	6.46
MH-212	734.79	739.39	590,399.99	False	0.00	4.60
MH-230	740.80	745.64	0.00	False	0.00	4.84
MH-215	754.15	759.59	590,399.99	False	4.19	5.44
MH-216	756.53	760.47	590,399.99	True	3.28	3.94
MH-217	718.19	723.45	11,219.40	False	0.37	5.26
MH-219	720.88	723.10	7,479.60	False	2.33	2.22
MH-220	729.85	734.75	7,479.60	False	2.00	4.90
MH-221	738.18	743.70	7,479.60	False	1.02	5.52
MH-214	745.26	751.36	590,399.99	False	6.38	6.10
MH-218	734.26	741.90	3,739.80	True	0.85	7.64
MH-222	716.15	723.69	11,219.40	False	1.12	7.54
MH-223	714.15	721.93	12,154.35	True	0.05	7.78
MH-224	713.70	717.92	12,154.35	True	0.05	4.22
MH-225	715.01	719.26	12,154.35	False	1.16	4.25
MH-226	727.68	732.40	58,901.85	False	4.68	4.72
MH-227	725.52	732.70	58,901.85	False	2.81	7.18
MH-615	711.78	722.32	472,356.59	False	2.66	10.54
MH-614	714.86	727.30	412,235.26	False	2.92	12.44
MH-612	717.24	724.26	412,235.26	False	2.92	7.02
MH-613	716.88	724.20	412,235.26	False	2.57	7.32
MH-229	745.29	756.71	406,747.51	False	0.36	11.42
MH-592	835.00	844.71	2,804.85	True	0.80	9.71
MH-590	831.78	837.20	46,747.50	False	1.59	5.42
MH-589	833.00	842.74	44,877.60	False	1.53	9.74
MH-250	835.64	843.94	42,072.75	False	2.32	8.30
MH-228	737.46	744.86	406,747.51	False	6.41	7.40
MH-610	720.24	726.60	412,235.26	False	8.66	6.36

FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (System Sanitary) (gpd)	Is Ever Surcharged?	Velocity (In) (ft/s)	Depth (Structure) (ft)
MH-611	718.55	724.37	412,235.26	False	2.48	5.82
MH-588	852.86	858.88	32,723.25	False	2.26	6.02
MH-249	855.67	869.12	32,723.25	False	2.44	13.45
MH-248	860.45	869.77	32,723.25	False	0.21	9.32
MH-593	862.50	868.76	4,674.75	False	0.82	6.26
MH-247	884.56	891.60	28,048.50	False	1.30	7.04
MH-246	899.54	905.90	25,243.65	False	3.75	6.36
MH-245	949.82	957.34	25,243.65	False	1.54	7.52
MH-244	950.66	962.62	25,243.65	False	2.00	11.96
MH-243	956.31	966.67	25,243.65	False	1.30	10.36
MH-242	962.56	973.66	23,373.75	False	1.38	11.10
MH-911	840.00	850.00	42,072.75	False	1.25	10.00
MH-251	748.08	756.26	359,999.99	False	7.09	8.18
MH-591	767.77	774.67	359,999.99	False	3.37	6.90
MH-252	769.88	775.72	359,999.99	False	2.99	5.84
MH-253	771.09	776.75	359,999.99	False	2.84	5.66
MH-255	787.91	796.07	359,999.99	True	2.99	8.16
MH-254	776.92	784.04	359,999.99	False	5.42	7.12
MH-256	784.75	793.83	2,804.85	False	0.80	9.08
MH-258	811.13	820.95	6,544.65	False	0.99	9.82
MH-259	786.64	795.86	6,544.65	False	2.23	9.22
MH-260	775.02	784.16	16,829.10	False	0.49	9.14
MH-302	795.80	804.83	6,544.65	False	0.99	9.03
MH-303	768.59	776.27	6,544.65	False	2.18	7.68
MH-506	777.79	785.72	3,739.80	True	0.85	7.93
MH-304	764.34	771.66	10,284.45	False	0.40	7.32
MH-305	771.45	780.75	16,829.10	False	1.57	9.30
MH-301	754.33	762.25	27,113.55	False	0.89	7.92
MH-300	737.84	743.66	30,853.35	False	1.30	5.82
MH-299	731.93	738.61	112,795.62	False	0.36	6.68
MH-282	749.68	753.94	19,300.62	False	1.05	4.26
MH-298	739.67	746.11	93,495.00	False	2.49	6.44
MH-297	741.72	747.24	93,495.00	False	3.22	5.52
MH-296	752.22	758.16	93,495.00	False	2.74	5.94
MH-295	758.15	768.73	93,495.00	False	1.96	10.58
MH-294	759.10	771.18	91,625.10	False	1.73	12.08
MH-293	759.94	771.14	91,625.10	False	1.98	11.20
MH-292	760.33	767.85	91,625.10	False	1.35	7.52
MH-291	761.28	767.90	88,820.25	False	1.90	6.62
MH-289	762.16	765.34	70,121.25	False	2.85	3.18
MH-288	767.03	773.83	18,699.00	False	1.66	6.80
MH-290	760.95	769.59	88,820.25	False	0.32	8.64
MH-283	768.56	776.52	15,560.82	False	0.45	7.96
MH-284	779.28	786.22	5,609.70	False	1.17	6.94
MH-285	784.47	789.73	5,609.70	False	0.95	5.26
MH-286	780.70	787.76	0.00	True	0.00	7.06
MH-287	773.58	782.64	18,699.00	False	0.84	9.06
MH-307	841.25	852.25	934.95	False	0.60	11.00
MH-281	774.50	784.54	12,154.35	False	0.86	10.04

FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (System Sanitary) (gpd)	Is Ever Surcharged?	Velocity (In) (ft/s)	Depth (Structure) (ft)
MH-311	786.88	794.92	12,154.35	False	0.09	8.04
MH-261	1,026.74	1,032.94	24,308.70	True	0.11	6.20
MH-262	1,011.32	1,017.56	24,308.70	True	0.11	6.24
MH-263	1,036.86	1,043.44	26,178.60	True	0.11	6.58
MH-264	1,046.42	1,053.10	26,178.60	True	0.12	6.68
MH-265	1,066.01	1,072.63	29,918.40	False	1.29	6.62
MH-266	1,038.25	1,046.31	35,528.10	False	1.29	8.06
MH-268	965.00	978.00	43,942.65	False	1.31	13.00
MH-267	1,011.60	1,018.72	35,528.10	False	3.50	7.12
MH-274	840.00	850.00	54,227.10	False	1.39	10.00
MH-278	801.12	812.32	10,284.45	False	1.11	11.20
MH-277	787.73	796.53	64,511.55	False	0.29	8.80
MH-280	770.54	778.06	70,121.25	False	0.15	7.52
MH-911	768.00	778.00	70,121.25	False	3.03	10.00
MH-279	783.28	791.20	5,609.70	True	0.95	7.92
MH-241	854.90	864.48	20,568.90	False	1.83	9.58
MH-238	840.75	848.83	20,568.90	False	2.38	8.08
MH-239	834.72	844.70	58,901.85	False	0.57	9.98
MH-237	836.12	842.54	38,332.95	False	0.83	6.42
MH-306	849.34	857.60	5,609.70	True	0.89	8.26
MH-236	840.64	850.58	27,113.55	False	0.28	9.94
MH-232	851.99	860.81	12,154.35	False	1.68	8.82
MH-231	856.83	864.85	12,154.35	False	2.34	8.02
MH-594	870.28	878.14	12,154.35	False	1.10	7.86
MH-235	848.81	856.75	21,503.85	False	0.55	7.94
MH-240	858.97	866.02	20,568.90	True	1.25	7.05
MH-234	850.23	857.41	9,349.50	False	0.95	7.18
MH-233	854.29	861.15	9,349.50	True	1.03	6.86
MH-204	7.58	793.23	3,739.80	True	0.02	785.65
MH-146	762.94	768.38	240,404.84	False	2.60	5.44
MH-912	767.00	777.00	2,804.85	False	0.80	10.00
MH-196	823.67	833.07	2,804.85	False	0.80	9.40
MH-257	804.18	814.18	0.00	False	0.00	10.00
MH-278	743.64	762.08	425,077.79	False	0.37	18.44
MH-279	745.21	756.00	368,696.24	False	2.12	10.79
MH-280	746.64	758.00	320,078.85	False	2.06	11.36
MH-281	746.22	757.00	368,696.24	False	0.33	10.78

APPENDIX D

Sewer System Regulations

City Code Section 13.10 – Sewer System Regulations
City Code Section 13.20 – Utility Main Charges
City Code Section 13.25 – Developer Extension Connection Charges
City Code Section 13.30 – Municipal Equipment Usage
City Code Section 13.35 – Developer Extension manual

Chapter 13.10
SEWERS

Sections:

13.10.010 Definitions.

13.10.020 Abbreviations.

13.10.030 Prohibited discharge standards.

13.10.040 Federal categorical pretreatment standards.

13.10.050 State and federal requirements.

13.10.060 Local discharge limitations.

13.10.070 Pretreatment authorization.

13.10.080 Pretreatment facilities for fats, oils, and grease (FOG).

13.10.090 Compliance monitoring.

13.10.100 Use of public sewers required.

13.10.110 Use of portable toilets.

13.10.120 Application for sewer services.

13.10.130 Fees and charges.

13.10.134 Forfeiture.

13.10.140 Requirements for connection to public sewers.

13.10.150 Installation of building sewer (private property) and side sewers.

13.10.160 Maintenance of private sewers.

13.10.170 Abandoned sewers and sewage disposal facilities.

13.10.180 Conveyance to city.

13.10.190 Ownership of lines.

13.10.200 Standard specifications for municipal public works construction.

13.10.210 Administration and judicial review.

13.10.220 Confidential business information.

13.10.230 Violation – Penalty.

13.10.010 Definitions.

Unless a provision explicitly states otherwise, the following terms and phrases, as used in this chapter, shall have the meanings hereinafter designated:

(1) “Abandon” means to discontinue use for a period of one year or longer.

(2) “Act” or “the Act” means the Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 USC 1251 et seq.

(3) “Applicable pretreatment standards” means, for any specified pollutant, Entiat prohibitive standards, Entiat specific pretreatment standards (local limits), state of Washington pretreatment standards, or EPA’s categorical pretreatment standards (when effective), whichever standard is appropriate and most stringent.

(4) “Approval authority” means the State of Washington Department of Ecology.

(5) “Authorized representative of the user” means:

(a) If the user is a corporation:

(i) The president, secretary, treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) The manager of one or more manufacturing, production, or operation facilities if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(b) If the user is a partnership or sole proprietorship, a general partner or proprietor, respectively.

(c) If the user is a federal, state, or local governmental facility, a director or highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or his/her authorized designee.

(d) The individuals described in subsections (5)(a) through (5)(c) of this section may designate another

authorized representative if the authorization is in writing, the authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company, and the written authorization is submitted to the city.

(6) “Best management practices (BMPs)” means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of “waters of the United States.” “BMPs” also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

(7) “Biochemical oxygen demand (BOD)” means the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures for five days at 20 degrees centigrade, usually expressed as a concentration (milligrams per liter (mg/l)).

(8) “Categorical pretreatment standard” or “categorical standard” means any regulation containing pollutant discharge limits promulgated by the U.S. EPA in accordance with Sections 307(b) and (c) of the Act (33 USC 1317) which apply to a specific category of users and which appear in 40 CFR Chapter 1, Subchapter N, Parts 405 through 471.

(9) “Categorical user” means a user covered by one of EPA’s categorical pretreatment standards.

(10) “City” means the city of Entiat, Washington.

(11) “City sewer system” means the sewer system, including treatment facilities, belonging to the combined water and sewer system of the city of Entiat, Washington.

(12) “Color” means the optical density at the visual wave length of maximum absorption, relative to distilled water. One hundred percent transmittance is equivalent to zero optical density.

(13) “Commercial sources” means businesses which are based on the interchange of goods or commodities, but do not manufacture said goods or commodities. “Commercial sources” shall also include service providers. “Commercial sources” shall include, but not be limited to, motels, office structures, shopping facilities, laundries, and service stations.

(14) “Composite sample” means the sample resulting from the combination of individual wastewater samples taken at selected intervals based on an increment of either flow or time.

(15) “Contact cooling water” means water used for cooling which does come into direct contact with any raw material, intermediate product, waste product, or finished product. “Contact cooling water” shall include cooling water to which corrosion and/or scale inhibitors of any type have been added with the exception of unpolluted cooling water defined hereunder.

(16) Discharge Authorization. See “Wastewater discharge authorization.”

(17) “Domestic user (residential user)” means any person who contributes, causes, or allows the contribution of wastewater into the city POTW that is of a similar volume and/or chemical make-up as that of a residential dwelling unit. Discharges from a residential dwelling unit typically include up to 100 gallons per capita per day at 220 mg/l of BOD and TSS.

(18) “Environmental Protection Agency (EPA)” means the U.S. Environmental Protection Agency or, where appropriate, the Regional Water Management Division Director, or other duly authorized official of said agency.

(19) “Existing source,” for a categorical industrial user, is any source of discharge, the construction or operation of which commenced prior to the publication by EPA of proposed categorical pretreatment standards, which will be applicable to such source if the standard is thereafter promulgated in accordance with Section 307 of the Act. For the purpose of this chapter, sources subject to categorical standards which have legally discharged wastewater to the city prior to the effective date of the ordinance codified in this chapter shall be considered “existing sources.” All other sources discharging to the city’s facility at the effective date of the ordinance codified in this chapter are “existing users.”

(20) “Existing user,” for noncategorical users, is defined as any user which is discharging wastewater prior to the effective date of the ordinance codified in this chapter.

(21) “Fats, oils and grease (FOG)” means those components of wastewater amenable to measurement by the methods described in Standard Methods for the Examination of Water and Wastewater, latest edition, Section 5520. The term “fats, oils and grease” shall include polar and nonpolar fats, oils, and grease.

(22) “Food waste” means solid wastes from the preparation, cooking, and dispersion of food, and from the handling, storage, and sale of produce.

(23) “Grab sample” means a sample which is taken from a waste stream on a one-time basis without regard to the flow in the waste stream and without consideration of time.

(24) “High strength waste” means any waters or wastewater having a concentration of BOD or total suspended solids in excess of 220 mg/l.

(25) “Indirect discharge” or “discharge” means the introduction of pollutants into the POTW from any nondomestic source regulated under Section 307(b), (c), or (d) of the Act. The discharge into the POTW is normally by means of pipes, conduits, pumping stations, force mains, constructed drainage ditches, surface water intercepting ditches, and all constructed devices and appliances appurtenant thereto.

(26) “Interference” means a discharge which, alone or in conjunction with a discharge or discharges from other

sources, either: (a) inhibits or disrupts the POTW, its treatment processes or operations; (b) inhibits or disrupts its biosolids (sludge) processes, use or disposal; or (c) is a cause of a violation of the city's NPDES authorization or of the prevention of sewage sludge use or disposal in compliance with any of the following statutory/ regulatory provisions or authorizations issued thereunder: Section 405 of the Clean Water Act; the Solid Waste Disposal Act (SWDA), including Title II commonly referred to as the Resource Conservation and Recovery Act (RCRA); any state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA; the Clean Air Act; the Toxic Substances Control Act; and the Marine Protection, Research, and Sanctuaries Act.

(27) "Local discharge limitations" means enforceable local standards developed by the city of Entiat. The standards are expressed in units of concentration as milligrams of pollutant per liter of solution.

(28) "Maximum allowable discharge limit" means the maximum concentration (or loading) of a pollutant allowed to be discharged at any time.

(29) "May" is permissive.

(30) "Medical wastes" means isolation wastes, infectious agents, human blood and blood products, pathological wastes, sharps, body parts, contaminated bedding, surgical wastes, potentially contaminated laboratory wastes, and dialysis wastes.

(31) New Source.

(a) "New source" means any building, structure, facility, or installation from which there is (or may be) a discharge of pollutants, the construction of which commenced after the publication of proposed pretreatment standards under Section 307(c) of the Act and after the effective date of the ordinance codified in this chapter. The above definition of a new source will be applicable to such source if such standards are thereafter promulgated in accordance with federal law; provided, that:

(i) The building, structure, facility, or installation is constructed at a site at which no other source is located; or

(ii) The building, structure, facility, or installation totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

(iii) The production or wastewater generating processes of the building, structure, facility, or installation are substantially independent of an existing source at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the extent to which the new facility is engaged in the same general type of activity as the existing source should be considered.

(b) Construction on a site at which an existing source is located results in a modification rather than a new source if the construction does not create a new building, structure, facility, or installation meeting the criteria of subsection (31)(a)(ii) or (31)(a)(iii) of this section but otherwise alters, replaces, or adds to existing processes or production equipment.

(c) Construction of a new source as defined under this subsection has commenced if the owner or operator has:

(i) Begun, or caused to begin as part of a continuous on-site construction program:

(A) Any placement, assembly, or installation of facilities or equipment; or

(B) Significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which is necessary for the placement, assembly, or installation of new source facilities or equipment; or

(ii) Entered into a binding contractual obligation for the purchase of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under this subsection.

(32) “New user” is not a “new source” and is defined as a user that applies to the city for a new building permit or any person who occupies an existing building and plans to discharge wastewater to the city’s collection system after the effective date of the ordinance codified in this chapter. Any person that buys an existing facility that is discharging nondomestic wastewater will be considered an “existing user” if no significant changes are made in the operation.

(33) “Noncontact cooling water” means water used for cooling which does not come into direct contact with any raw material, intermediate product, waste product, or finished product. Cooling water may be generated from any use, such as air conditioning, heat exchangers, cooling or refrigeration to which the only pollutant added is heat. “Noncontact cooling water” does not include cooling water to which corrosion and/or scale inhibitors have been added.

(34) “Pass through” means a discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the city’s NPDES authorization (including an increase in the magnitude or duration of a violation). “Pass through” shall also be interpreted to include a discharge which exits the POTW in the form of a residual solid material. Residual solid materials shall be described by the term “biosolids” and/or “sewage sludge.”

(35) “Person” means any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity, or any other legal entity, or their legal representatives, agents, or assigns. This definition includes all federal, state, or local governmental entities.

(36) “pH” means a measure of the acidity or alkalinity of a substance, expressed in standard units.

(37) “Pollutant” means any dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, medical wastes, chemical wastes, biological materials, radioactive materials, heat, wrecked or discharged equipment, rock, sand, cellar dirt, agricultural and industrial wastes, and the characteristics of the wastewater (i.e., pH, temperature, TSS, turbidity, color, BOD, chemical oxygen demand (COD), toxicity, or odor).

(38) “Pretreatment” means the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to (or in lieu of) introducing such pollutants into the POTW. This reduction or alteration can be obtained by physical, chemical, or biological processes, by process changes, or by other means (except by diluting the concentration of the pollutants unless allowed by an applicable pretreatment standard).

(39) “Pretreatment requirements” means any substantive or procedural requirement related to pretreatment imposed on a user, other than a pretreatment standard.

(40) “Pretreatment standards” or “standards” shall mean prohibited discharge standards, categorical pretreatment standards, and local limits established by the city (POTW).

(41) “Private sewer” means a sewer built in a private property and used to connect any building with either a public sewer or a private sewage disposal system. The sewer is maintained by the private property owner.

(42) “Prohibited discharge standards” or “prohibited discharges” means absolute prohibitions against the discharge of certain substances; these prohibitions appear in subsequent sections of this chapter.

(43) “Properly shredded food waste” means the wastes from the preparation, cooking, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers.

(44) “Public sewer” means a sewer which is owned and maintained by the city of Entiat.

(45) “Public works supervisor (supervisor)” is a city employee acting in the capacity of a job described in the city’s personnel manual as public works maintenance supervisor. A summary of the job description from the city’s manual is as follows: “The public works maintenance supervisor is a working supervisor position, and is responsible for maintenance in all city departments, as well as the operation of street and utility departments.” The job description for this position is available from the city upon request.

(46) “Publicly owned treatment works (POTW)” means a “treatment works,” as defined by Section 212 of the Act (33 USC 1292) which is owned by the city. This definition includes all devices, facilities, or systems used in the collection, storage, treatment, recycling, and reclamation of sewage or industrial wastes of a liquid nature and any conveyances which convey wastewater to a treatment plant. The term also means the city of Entiat wastewater treatment plant.

(47) “Recreational vehicle waste (RV waste)” means any domestic and/or residential wastes from holding tanks on private recreational vehicles, including travel trailers, pickup-truck-mounted campers and mobile domestic single-family recreational vehicles. This category does not include tour buses and public transportation vehicles. This category does not include wastes from vehicles which collect wastewater from holding tanks.

(48) “Sanitary sewer” means a sewer which carries sewage and to which storm, surface, and ground water is not intentionally admitted.

(49) “Septic tank waste” means any domestic and/or residential sewage from holding tanks such as vessels, chemical toilets, and septic tanks.

(50) “Sewage” means human excrement and gray water (household showers, dishwashing operations, etc.).

(51) “Sewer” means any pipe, conduit, ditch, or other device used to collect and transport sewage from the generating source.

(52) “Shall” is mandatory.

(53) “Side sewer” means that portion of the public sewer system between its mainline sewer and the private sewer serving a building. Typically the sewer pipe from the mainline to the property line.

(54) “Significant industrial user (SIU)” means:

(a) A user subject to categorical pretreatment standards; or

(b) A user that:

(i) Discharges an average of 6,000 gpd or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blowdown wastewater); or

(ii) Contributes a process waste stream which makes up five percent or more of the facility design criteria. Facility design criteria are as follows:

Facility Design Criteria

City of Entiat Treatment Facilities

Monthly average flow	0.12 mgd
BOD_5 influent loading	220 lbs/day
TSS influent loading	260 lbs/day
Design population equivalent	1,100 people

(iii) Is designated as such by the city on the basis that it has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement. Reasonable potential shall be determined in accordance with the process of determining reasonable potential in the Technical Support Document for Water Quality Based Toxics Control (EPA/505/2-90-001).

(c) Upon a finding that a user meeting the criteria in subsection (54)(b) of this section has no reasonable potential for adversely affecting the POTW's operation or for violating any applicable pretreatment standard or requirement, the city may at any time, on its own initiative or in response to a petition received from a user, determine that such user should not be considered a significant industrial user and request that the Department of Ecology concur in such change of classification.

(55) "Slug load" means any discharge at a flow rate or concentration which could cause a violation of the discharge standards in EMC 13.10.030 or any discharge of a nonroutine, episodic nature, including but not limited to an accidental spill or a noncustomary batch discharge, or any discharge greater than or equal to five times the amount or concentration allowed by authorization or this chapter.

(56) "Standard Industrial Classification (SIC) Code" means a classification pursuant to the Standard Industrial Classification Manual issued by the United States Office of Management and Budget.

(57) "State" means the state of Washington.

(58) "Storm sewer" means a sewer which carries storm and surface waters and drainage, but excludes sewage and industrial wastes, other than unpolluted cooling water, and/or noncontact cooling water.

(59) "Storm water" means any flow occurring during or following any form of natural precipitation, and resulting from such precipitation, including snowmelt.

(60) "Total suspended solids" means the total suspended matter that floats on the surface of, or is suspended in, water, wastewater, or other liquid, and which is removable by laboratory filtering.

(61) "Toxic pollutant" means one of the pollutants, or combination of those pollutants, listed as toxic in regulations promulgated by the EPA under Section 307 (33 USC 1317) of the Act, or other pollutants as may be

promulgated.

(62) “Treatment plant effluent” means the discharge from the POTW into waters of the United States.

(63) Treatment Works. See “Publicly owned treatment works (POTW).”

(64) “Unpolluted cooling water” means water to which scale and corrosion inhibitors have been added which meet the following conditions:

(a) Total absence of chromates is documented.

(b) Total absence of priority pollutants (Federal Register, 46 CFR 2264, January 8, 1981) is documented.

(c) Whole effluent toxicity (WET) testing has been accomplished on the water. WET tests indicate that no statistically significant effect is observed in 100 percent cooling water (NOEC ≥ 100 percent). Laboratory species shall include Daphnia and Fathead Minnow acute tests per EPA/600/4-90/027F. Tests shall be accomplished by a laboratory certified by Ecology for the subject tests.

(d) The water contains only corrosion and scale inhibitors added in accordance with manufacturers’ recommendations.

(e) The water is managed and/or discharged in accordance with all applicable laws, regulations, and requirements of the Department of Ecology, the state of Washington, and the United States government.

(f) The conditions listed above shall be documented and accomplished to the satisfaction of the supervisor in all cases and may include ongoing testing requirements.

(65) “User” or “industrial user” means a source of nondomestic discharge. The source shall not include “domestic user” as defined herein.

(66) “Wastewater” means liquid and water-carried industrial wastes and sewage from residential dwellings, commercial buildings, industrial and manufacturing facilities, and institutions, whether treated or untreated, which are contributed to the POTW.

(67) “Wastewater discharge authorization” means an authorization or equivalent control document issued by the city to users discharging wastewater to the POTW. The authorization may contain appropriate pretreatment standards and requirements as set forth in this chapter.

(68) “Wastewater treatment plant” or “treatment plant” means that portion of the POTW which is designed to provide treatment of municipal sewage and authorized industrial waste.

The use of the singular shall be construed to include the plural and the plural shall include the singular as

indicated by the context of its use. (Ord. 516 § 1, 1998)

13.10.020 Abbreviations.

The following abbreviations shall have the designated meanings:

AKART	All known available and reasonable technology
ASPP	Accidental spill prevention plan
BMPs	Best management practices
BOD	Biochemical oxygen demand
CFR	Code of Federal Regulations
COD	Chemical oxygen demand
EPA	U.S. Environmental Protection Agency
FOG	Fats, oils, and grease
gpd	Gallons per day
l	Liter
LEL	Lower explosive limit
mg	Milligrams
mg/l	Milligrams per liter
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
POTW	Publicly owned treatment works
RCRA	Resource Conservation and Recovery Act
SIC	Standard Industrial Classifications
SWDA	Solid Waste Disposal Act (42 USC 6901, et seq.)
TSS	Total suspended solids

USC United States Code

(Ord. 516 § 2, 1998)

13.10.030 Prohibited discharge standards.

(1) General Prohibitions. No user shall introduce or cause to be introduced into the POTW any pollutant or wastewater which causes pass through or interference. These general prohibitions apply to all users of the POTW whether or not they are subject to categorical pretreatment standards or any other national, state, or local pretreatment standards or requirements.

(2) Specific Prohibitions. No user shall introduce or cause to be introduced into the POTW the following pollutants, substances, or wastewater:

(a) Pollutants which create a fire or explosive hazard in the POTW, including, but not limited to, waste streams with a closed-cup flashpoint of less than 140 degrees Fahrenheit (60 degrees Celsius) using the test methods specified in 40 CFR 261.21;

(b) Wastewater having a pH less than 5.5 or more than 10.0, or otherwise causing corrosive structural damage to the POTW or equipment;

(c) Solid or viscous substances in amounts which will cause obstruction of the flow in the POTW or interfere with preliminary treatment operations and/or secondary treatment processes. For specific requirements with respect to fats, oils, and grease (FOG), see EMC 13.10.080;

(d) Pollutants, including oxygen-demanding pollutants (BOD, COD, etc.), released in a discharge at a flow rate and/or pollutant concentration which, either singly or by interaction with other pollutants, may cause interference with the POTW;

(e) Wastewater having a temperature which will inhibit biological activity in the treatment plant resulting in interference, but in no case wastewater which causes the temperature at the introduction into the treatment plant to exceed 104 degrees Fahrenheit (40 degrees Celsius). In no case shall wastewater having a temperature greater than 150 degrees Fahrenheit be discharged to the collection system;

(f) Petroleum oil, nonbiodegradable cutting oil, solvents, or products of mineral oil origin, in amounts that will cause interference or pass through;

(g) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems;

(h) Trucked or hauled pollutants, including sanitary wastes and grease wastes, unless authorized by the public works supervisor;

(i) Noxious or malodorous liquids, gases, solids, or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or a hazard to life, or to prevent entry into the sewers for maintenance or repair;

(j) Wastewater which imparts color which cannot be removed by the treatment process, such as, but not limited to, dye wastes and vegetable tanning solutions;

(k) Wastewater containing any radioactive wastes or isotopes except as specifically approved by the public works supervisor in compliance with applicable state or federal regulations;

(l) Storm water, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, noncontact cooling water, and unpolluted wastewater, unless specifically authorized by the public works supervisor, and the Washington State Department of Ecology;

(m) Any sludges, screenings, or other residues removed by the pretreatment process of industrial or commercial establishments;

(n) Medical wastes, except as specifically authorized by the public works supervisor;

(o) Wastewater causing, alone or in conjunction with other sources, the treatment plant's effluent to fail a toxicity test or a whole effluent toxicity (WET) performance standard, when the city's NPDES permit contains a requirement for such WET testing;

(p) Detergents, surface-active agents, or other substances which may cause excessive foaming in the POTW;

(q) Any hazardous or dangerous wastes as defined in rules published by the state of Washington (Chapter 173-303 WAC) and/or in EPA rules (40 CFR Part 261);

(r) All pesticides, herbicides, and fungicides including pesticides regulated by the Federal Insecticide Fungicide Rodenticide Act (FIFRA). Incidental discharge of these substances is excepted. Incidental discharge shall be defined as unintended discharge associated with washing produce with clean water such that dilution is greater than a factor of 100 over the label rate;

(s) Any slug load;

(t) Any substance which may cause the POTW's effluent or treatment residues, sludges, or scums to be unsuitable for reclamation and reuse, or to interfere with the reclamation process.

Pollutants, substances, or wastewater prohibited by this section shall not be processed or stored in such a

manner that they could be discharged to the POTW. (Ord. 516 § 3, 1998)

13.10.040 Federal categorical pretreatment standards.

The national categorical pretreatment standards found at 40 CFR Chapter 1, Subchapter N, Parts 405 through 471 are incorporated herein by reference as if set forth in full in this chapter. A copy of 40 CFR Chapter 1, Subchapter N, Parts 405 through 471, is available for use and examination by the public at the Entiat City Hall during normal business hours. (Ord. 516 § 4, 1998)

13.10.050 State and federal requirements.

State requirements and limitations on discharges to the POTW shall be met by all users which are subject to such standards. Any federal or state requirements which are more restrictive than the conditions in this chapter take precedence over the chapter. (Ord. 516 § 5, 1998)

13.10.060 Local discharge limitations.

(1) The following discharge limitations are established to prevent site-specific treatment plant and environmental problems. The local discharge limitations under this section are in force for US Castings Inc. as the only significant industrial user (SIU) currently discharging to the plant. These numbers may change if additional SIUs commence discharges to the treatment works.

(2) The following interim mass-loading limit is based on a technical analysis of the total loading of pollutants to the Columbia River watershed and the requirements of the Washington State Water Quality Standards. These discharge limitations are also based on biosolids protection criteria. Wastewater containing total recoverable metals in concentrations exceeding these local discharge limitations shall not be discharged to the city's collection system or treatment works.

Table 1

Interim Mass Loading Limit for US Castings Inc. (or successor firm)*

Pollutant	Composite Sample
Arsenic	0.48 grams/day
Cadmium	0.5 grams/day
Chromium	15.9 grams/day
Copper	16.6 grams/day
Lead	3.4 grams/day
Mercury	0.21 grams/day
Nickel	5.7 grams/day

Zinc	25.9 grams/day
Cyanide	9.46 grams/day
Silver	4.5 grams/day
*Compliance with these limits is to be determined on the basis of composite samples collected over 24 hours and representative of the discharge (flow proportional) during that time.	

(3) Local discharge limitations apply at the point where wastewater is discharged to the collection system for all users. Local discharge limitations are in force at all monitoring facilities required under EMC 13.10.090. Local discharge limitations do not take precedence over federal or state pretreatment requirements or regulations.

(4) The city may, at its sole discretion, calculate an interim mass-loading limit for an individual industry. This interim mass-loading limit for a pollutant listed in Table 1 shall be in grams, or fraction thereof, per day. The interim mass-loading limit shall be consistent with all federal and state pretreatment guidances and regulations. The interim mass-loading discharge limitation for an individual pollutant shall become null and void at the time that the city amends this chapter to adopt a specific numerical concentration limit for each pollutant in Table 1.

(5) The city will develop a formatted worksheet known as the interim mass-loading analysis (IMLA). The IMLA shall be an appendix to the ordinance codified in this chapter. The IMLA calculates the maximum allowable headworks loading based on the methodology described in the document entitled “City of Entiat Industrial Waste Control Program Allowable Headwork’s Loading Analysis.” The IMLA worksheet may be revised from time to time to reflect changes in scientific knowledge or new regulatory requirements to which the city is subject. (Ord. 591 § 1, 2002; Ord. 548 § 2, 1999; Ord. 516 § 6, 1998)

13.10.070 Pretreatment authorization.

(1) If any waters or wastes are discharged, or are proposed to be discharged, to the public sewers, which waters contain the substances or possess the characteristics enumerated in EMC 13.10.030, 13.10.040, 13.10.050 and 13.10.060, the public works supervisor will:

(a) Reject the wastes; or

(b) Require pretreatment to an acceptable condition for discharge to the public sewers.

(2) If the public works supervisor permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the public works supervisor, or his representative, and subject to the requirements of all applicable codes, ordinances, laws, and conform to the requirements of the Department of Ecology as well as federal regulations.

(3) Nondomestic discharges will be accepted only if the discharge is considered treatable and compatible with the satisfactory operation of the collection and treatment systems. The city will consider the following factors in making the decision on whether to accept nondomestic discharges: the prohibited discharge conditions, the ability to comply with the conditions in the city's NPDES permit, and the potential for pass through or interference. The city may require a contract (see EMC 13.10.130(6)) before accepting nondomestic wastewater, and may impose other reasonable conditions such as requiring insurance or a deposit to cover reasonable contingencies and monitoring facilities. Existing industrial sources shall provide the information specified in EMC 13.10.120(2)(b) at the request of the city. (Ord. 516 § 7, 1998)

13.10.080 Pretreatment facilities for fats, oils, and grease (FOG).

(1) General.

(a) It shall be unlawful for any food service establishment or other person that meets the definition of "new source" or "new user" as defined in EMC 13.10.010 to discharge, or cause to be discharged, processing wastewater to the collection system or POTW which contains oils, greases, solids, or liquids sufficient to cause obstruction or otherwise interfere with the proper operations of the POTW or collection system.

(b) It shall also be unlawful for any food service establishment or other person to dispose of any grease waste or processing water containing oils, greases, solids, or liquids and discharge said waste into any drainage piping, public or private sanitary sewer, storm drainage system. The city does not authorize discharge of these materials at any location not listed in this subsection.

(c) It shall further be unlawful for any person to allow liquid waste to accumulate on his property or in his possession which is injurious to public health or emits offensive odors.

(d) It shall be unlawful for any person to utilize any chemical emulsifying agent for the purpose of hindering or eliminating the interception of fats or grease prior to entering the city's wastewater collection system.

(e) Food service establishments and other facilities described in subsection (4) of this section discharging wastewater shall install, operate, clean, and maintain a sufficiently sized oil and grease, water and solids separator (herein called grease interceptor) necessary to achieve compliance with requirements set forth under this provision.

(f) Minimum design standards for engineered fats, oils, and grease (FOG) system:

(i) Oil or grease of petroleum or mineral origin shall not be discharged to the city's sewer system at a concentration in excess of 100 mg/l.

(ii) Fats, oil, or grease of animal or vegetable origin shall not be discharged to the city's sewer system at a concentration in excess of 100 mg/l.

(g) The concentration of oils and grease shall be measured in samples taken from the sampling chamber following pretreatment in an approved grease interceptor in accordance with the requirements of this section. Oil and grease concentration shall be measured using the partition-gravimetric method or the partition-infrared method outlined in the latest edition of Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association.

(2) Waste Discharge Requirements.

(a) Waste discharge from fixtures and equipment in establishments that may contain grease, including but not limited to scullery sinks, pot and pan sinks, vent hood drains, dishwashing machines, soup kettles and floor drains located in areas where grease-containing materials may exist may be drained into the sanitary sewer only after such discharges are pretreated in an approved grease waste interceptor in accordance with this section.

(b) No sanitary wastes from toilets, urinals, or other similar fixtures may be discharged through any grease waste interceptor. All wastes shall enter the interceptor through the inlet pipe only. The wholesale shredding of food wastes into any fixture which discharges to a grease waste interceptor is prohibited.

(3) Location.

(a) Each grease interceptor shall be so installed and connected that it shall be at all times easily accessible for inspection, cleaning, and the removal of the intercepted grease. A grease interceptor may not be installed in any part of a building where food is handled. Location of the interceptor shall meet the approval of the public works supervisor, and the Chelan/Douglas health district.

(b) Interceptors shall be placed as close as practical to the fixture(s) they serve.

(c) Each business establishment for which a grease interceptor is required shall have an interceptor which shall serve only that establishment.

(4) Pretreatment Required.

(a) Dischargers who operate newly constructed or remodeled restaurants, meat cutting facilities, cafes, lunch counters, bakeries, cafeterias, bars, or clubs, or hotel, hospital, sanitarium, factory, or school kitchens, or other establishments that serve or prepare food where grease may be introduced to the sewer system shall have pretreatment facilities to prevent the discharge of fat waste, oil, or grease.

(b) Dischargers who operate automatic and coin-operated laundries, car washes, filling stations, commercial garages or similar businesses having any type of washing facilities (including pressure washing and steam cleaning) or any other dischargers producing grit, sand, oils, lint, or other materials

which have the potential of causing partial or complete obstruction of the building site sewer or other areas in the POTW shall install approved interceptors, oil/water separators, or tanks in accordance with specifications adopted by the city of Entiat such that excessive amounts of oil, sand, and inert solids are effectively prevented from entering the POTW.

(5) Grease Interceptor Design.

(a) Grease interceptors shall be multiple compartment flotation chambers where grease floats to the water surface and is retained while the clear water underneath is discharged. The clear water discharged is subject to the discharge prohibitions of subsection (1) of this section.

(b) The grease interceptor shall be followed by a sampling compartment to allow for monitoring of discharges from the pretreatment unit. Interceptors shall have fittings designed for grease retention.

(c) Sizing Formula. The size of the grease interceptor shall be determined by using the following formula: seating capacity or the number of meals served per peak hour, whichever is greater x 6.0 gallons x 2.5 hours x storage factor = interceptor size in gallons. Storage factor shall be as follows:

Facilities open less than 16 hours	=	1
Facilities open for 16 hours or more	=	2
Facilities open for 24 hours	=	3

(d) In cases of certain fast food restaurants or establishments with the potential to discharge large quantities of oils, grease, solids, or wastewaters, larger capacities of grease interceptors may be required. Prepackaged or manufactured grease interceptors may be approved by the public works supervisor with proper engineering and application review.

(6) Grease Interceptor Maintenance. Each facility required to install and maintain a grease waste interceptor under this chapter shall provide regular maintenance of said interceptor to the satisfaction of the supervisor in accordance with the requirements set forth in this chapter.

Each person who removes grease waste from the grease interceptor shall, to the extent technically and mechanically possible, remove the entire content of the grease interceptor.

(a) Pumping. All grease interceptors shall be maintained by the user at the user's expense. Maintenance shall include the complete removal of all contents, including floating materials, wastewater, and bottom sludges and solids. Decanting or discharging of removed waste back into the interceptor from which the waste was removed or any other grease interceptor for the purpose of reducing the volume to be hauled is

prohibited.

(b) Grease Removal and Grease Interceptor Pumping Frequency. All grease interceptors must be pumped out completely once every six months, or more frequently, as required by the director. Exception to this minimum frequency of pumping may be made with special written approval from the director for generators of small quantities of grease wastes. In no case shall the frequency of pumping be less than once per year.

(c) Disposal of Grease Interceptor Pumpage. All waste removed from each grease interceptor must be disposed of at a facility permitted by the health department in the county in which the disposal facility is located. Under no circumstances shall pumpage be returned to any POTW or any sewer. (Ord. 516 § 8, 1998)

13.10.090 Compliance monitoring.

(1) Inspection and Sampling. Continued connection to and use of the city's sewer system shall be contingent on the right of the city to inspect and sample all discharges into the system. The city shall have the right to enter the facilities of any user for the purpose of the enforcement of this chapter and to determine that any wastewater discharge authorization or order issued hereunder is being met and whether the user is complying with all requirements thereof. Users shall allow the public works supervisor reasonable access to all parts of the premises pertinent to the discharge for the purposes of inspection, sampling, records examination and copying, and the performance of any additional duties.

(a) Where a user has security measures in force which require proper identification and clearance before entry into its premises, the user shall make necessary arrangements with its security guards so that, upon presentation of suitable identification, the public works supervisor will be permitted to enter without delay for the purposes of performing specific responsibilities.

(b) The public works supervisor shall have the right to set up on the user's property, or require installation of such devices as are necessary to conduct sampling and/or metering of the user's operations.

(c) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the user at the written or verbal request of the public works supervisor and shall not be replaced. The costs of clearing such access shall be borne by the user.

(d) Unreasonable delays in allowing the public works supervisor access to the user's premises shall be a violation of this chapter.

(2) Monitoring Facilities. The following shall apply for each discharge point of process wastewater entering the city's sewer collection system.

(a) Each significant industrial user (SIU) shall provide and operate at its own expense a monitoring facility to allow inspection, sampling, and flow measurements of each side sewer discharge to the city. Each

monitoring facility shall be situated on the user's premises, except where such a location would be impractical or cause undue hardship on the user, the city may concur with the facility being constructed in the public street or sidewalk area, providing that the facility is located so that it will not be obstructed by landscaping or parked vehicles. The public works supervisor, whenever applicable, may require the construction and maintenance of sampling facilities at other locations (for example, at the end of a manufacturing line, wastewater treatment system).

(b) A monitoring facility shall consist of a manhole or other structure in which a prefabricated palmer-bowlus or parshall flume shall be installed. The flume shall be of standard dimension and shall be manufactured of corrosion-resistant materials. Plans and specifications for monitoring facilities shall be submitted to the supervisor for approval prior to construction.

(c) The flume shall be installed such that free flowing conditions occur downstream of the throat of the flume structure. The installation shall include a permanent, digital, recording, totalizing, open channel flowmeter and shall be permanently installed in a weatherproof enclosure. The flowmeter installation shall include an appropriate automatic system to measure the water level through the flume at the appropriate control point so that the flow rate can be automatically calculated and totalized at selected intervals. Measured liquid level readings shall be converted into corresponding flow rates using internal conversion algorithms. Flow monitoring data shall be made available to the public works supervisor upon request.

(d) The flowmeter shall be capable of initiating the operation of an attached sampler. The flowmeter signal shall be a five to 15 volt DC pulse or isolated contact closure of at least 25 milliseconds duration. Sample interval frequency shall be user-selected.

(e) The monitoring facility shall be approved by the public works supervisor in writing prior to construction. Existing monitoring facilities may be approved in lieu of new construction if approval of the installation, in writing, is provided by the public works supervisor. Monitoring facilities shall include a secure area for placement of a portable sampler owned by the city.

(f) There shall be ample room in or near such sampling facility to allow accurate sampling, flow measurement and preparation of samples for analysis. The flow monitoring equipment shall be maintained at all times in a safe and proper operating condition at the expense of the user. All monitoring facilities shall be constructed and maintained in accordance with all applicable local construction standards and specifications.

(g) The public works supervisor may require the user to install sampling and analytical equipment as necessary. All devices used to measure wastewater flow and quality shall be calibrated to ensure their accuracy. Such monitoring equipment and activities shall be provided at the expense of the user.

(h) The requirements of this section shall apply to each significant industrial user. A monitoring facility shall

also be installed by any nondomestic user at the direction of the public works supervisor.

(3) Correspondence Requirements.

(a) Dischargers subject to the requirement for a state waste discharge permit under Chapter 173-216 WAC shall forward to the city of Entiat one copy of all correspondence with the Department of Ecology associated with the discharger's state waste discharge permit. Correspondence covered by this submittal requirement shall include letters, applications, reports, electronic communication, and all records and plans. The discharger shall provide copies of accidental spill prevention plans, compliance schedules, certifications and other documents and records, including analytical data, which are forwarded to the Department of Ecology pursuant to the discharger's state waste discharge permit. These requirements for submittal of copies to the city of Entiat shall include applications for permit and documents associated with a temporary or interim permit issued by the Department of Ecology.

(b) Dischargers subject to state waste discharge permit applications and permit requirements shall also submit one copy of all correspondence received from the Department of Ecology pursuant to the facility's state waste discharge permit except where documents received from Ecology by the subject discharger are clearly marked to show that the city received a copy of the original correspondence.

(c) Copies of all correspondence required to be submitted to the city of Entiat pursuant to this chapter shall be submitted to the city at the time said correspondence is forwarded to the primary recipient. (Ord. 548 § 2, 1999; Ord. 516 § 9, 1998)

13.10.100 Use of public sewers required.

(1) The owner or occupant of any house, building, or properties used for human occupancy, employment, recreation, commercial or other purposes, situated within the city sewer service boundaries is hereby required at his or her expense to install suitable facilities to collect all wastewater generated therein, and to connect such facilities directly with the public sewer in accordance with the provisions of this chapter, with the following exceptions:

(a) A new single-family residence located on a lot more than 300 feet from a municipal sewer main;

(b) A property that is located more than 300 feet from a municipal sewer main and is currently served by an on-site private wastewater disposal system unless and until said system is found to be in failing condition as determined by the Chelan-Douglas health district, or said system is found to be inadequate for the existing use of the property as determined by the Chelan-Douglas health district; or

(c) Outdoor public recreational facilities, such as ball fields and parks.

(2) If any such connection shall not be made within 60 days after written notice to the occupant or owner of such lot or parcel of property, building or structure, the city is hereby authorized to cause such connection to be made

and to file a statement of the cost thereof with the city clerk, and thereupon a warrant in the amount of such cost payable to the city shall be issued by the city treasurer under the direction of the city council. The amount of such warrant, plus interest at the rate of eight percent per annum upon the total amount of such cost shall be assessed against the property upon which the said building or structure is situated, and shall become a lien thereon to be enforced in the same manner as mechanics' and materialmen's liens under Chapter 60.04 RCW. Such total amount, when collected, shall be paid into the city water/sewer utility fund.

(3) In the event of the division of land, construction, or development, said activity shall not proceed unless and until adequate provision has been made for connection to the city sewer system consistent with this chapter. (Ord. 783, 2018; Ord. 669 § 1, 2007; Ord. 655 § 1, 2006; Ord. 516 § 10, 1998)

13.10.110 Use of portable toilets.

Portable toilets may be used within the area served by sewers, under the following conditions:

(1) Construction Sites. Portable toilets may be used on construction sites until the connection to the sanitary sewer is completed, and a valid and current building permit shall be required as a condition to using a portable toilet on a construction site.

(2) Special Events. Portable toilets may be used for special events for the public. Special events shall not exceed three consecutive days in duration or more than three special events per location in any one year without advance written permission from the city council.

(3) Seasonal Agricultural Purposes. Portable toilets may be used for seasonal agricultural purposes.

(4) Maintenance. Portable toilets must be maintained by a contractor licensed by the Chelan-Douglas health district. (Ord. 669 § 2, 2007; Ord. 655 § 1, 2006; Ord. 516 § 11, 1998)

13.10.120 Application for sewer services.

(1) Domestic Dwelling Application. The owner, or owner's representative, of any property desiring to connect to the city sewer system shall apply for the connection on such forms as may be prepared and made available by the city. No application shall be deemed accepted or granted by the city, and no vested rights to utility service shall accrue, unless and until all prerequisites for approval, as specified by ordinance or resolution, are complied with in full and to the satisfaction of the city.

(2) Nondomestic Sources.

(a) Commercial Sources. Commercial sources shall be handled on a case-by-case basis. Commercial sources desiring to connect to the city's sewer system shall supply information as requested by the city so that an evaluation can be made as to the number of equivalent residential units (ERUs) represented by the source. Commercial sources shall submit information as described in subsection (2)(b) of this section at

the request of the city.

(b) Industrial Sources.

(i) All industrial sources desiring to connect (and commercial source as required) shall submit, at a minimum, the following information. Categorical users submitting the following information shall have complied with 40 CFR 403.12(b). The following information is required for all applications from industrial sources:

(A) Identifying Information. The source shall submit the name and address of the facility including the name of the operator and owners. The source shall provide the standard industrial classification (SIC) number for the facility.

(B) Authorization. The source shall submit a list of any environmental control authorizations held by or for the facility.

(C) Description of Operations. The source shall submit a description of the nature, average rate of production, and standard industrial classification of the operation(s) carried out by such industrial user, including the following information, where available: a list of all raw materials and chemicals used or stored at the facility which are, or could accidentally or intentionally be, discharged to the POTW; number and type of employees; hours of operation; each product produced by type, amount, process or processes, and rate of production; type and amount of raw materials processed (average and maximum per day) and the time and duration of discharges. This description shall also include a schematic process diagram which indicates points of discharge to the POTW from the regulated or manufacturing processes. Disclosure of site plans, floor plans, mechanical and plumbing plans and details to show all sewers, sewer connections, inspection manholes, sampling chambers, and appurtenances by size, location, and elevation.

(D) Engineering Reports. Engineering reports prepared for the facility shall be submitted to the city. Engineering reports meeting the requirements of WAC 173-240-130 are required for all significant industrial users.

(ii) The public works director shall review the information submitted with the application. If the discharge meets the standards contained in the ordinance without pretreatment, the application will be approved subject to payment of the city's standard fees. If the application indicates that the discharge contains a substance enumerated in EMC 13.10.030, 13.10.040, 13.10.050 or 13.10.060, then the public works director shall make a determination as detailed in EMC 13.10.070.

(iii) If pretreatment is permitted, the applicant shall contact the Department of Ecology and proceed to obtain a state waste discharge permit for discharge into the city's wastewater treatment plant. If any of

the permit provisions are less restrictive than the provisions contained in this chapter, then the chapter requirement shall prevail.

(c) Existing Sources Compliance Schedule. Categorical users defined as existing sources shall submit information specified in subsection (2)(b) of this section within three months of the effective date of the ordinance codified in this chapter. Existing sources shall submit a compliance schedule with the application detailing the proposed improvement timetable if improvements are required to come into compliance with this chapter. Significant milestone dates shall be indicated in the timetable.

Monitoring facilities required pursuant to EMC 13.10.090(2) shall be installed within six months of the effective date of the ordinance codified in this chapter.

Following approval by the city, the applicant shall pay all required fees and charges. No utility connections shall be made until the fees and charges are paid in full. If the application is for both water and sewer service, all fees and charges must be paid for both utilities before either one is connected. (Ord. 655 § 1, 2006; Ord. 516 § 12, 1998)

13.10.130 Fees and charges.

(1) Every new connection to the city sewer system shall pay a connection fee as provided for in the city fee schedule resolution.

(2) Monthly service fees shall be determined by the city council at the end of every year and will be set forth in the current city fee schedule resolution.

(3) Costs for Chelan County Residents. All persons residing outside the corporate limits of the city of Entiat, and are located within the city's urban growth area, who desire the benefit and use of the city sewer system shall pay a sewer service fee equal to 150 percent of the fee that a similar person residing within the corporate limits of the city of Entiat would pay for that specific type of service.

(4) Billings to Record Owner. All fees for sewer service shall be billed to the property owner of record. In the event of rental property and the property owner wishes the renter to be billed for sewer fees assessed, the property owner must authorize said billing to the renter by signing the "change of utilities" form in the city clerk-treasurer's office for each change of service. Property owners of record will be notified of delinquent account(s) of renters prior to sewer shutoff for nonpayment of service received. There will be no credit for vacant premises.

(5) A connection charge shall be assessed to all new connections which utilize sewer mains already existing across the frontage of the property being served. The charges constitute payment to the city for the actual costs incurred in originally constructing the main across the frontage of the subject property. Such charges shall not apply when the affected property participated in a utility local improvement district for the construction of a sewer main; nor shall such charges be applicable in cases where the main was built and totally paid for by the

owner of the subject property or by any private developer who may still be entitled to reimbursement from abutting owners pursuant to a recorded recovery contract.

(6) Agreements. The city may enter into agreements with commercial and industrial users to accept conventional pollutants compatible with the treatment system at concentrations greater than those typical of domestic wastewater. Users with BOD or TSS levels higher than 220 mg/l must have a written agreement with the city before commencing discharge. Within such agreements, the city may establish terms of the user's discharge to the POTW, including maximum flow rates. The city may also establish fees to recover costs associated with treatment of such wastes and the cost of monitoring to verify operation in accordance with the agreements.

(7) All significant industrial users shall enter into an agreement with the city which covers the terms and conditions under which wastewater may be discharged to the municipal sewage system as referenced in subsection (6) of this section. The fee for service provided shall be in proportion to benefits received. Services provided by the city may be billed directly to the benefited user for up to 100 percent of cost where a single user is the sole or primary beneficiary. Laboratory analytical work (including whole effluent toxicity testing) may be billed to a single significant industrial user as determined by the director if that user constitutes the basis for insertion of specific testing requirements into the city's NPDES permit.

(8) Expenses incurred by the city prior to adoption of this chapter shall be payable to the city where the following conditions are met:

(a) The work was accomplished not greater than one year prior to chapter adoption;

(b) The service provided would be billable under this chapter if the work had been accomplished after chapter adoption. (Ord. 783, 2018; Ord. 655 § 1, 2006; Ord. 613 § 2, 2003; Ord. 548 § 2, 1999; Ord. 516 § 13, 1998)

13.10.134 Forfeiture.

(1) Forfeiture of Sewer Service Connection in Arrears of Excessive Utility Service Account. For properties including, but not limited to, demolished buildings, vacant buildings, inactive properties, or any property that is owing utility service account fee arrearages equal to or greater than applicable then-current sewer service connection rate, either consecutively or collectively, shall forfeit all sewer service connections associated with said property. In full consideration of forfeiting the sewer service connection, the city by approval of council shall remove the accrued utility service delinquent amount from the forfeited account, including late penalties. Renewed service to a property under this section can only occur by paying new sewer service connection charge at the then-current rate, as if it were a vacant property. No credits will be issued for past payments on the property account.

(2) Notice and Administrative Hearing. The city will send notice to the property owner at least 10 days prior to the forfeiture of sewer service connection pursuant to subsection (1) of this section. A property owner shall be

afforded the opportunity to an administrative hearing to contest the forfeiture. Any hearing pursuant to this section must be requested by the property owner in writing within 10 days after the property owner receives notice of the forfeiture. Failure to submit a timely notice shall be deemed to be a failure to exhaust administrative remedies and shall preclude any further review. The city will conduct the hearing within 20 days of the receipt of the request. The administrative hearing will be held before the city's public works director ("director"), or his or her designee. Formal rules of evidence will not apply; provided, however, that the director will review the existing record, and only the property owner and the city will be allowed to present oral testimony and documentary evidence to the director. The director will issue a written decision within 10 days of the conclusion of the hearing. Except as otherwise provided, all decisions by the director shall be final and conclusive on all parties unless appealed to the hearing examiner under subsection (3) of this section. The director's decision, action, or determination shall remain in effect during such period of appeal.

(3) Appeal to the Hearing Examiner and Judicial Review. Any decision of the director rendered pursuant to subsection (2) of this section may be reviewed by open record appeal to the hearing examiner. Pursuant to EMC 14.10.030, Administrative appeals, the property owner must file written notice of appeal with the city clerk within 14 calendar days following notification of the director's decision. Such notice of appeal shall set forth in reasonable detail the action or decision appealed and the property owner's grounds for reversal or modification thereof. Failure to submit a timely notice of appeal shall be deemed to be a failure to exhaust administrative remedies and shall preclude any further review. Following receipt of such notice of appeal, the city clerk will schedule a date for a public hearing with the hearing examiner at which time the hearing examiner shall consider the appeal. The date of the public hearing should be no later than 30 calendar days following the date the clerk received notice of the appeal. The clerk will mail written notice to all parties of record to apprise them of the hearing date. The hearing shall be an open record hearing at which the property owner and the city may present witness testimony and documentary evidence. At the conclusion of the public hearing the hearing examiner may adopt, amend and adopt, reverse, amend and reverse the findings, conclusions, and decision of the director. Pursuant to EMC 14.10.040, Judicial appeals, the decision of the hearing examiner on appeal of the decision of the director shall be final and conclusive unless, within 21 calendar days from the date of final action, the property owner files a petition for review with the superior court of Chelan County in the manner prescribed by law. Judicial review shall be a closed record appeal based upon the record created before the hearing examiner.

(4) Voluntary Relinquishment of Sewer Service Connection. Voluntary relinquishment of sewer service connection associated with an inactive property, including but not limited to demolished buildings, is allowed at any time prior to owing equal to or greater than applicable then-current sewer service connection rate in arrears of utility service accounts at the property owner's request. In full consideration of forfeiting the sewer service connection, the city by approval of council shall remove the accrued utility service delinquent amount from the forfeited account, including late penalties, and send notice and confirmation to property owner of same. No credits will be issued for past payments on the property account. Service to a property under this section can only be restored by paying full new sewer connection charges at the then-current rate, as if it were a vacant property. (Ord. 837 § 1, 2022)

13.10.140 Requirements for connection to public sewers.

(1) All costs associated with the installation and connection to the public sewer system required by EMC 13.10.100 shall be borne by the user. All lateral sewer lines on private property are considered private lines and maintenance of same is the responsibility of the property owner.

(2) No unauthorized person shall uncover, make any connection with or opening into, use, alter, or disturb any public sewer or appurtenance thereof without first obtaining permission from the public works director.

(3) A separate and independent building sewer shall be provided for every building, except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, courtyard, or driveway. The building sewer from the front building may be extended to the rear building and the whole considered a one-building sewer; provided, that before such a connection is made, a sewer easement shall be drawn up and given to the city attorney for his approval. If approved, it shall be recorded in Chelan County. At least a four-inch line shall be required for two buildings. Before three or more buildings can hook up to the same sewage line, the city engineer shall determine the size of line required to adequately dispose of sewage, and shall inform the applicant of the size.

(4) Old building sewers may be used in connection with new buildings only when they are found to meet all requirements of this chapter.

(5) The size, slope, alignment, materials of construction of a building sewer (private sewer) and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling the trench shall conform to the requirements of the building and plumbing code and other applicable rules and regulations of the city of Entiat.

(6) No person shall make connection of roof downspouts, exterior foundation drains, areaway drains, or other sources of surface runoff or ground water to a building sewer or building drain which in turn is connected directly or indirectly to a public sanitary sewer.

(7) The connection of the private building sewer into the public sewer shall conform to the requirements of the city of Entiat and to the building and plumbing codes adopted by reference.

(8) The applicant for the sewer connection shall notify the public works director when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the public works director and/or his designee.

(9) All excavations for private sewer installation shall be adequately guarded with barricades and lighted so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the city of Entiat. (Ord. 669 § 3, 2007; Ord. 655 § 1, 2006; Ord. 516 § 14, 1998)

13.10.150 Installation of building sewer (private property) and side sewers.

(1) Installation of Private Sewage System. All individuals, businesses or corporations who make application to install sewer lines or any part thereof have the right to privately install their respective building and/or private sewer line where said private sewer line is located within the property lines of the individual's, business', or corporation's property. In the event that any individual, business, or corporation shall not install their own private sewer, but shall cause said private sewer to be installed by any other person, then said individual, business, or corporation shall allow only a licensed and bonded contractor to install said private sewer line, in accordance with the provisions set forth in this section.

(2) Installation of Side Sewers. All individuals, businesses, and corporations who make application to install side sewer lines or any part thereof which shall cross any municipally owned or managed property shall have the actual installation work done by a licensed and bonded contractor.

(3) Type of Side Sewer Pipe Allowed. Pipe used in the construction of a private sanitary sewer may be any of the following; provided, that all pipe so installed shall be connected with rubber or neoprene gaskets or any similar material specifically approved by the city engineer for that purpose:

(a) Rigid pipe: ductile iron;

(b) Flexible pipe: PVC (poly vinyl chloride).

(4) Bonds.

(a) All individuals, businesses, and corporations who make application to install sewer lines or any part thereof in any street in the city of Entiat which are to be connected with the city of Entiat's sewer system and, whether the area is inside or outside the city corporate limits, shall post with the city of Entiat:

(i) A bond acceptable to the city of Entiat in sufficient sums to restore to its preexisting condition the area in which said systems are installed, which when within the city limits shall be not less than $5,000, which may be continuous bond for all such installations;

(ii) In addition, a performance bond of not less than $2,000 to guarantee for one year the aforesaid work actually performed, including but not limited to actual installation of lines;

(iii) In the event that the person having the sewer line installed shall employ a licensed and bonded side sewer contractor, the contractor shall register at the City Hall and shall provide adequate proof of his licensing and bonding so as to satisfy the requirements of subsections (4)(a)(i) and (4)(a)(ii) of this section.

(b) Such bonds are conditions precedent to the commencement of work.

(c) Any individual, business, or corporation which receives a permit to install sewer lines as described in subsection (4)(a) of this section, agrees by acceptance of such permit that he, his successors and assigns will protect the city of Entiat and save it harmless from all claims, actions, and damages of every kind and description which may accrue to or be suffered by any person or persons or property by reason of the performance of such work, character of materials used, manner of installation, or by improper occupancy of rights-of-way or public place or public structure. In case any suit or action is brought against the city of Entiat for damages arising out of or by reason of any of the above cases, the permittee, his successors or assigns will, upon notice to him or them of commencement of such action, defend the same at his or their own sole expense and cost, and will satisfy any judgment after such suit or action which shall have been determined, if adverse to the city of Entiat, and further, shall reimburse the city of Entiat for reasonable attorney's fees expended by the city in such actions.

(d) All work contemplated to be done thereunder shall be done satisfactorily to the public works supervisor of the city of Entiat before any one individual or business is released from said restoration bond and before the one-year term of performance bond ceases.

(5) Insurance. The amounts of insurance required for issuance of a contractor's license/permit shall conform to the current state law regarding licensing requirements/limits of insurance for specialty contractors. Special insurance: where crossings under railroads are required or state highways, the amounts of insurance shall be as directed by the railroad or Department of Transportation. All required insurance policies shall name the city of Entiat as an additional insured. Proof of insurance shall be provided to the city prior to issuance of contractor license/permit. (Ord. 655 § 1, 2006; Ord. 516 § 15, 1998)

13.10.160 Maintenance of private sewers.

(1) Maintenance and repair of all private sewers is the responsibility of the owner. Any construction or repair of said sewer must be done by the owner.

(2) The city assumes no responsibility for the maintenance of any customer service lateral, or any building sewer lines on private property or in easements or street rights-of-way.

(3) If the customer's service fails, the customer shall endeavor to determine if the cause and location of the service line failure is on the property. If a city employee is sent to a customer's premises, and it is determined that the problem is caused by failure of the customer's system or line, a charge may be made by the city to the customer.

(4) The public works director of the city sewer system shall not, without the express permission of the city council and mayor, build, repair or clean any sewer other than those owned by the city. (Ord. 727 § 1, 2012; Ord. 655 § 1, 2006; Ord. 516 § 16, 1998)

13.10.170 Abandoned sewers and sewage disposal facilities.

Every abandoned building, house, or other premises shall have its sewer plugged or capped in an approved manner. Every cesspool, septic tank, and seepage pit which has been abandoned or has been discontinued otherwise from future use or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed therefrom and be closed in accordance with the requirements of the Chelan-Douglas County health district, specifically in regard to removal procedures and fill materials. (Ord. 655 § 1, 2006; Ord. 516 § 17, 1998)

13.10.180 Conveyance to city.

All extensions to the public sewer system shall be conveyed to the city by bill of sale and shall be accompanied by the following: a title report assuring that there are no liens and debts against the property and the person granting an easement has title to the property; that the extension was constructed in accordance with city standards and specifications proven with submittal of as-built drawings; a performance bond assuring the function of the new connection up to one year; proof of liability insurance to protect the city from damages arising out of the failure of a line due to defective materials or workmanship. If the lines cross private property, the grantor shall convey to the city the required easements for constructing, repairing, maintaining, altering, changing, controlling, and operating the lines in perpetuity. (Ord. 655 § 1, 2006; Ord. 516 § 18, 1998)

13.10.190 Ownership of lines.

The city owns all utility lines constructed by it, or conveyed to and accepted by it, or which it has maintained and operated for a period of not less than 10 years. The city disclaims ownership of any collection mains which are not located within public property or public easement. The city reserves the right to disclaim ownership of any privately constructed sewer main which was not built to city specifications. The city shall have no maintenance, repair, or replacement obligation with respect to lines which it does not own. (Ord. 516 § 19, 1998)

13.10.200 Standard specifications for municipal public works construction.

All materials and construction methods used for extensions and additions to the city utility system shall conform to the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as prepared by the Washington State Department of Transportation and the American Public Works Association, Washington State Chapter, as the same may be modified by the city's specification manual. (Ord. 516 § 20, 1998)

13.10.210 Administration and judicial review.

(1) Decisions made by the public works director shall be reviewed by the chief administrative officer of the city upon a minimum of 14 days' prior written notice by the aggrieved party. The request shall describe the decision sought to be reviewed with sufficient clarity to promote a meaningful review of the issue. Upon receiving a request for review, the chief administrative officer shall contact the city's hearing examiner to schedule a public hearing at which the public work director's decision will be reviewed. The hearing shall be set within a reasonable time, allowing for review and comment by the city engineer. After considering the matter at the public hearing, the hearing examiner shall make his/her decision based on findings of fact and conclusions to support

the decision.

(2) Further appeal of the hearing examiner decision can be made by the applicant to the Chelan County Superior Court, if the appeal is made to the court within 21 days from the time of the hearing examiner's decision. The cost of the transcription of all records ordered certified by the court for such appeal shall be borne by the applicant/appellant. (Ord. 655 § 1, 2006; Ord. 516 § 21, 1998)

13.10.220 Confidential business information.

(1) Information and data on a user obtained from reports, surveys, wastewater discharge permit applications, wastewater discharge permits, and monitoring programs, and from city inspection and sampling activities, shall be available to the public without restriction, unless the user specifically requests and is able to demonstrate to the satisfaction of the city that the release of such information would divulge information, processes, or methods of production entitled to protection as trade secrets under applicable state law.

(2) When requested and demonstrated by the user furnishing a report that such information should be held confidential, the city shall make reasonable efforts to protect the portions of a report which might disclose trade secrets or secret processes from inspection by the public, but shall be made available immediately upon request to governmental agencies for uses related to the NPDES program or pretreatment program, and in enforcement proceedings involving the person furnishing the report.

(3) Wastewater constituents and characteristics and other "effluent data" as defined by 40 CFR 2.302 will not be recognized as confidential information and will be available to the public without restriction. (Ord. 516 § 22, 1998)

13.10.230 Violation – Penalty.

(1) Any person who shall violate any provision of the chapter shall be fined pursuant to Chapter 90.56 RCW and RCW 90.48.140 and 90.48.144, referenced specifically by the state Department of Ecology.

(2) Any person violating any of the provisions of this chapter shall become liable to the city for any expense, loss, or damage occasioned by the city by reason of such violation.

(3) Illegal Discharges. The discharger may be responsible for all costs associated with illegal discharges. This shall include, but not be limited to, damages to sewers, other property owners, or the treatment plant. The discharger shall be responsible for fines levied as a result of interference, pass through, or other permit violations caused by the illegal discharge.

(4) Compliance Schedule for Existing Customers. Existing users except for categorical users at the time this chapter is enacted that are out of compliance with this chapter on the date of enactment must conform their use to the requirements of the chapter within a reasonable time set forth in a compliance schedule established by the city engineer and the public works director, and approved by the city council. Failure to satisfy the requirements of the compliance schedule shall constitute a violation of this chapter and subject the user to the penalties set

forth herein. Categorical users shall follow the compliance schedule in EMC 13.10.120 (2)(c). (Ord. 655 § 1, 2006; Ord. 516 § 23, 1998)

Chapter 13.20
UTILITY MAIN CHARGES

Sections:

13.20.010 Basis of utility main charge.

13.20.020 Utility main charges.

13.20.010 Basis of utility main charge.

A utility main charge shall be assessed to all new connections which utilize water or sewer mains already existing across the frontage of the property being served. The charges constitute payment to the city for the actual costs incurred in originally constructing the main across the frontage of the subject property. Such charges shall not apply when the affected property participated in a utility local improvement district for the construction of a water or sewer main, nor shall such charges be applicable in cases where the main was built and totally paid for by the owner of the subject property or by any private developer who may still be entitled to reimbursement from abutting owners pursuant to a recorded contract. (Ord. 504 § 1, 1996)

13.20.020 Utility main charges.

(1) The utility main charge shall be the actual cost of the main in question at a minimum size of eight inches for water main and at a minimum size of 10 inches for sewer main; however, the size of mains may be increased to adequately serve the subject property/area and said size increase shall be determined by the city engineer. The charge shall be prorated on a front-foot basis.

(2) The city shall keep a record, open to the public, of the prorated construction cost for all city utility mains.

(3) In cases where the city has participated with a private party or utility local improvement district in constructing a main, only that portion of the total costs actually paid by the city shall be used for calculating the utility main charge.

(4) When service is requested to a parcel of property that is subdividable, and service is only desired for a portion of the footage, a minimum frontage of 70 feet shall be used to determine the total front-foot charge. When such parcel is subdivided by either a short or long plat, the balance of the frontage charge shall be paid as a condition of preliminary plat approval.

(5) In addition to the per-front-foot cost reference, the city may assess a charge for any other water or sewer mains constructed with city funds subsequent to 1999. The city shall establish a schedule of fees and a map open to the public at City Hall showing the utility mains which are subject to this charge. The per-front-foot charge for such mains constructed after 1999 shall be administratively calculated by the city engineer; provided, the total of all fees charged on a front-foot basis shall not exceed the total original cost of the project, including all construction, engineering, right-of-way and easement acquisition, and administrative fees. (Ord. 655 § 1,

2006; Ord. 504 § 2, 1996)

Chapter 13.25
DEVELOPER EXTENSION CONNECTION CHARGES

Sections:

13.25.010 Policies and fees.

13.25.020 Property gaining access to utilities by development project extension of utility mains.

13.25.030 Property connecting to water and/or sewer system where utilities are available without developer extension.

13.25.040 Connections for all properties to utilities.

13.25.010 Policies and fees.

The policies and fees for connecting to city water and sewer utilities shall be as set out in this chapter. (Ord. 419, 1993)

13.25.020 Property gaining access to utilities by development project extension of utility mains.

When a developer extends water and/or sewer lines through an area in Entiat, making properties there accessible to city domestic water or sewer services, responsibilities for individual line installation and connection fees shall be as follows:

(1) The developer shall provide water and sewer to the property line of every lot within the development.

(2) The developer shall provide water and sewer to the property lines of all existing residences and businesses adjacent to the extension.

(3) Within the development itself, if the development includes residences or businesses, the developer shall make connection of them to the water and sewer system. If the development is for lots, each lot purchaser shall provide connection to city water and sewer, as located at the property line by the developer, when construction of any residences or businesses takes place.

(4) Individual property owners of existing residences or businesses adjacent to the extension shall connect to city domestic water and/or sewer, between the residence or business and the property line.

(5) Actual connection to domestic water service at the property line and installation of the water meter shall be made by the city.

(6) The city shall inspect all sewer connections before they are covered.

(7) Fees for connection in above situations shall be set forth in the annual city fee schedule resolution. (Ord. 655

§ 1, 2006; Ord. 419 § 1, 1993)

13.25.030 Property connecting to water and/or sewer system where utilities are available without developer extension.

The property owner shall provide service lines for both water and sewer between the residence/business and the property line.

(1) Sewer Lines. The property owner shall provide a sewer line from the city sewer main to the property as well as the private lines on the property. The city will inspect all sewer connections before the work is covered. Connection fees for the city sewer are set forth in the current city fee schedule resolution.

(2) Water Connections. The city shall provide water connection lines from the domestic water mains to the property line, and the city will make actual connection to the city water system. The property owner shall provide private water lines from the residence or business to the property line at the location of the meter. Connection fees for domestic water including the cost of the meter for each service is set forth in the current city fee schedule resolution. (Ord. 655 § 1, 2006; Ord. 419 § 2, 1993)

13.25.040 Connections for all properties to utilities.

(1) The city, as licensed domestic water distributor, shall make all actual connections at the property line to the domestic water system.

(2) The city shall inspect all sewer connections before they are covered.

(3) Water meters shall be the property of the city.

(4) Water and sewer lines in the utility system and to the property lines are the property of the city.

(5) Private water and sewer service lines, between the property line and the buildings being served, are the property of the property owner. (Ord. 655 § 1, 2006; Ord. 419 § 3, 1993)

Chapter 13.30
MUNICIPAL EQUIPMENT USAGE

Sections:

13.30.010 Municipal water-sewer system management and operation authority.

13.30.020 Operation of municipal equipment or property on private landowners' property – Restrictions.

13.30.030 Occasions upon which municipal equipment to be used upon a private landowner's property.

13.30.040 Violation – Penalty.

13.30.010 Municipal water-sewer system management and operation authority.

The city of Entiat is authorized to install, repair, and maintain various pipes and associated equipment in conjunction with the management and operation of the municipal water-sewer system. (Ord. 655 § 1, 2006; Ord. 221 § 1, 1979)

13.30.020 Operation of municipal equipment or property on private landowners' property – Restrictions.

Whenever municipal equipment is used upon a private landowner's property, said equipment shall be used and operated only by municipal employees and at no time shall a private citizen use the municipal equipment or property. (Ord. 655 § 1, 2006; Ord. 221 §§ 2, 3, 1979)

13.30.030 Occasions upon which municipal equipment to be used upon a private landowner's property.

The only occasions upon which municipal equipment shall be used upon a private landowner's property is when either of the following two conditions exist:

(1) An emergency exists wherein it is not feasible to have a commercial business engaged in the necessary work retained.

(2) Wherein the city of Entiat, by code, is directed to make installations, maintenance or repairs to municipal utility systems upon private property, wherein the private property owner is to be charged for the municipal services. (Ord. 655 § 1, 2006; Ord. 221 § 4, 1979)

13.30.040 Violation – Penalty.

Any violation of this chapter shall be an infraction and punishable by a fine pursuant to the monetary penalty schedule provided for in Infraction Rules for Courts of Limited Jurisdiction. (Ord. 655 § 1, 2006; Ord. 221 § 5, 1979)

Chapter 13.35
DEVELOPER EXTENSION MANUAL

Sections:

13.35.010 Adopted.

13.35.020 Copies.

13.35.010 Adopted.

The Developer Extension Manual (Standard Plan Guidebook), dated February 2006, and prepared by Hammond, Collier, Wade & Livingstone Inc., city engineer, for use as a guideline for development of city infrastructure, inclusive of water, sewer, streets and stormwater, was adopted by city council resolution and any subsequent amendments thereto. (Ord. 655 § 1, 2006; Ord. 268, 1981)

13.35.020 Copies.

A copy of the manual/guidebook shall be available from the city clerk-treasurer for any individual wishing to perform work affecting the city infrastructure. (Ord. 655 § 1, 2006; Ord. 268, 1981)

APPENDIX E

Mixing Zone and Effluent Temperature Attachments

PLUMES 2 Mixing Zone Data Sheets
Ecology Reasonable Potential Spreadsheet (NH3, CU, ZN)
Temperature Ecology Reasonable Potential Spreadsheet
Ambient River Data used for the ECY Cormix Model from 2016 Fact Sheet

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Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.000	0.152	0.000	0.000	20.700	0.000	0.000	0.152	0.000	0.00080
23.774	0.152	0.000	0.000	20.700	0.000	0.000	0.152	0.000	0.00080

Diffuser Table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(m)	(m)	(deg)	(deg)	()	(m)	(m)	(m)	(m)	(m3/s)	(psu)	(C)	(kg/kg)
0.20	0.91	0.00	90.00	1.00**********		9.14	91.44	22.86	0.00	0.00	20.00	0.00

Simulation Results:

Step	Avg-Dil ()	P-dia (m)	x-posn (m)	y-posn (m)	Depth (m)
10	1.099	0.222	0.001	0.013	-22.860
20	1.220	0.244	0.003	0.023	-22.860
30	1.353	0.265	0.005	0.032	-22.860
40	1.499	0.285	0.009	0.040	-22.860
50	1.661	0.303	0.016	0.050	-22.860
60	1.775	0.314	0.025	0.060	-22.860
70	1.890	0.324	0.035	0.071	-22.860
80	2.023	0.334	0.046	0.081	-22.860
90	2.180	0.344	0.060	0.092	-22.860
100	2.368	0.356	0.076	0.103	-22.861
110	2.602	0.369	0.095	0.114	-22.861
120	2.902	0.384	0.118	0.126	-22.861
130	3.298	0.403	0.150	0.139	-22.861
140	3.857	0.428	0.200	0.156	-22.862
150	4.676	0.462	0.283	0.178	-22.862
160	5.700	0.500	0.404	0.203	-22.863
170	6.949	0.543	0.571	0.231	-22.865
180	8.470	0.592	0.802	0.261	-22.867
190	10.326	0.647	1.119	0.293	-22.870
200	12.587	0.708	1.551	0.329	-22.874
210	15.343	0.776	2.131	0.369	-22.881
220	18.703	0.851	2.901	0.410	-22.890
230	22.799	0.935	3.910	0.455	-22.902
240	27.792	1.028	5.215	0.502	-22.920
250	33.879	1.131	6.877	0.551	-22.943
260	41.298	1.246	8.966	0.600	-22.974

..... Reached Acute Mixing Zone .....

270	50.342	1.372	11.557	0.651	-23.014

---------- Plume hits the bottom ----------

277	57.827	1.469	13.712	0.686	-23.049

---------- Starting Farfield Calculations ----------

Farfield dispersion based on wastefield width of : 1.47 (m)

Linearly Varying Eddy Diffusivity is used:

Dilution ()	Width (m)	Distance (m)

57.827	1.480	13.730
60.355	1.929	20.000
76.848	2.646	30.000
96.397	3.362	40.000
116.494	4.078	50.000
136.757	4.794	60.000
157.085	5.510	70.000
177.442	6.226	80.000
197.815	6.943	90.000

..... Reached Chronic Mixing Zone .....

218.197	7.659	100.000
238.583	8.375	110.000
258.973	9.091	120.000
279.364	9.807	130.000
299.758	10.523	140.000
320.152	11.239	150.000
340.546	11.955	160.000
360.942	12.671	170.000
381.337	13.387	180.000
401.733	14.103	190.000
422.129	14.820	200.000
442.526	15.536	210.000
462.922	16.252	220.000
483.319	16.968	230.000
503.715	17.684	240.000
524.112	18.400	250.000
544.509	19.116	260.000
564.905	19.832	270.000
585.302	20.548	280.000
605.699	21.264	290.000
626.096	21.980	300.000
646.493	22.696	310.000
664.761	23.338	318.957

****

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.000	0.152	0.000	0.000	20.700	0.000	0.000	0.152	0.000	0.00080
23.774	0.152	0.000	0.000	20.700	0.000	0.000	0.152	0.000	0.00080

Diffuser Table:

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(m)	(m)	(deg)	(deg)	()	(m)	(m)	(m)	(m)	(m3/s)	(psu)	(C)	(kg/kg)
0.20	1.83	0.00	90.00	1.00**********		9.14	91.44	22.86	0.02	0.00	20.00	0.00

Simulation Results:

Step	Avg-Dil ()	P-dia (m)	x-posn (m)	y-posn (m)	Depth (m)
10	1.215	0.246	0.002	0.052	-22.860
20	1.441	0.291	0.007	0.100	-22.860
30	1.671	0.335	0.015	0.144	-22.860
40	1.908	0.380	0.025	0.184	-22.860
50	2.154	0.425	0.037	0.221	-22.860
60	2.414	0.470	0.050	0.255	-22.860
70	2.689	0.515	0.066	0.287	-22.860
80	2.984	0.560	0.084	0.319	-22.860
90	3.305	0.606	0.106	0.351	-22.861
100	3.659	0.654	0.131	0.383	-22.861
110	4.057	0.703	0.161	0.416	-22.861
120	4.511	0.755	0.195	0.450	-22.861
130	5.039	0.810	0.236	0.484	-22.861
140	5.662	0.869	0.285	0.520	-22.862
150	6.418	0.934	0.350	0.561	-22.862
160	7.367	1.008	0.438	0.608	-22.863
170	8.603	1.095	0.565	0.666	-22.863
180	10.298	1.200	0.759	0.739	-22.865
190	12.552	1.325	1.050	0.828	-22.867
200	15.301	1.461	1.444	0.925	-22.870
210	18.652	1.610	1.974	1.030	-22.874
220	22.737	1.774	2.685	1.145	-22.880
230	27.716	1.954	3.635	1.270	-22.889
240	33.785	2.153	4.896	1.405	-22.901
250	41.184	2.372	6.562	1.550	-22.919
260	50.203	2.614	8.744	1.705	-22.944

..... Reached Acute Mixing Zone .....

270	61.198	2.882	11.579	1.870	-22.980
280	74.600	3.178	15.226	2.043	-23.028

---------- Plume hits the bottom ----------

284	80.749	3.305	16.952	2.115	-23.052

---------- Starting Farfield Calculations ----------

Farfield dispersion based on wastefield width of : 3.30 (m)

Linearly Varying Eddy Diffusivity is used:

Dilution	Width	Distance

()	(m)	(m)
80.749	3.319	17.083
80.753	3.594	20.000
86.395	4.535	30.000
99.679	5.476	40.000
115.011	6.415	50.000
131.012	7.355	60.000
147.283	8.293	70.000
163.686	9.232	80.000
180.158	10.171	90.000

..... Reached Chronic Mixing Zone .....

196.670	11.109	100.000
213.205	12.048	110.000
229.757	12.986	120.000
246.319	13.924	130.000
262.888	14.863	140.000
279.461	15.801	150.000
296.039	16.740	160.000
312.619	17.678	170.000
329.201	18.616	180.000
345.784	19.555	190.000
362.369	20.493	200.000
378.954	21.431	210.000
395.541	22.370	220.000
412.128	23.308	230.000
428.715	24.246	240.000
445.302	25.185	250.000
461.890	26.123	260.000
478.479	27.061	270.000
495.067	27.999	280.000
511.655	28.938	290.000
528.244	29.876	300.000
528.646	29.899	300.242

Click for Instructions

Dilution Factor Calculations and Receiving Water Critical Conditions

Step 1: Enter Waterbody Type

Water Body Type	Freshwater

Facility Name	Entiat
Receiving Water	Columbia River

Step 2: Enter Dilution Factors -OR- Calculate DFs by entering Facility/Receiving Water Flow Data

Do you want to enter dilution factors -or- flow data?	Dilution Factors

Facility Flow, MGD			

	Dilution Factor Allowed
Aquatic Life - Acute	**52.0**
Aquatic Life - Chronic	**183.0**
HH-Non-Carcinogen	**52.0**
HH-Carcinogen	**52.0**
Whole river at 7Q10	**183**

Step 3: Enter Critical Data

	Effluent	Receiving Water
Temp, °C	20	20.7
pH, s.u.	7.5	7
Alkalinity, mg/L as CaCO3	250	65
Hardness, mg/L CaCO3	205	65
Salinity, psu		
Receiving water TSS, mg/L (leave blank if unknown)		
If TSS is annual data, enter 'A'; if from critical period, enter 'S'; If no TSS, leave blank		

no data for river (jcp)

no data for river so used hardness (jcp)

Step 4: Specifiy if using 'Mixed' values for hardness, temperature, and pH

	Use 'Mixed Hardness' (Y/N)	Use 'Mixed Max Temp' (Y/N)	Use 'Mixed pH (Y/N)
	Y	Y	Y
Acute Zone Boundary	67.7	20.7	7.0
Chronic Zone Boundary	65.8	20.7	7.0
Whole river at 7Q10	65.8	20.7	7.0

Reasonable Potential Calculation

Facility	Entiat
Water Body Type	Freshwater
Rec. Water Hardness	Acute=67.7, Chronic=65.8 mg/L

Dilution Factors:

Aquatic Life
Human Health Carcinogenic
Human Health Non-Carcinoge

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	COPPER - 744058 6M Hardness	ZINC- 7440666 13M hardness de					
Effluent Data	# of Samples (n)		126	9	10					
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		43,650	4.68	80.3					
	Calculated 50th percentile Effluent Conc. (when n>10)		16500							
Receiving Water Data	90th Percentile Conc., ug/L		40	2	4					
	Geo Mean, ug/L			2						
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	24,103	11.7814368220824	82.2283910783943					
		Chronic	1,395	7.93426220752321	73.271638121937					
	WQ Criteria for Protection of Human Health, ug/L		-	1300						
	Metal Criteria Translator, decimal	Acute	-	0.996	0.996					
		Chronic	-	0.996	0.996					
	Carcinogen?		N	N	N					

Aquatic Life Reasonable Potential

Effluent percentile value			0.950	0.950	0.950					
s	$s^2=\ln(CV^2+1)$		0.555	0.555	0.555					
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.977	0.717	0.741					
Multiplier			1.00	1.81	1.74					
Max concentration (ug/L) at edge of…		Acute	879	2.124	6.598					
		Chronic	278	2.035	4.738					
Reasonable Potential? Limit Required?			**NO**	**NO**	**NO**					

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month										
LTA Coeff. Var. (CV), decimal										
Permit Limit Coeff. Var. (CV), decimal										
Waste Load Allocations, ug/L		Acute								
		Chronic								
Long Term Averages, ug/L		Acute								
		Chronic								
Limiting LTA, ug/L										
Metal Translator or 1?										
Average Monthly Limit (AML), ug/L										
Maximum Daily Limit (MDL), ug/L										

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.554513029376191								
Pn	$Pn=(1\text{-confidence level})1/n$	0.717								
Multiplier		0.727564242886788								
Dilution Factor		52								
Max Conc. at edge of Chronic Zone, ug/L		2.02701924339827								
Reasonable Potential? Limit Required?		**NO**								

Human Health Limit Calculation

# of Compliance Samples Expected per month										
Average Monthly Effluent Limit, ug/L										
Maximum Daily Effluent Limit, ug/L										

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Freshwater Temperature Reasonable Potential and Limit Calculation

	Core Summer Critera	Supplemental Criteria
INPUT	**July 1-Sept 14**	**Sept 15-July 1**
1. Chronic Dilution Factor at Mixing Zone Boundary	183.0	183.0
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	22.5 °C	20.9 °C
3. 7DADMax Effluent Temperature (95th percentile)	25.0 °C	25.0 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	17.5 °C	17.5 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	22.5 °C	20.9 °C
6. Incremental Temperature Increase or decrease:	0.0 °C	0.0 °C
7. Maximum Allowable Incremental Temperature Increase:	0.3 °C	0.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	22.8 °C	21.2 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	YES	YES
10. Temperature Limit if Required:	NO LIMIT	NO LIMIT
B. If ambient temp is cooler than WQ criterion but within 28/(T_{amb}+7) and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	---	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within 28/(T_{amb}+7) of the criterion		
13. Does temp fall within this Incremental temp. range?	---	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
D. If ambient temp is cooler than (WQ criterion - 28/(T_{amb}+7))		
15. Does temp fall within this Incremental temp. range?	---	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
17. Do any of the above cells show a temp increase?	**NO**	**NO**
18. Temperature Limit if Required?	**NO LIMIT**	**NO LIMIT**

4 Ambient River Data used for the ECY Cormix Model from 2016 Fact Sheet

ECY used the EPA approved CORMIX model to calculate dilution factors. A copy of the modeling parameters and results are attached to this TM. The ambient background data used for the permit includes data from sampling conducted by the USGS at Vernita Bridge on the Columbia River as shown below.

Ambient Data Used in Reasonable Potential Analysis (Where applicable)

Parameter	Value used
7Q10 low flow	50,000 cfs
Velocity	0.392 ft/sec
Depth	75 feet
Width	1700 feet
Roughness (Manning)	n=0.035
Fecal Coliforms	2 colonies /ml (geomean)
Dissolved Oxygen	8.5 mg/L
Total Ammonia-N	40 µg/L
Hardness	65 mg/L as CaCO3
Lead	0.17 ug/L [a]
Iron	1.0 ug/L [a]
Copper	2.0 ug/L
Zinc	4.0 ug/L
Aluminum	28 ug/L
[a] Ambient concentration reported as less than the quantification level, entered at quantification level for purposes of conservative reasonable potential analysis.	

APPENDIX F

Environmental Documentation
Determination of Non-significance (DNS)
SEPA Documentation
SERP Documentation

STATE ENVIRONMENTAL POLICY ACT

Determination of NonSignificance

April 4, 2025

Lead agency: City of Entiat

Agency Contact: Mark Botello, mbotello@entiatwa.us, 509-784-1500

Description of proposal: The proposed project is for the adoption of the City of Entiat's Facilities Plan and General Sewer Plan dated 2025. The Facilities Plan and General Sewer Plan is a non-project action; it is a planning document that identifies the City's treatment and collection system deficiencies and corresponding improvement alternatives. This Facilities Plan and General Sewer Plan is in compliance with ECY requirements.

Location of proposal: The Facilities Plan and General Sewer Plan recommend several capital improvements to the City's existing wastewater collection system. The City of Entiat and the recommended Facilities Plan and General Sewer Plan improvements are generally located within Township 25 North, Range 21 East, Section 09.

The City of Entiat has determined that this proposal will not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030. We have reviewed the attached Environmental Checklist and other information on file with the lead agency. This information is available to the public on request.

This DNS is issued under WAC 197-11-340(2) and the comment period will end on Friday, April 25, 2025

Responsible Official: Mark Botello

Position/title: Public Works Director/Community Development Director

Phone: 509-659-1930

Address: 14070 Kinzel St., Entiat, WA 98822

Signature Mark Botello (electronic signature or name of signor is sufficient) Date 4/7/25

Pursuant to EMC 14.10.030 Administrative appeals. Appeal of an administrative decision made to the hearing examiner shall be filed with the city within 14 calendar days after the date of the decision of the matter being appealed. If the 14-day period ends on a weekend or on a holiday, the following working day shall be the fourteenth day.

SEPA[1] Environmental Checklist

Purpose of checklist

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. **You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown.** You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to **all parts of your proposal**, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for lead agencies

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the Supplemental Sheet for Nonproject Actions (Part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in "Part B: Environmental Elements" that do not contribute meaningfully to the analysis of the proposal.

[1] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Checklist-guidance

A.Background

Find help answering background questions[2]

1. **Name of proposed project, if applicable:**

   City of Entiat Wastewater Facilities Plan and General Sewer Plan (FP-GSP)

2. **Name of applicant:**

   City of Entiat

3. **Address and phone number of applicant and contact person:**

   Mark Botello

   (509) 784-1500

   City of Entiat

   14070 Kinzel St.

   Entiat, WA 98822

   PO Box 228

4. **Date checklist prepared:**

   04/02/2025

5. **Agency requesting checklist:**

   Washington State Department of Ecology

6. **Proposed timing of schedule (including phasing, if applicable):**

   Plan adoption by the end of 2025. The Plan recommends capital improvements that would be proposed separately and dependent on project funding. The estimated schedule in the Plan for recommended improvements is as follows: Apply for funding October 2025. Design in October 2026 and Construction in the summer of 2027. Depending on funding, construction may begin in late summer 2027 and go into the summer of 2028.

7. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

   Yes, the plan covers capital improvements that the City plans to implement.

8. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

   The City will complete SERP in addition to this SEPA checklist. Environmental and archaeological reviews of the capital improvements will be conducted when each project is proposed.

9. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

[2] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-A-Background

No.

10. **List any government approvals or permits that will be needed for your proposal, if known.**

    None that are known.

11. **Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

    The Facilities Plan and General Sewer Plan is a non-project action; it is a planning document that identifies the City's collection system deficiencies and corresponding improvement alternatives. This General Sewer Plan is in compliance with ECY requirements and has been prepared in general accordance with WAC Chapter 173-240

12. **Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

    The FP-GSP identifies several alternatives that include City-wide improvements. Several maps showing the locations of suggested improvements are attached.

    The City of Entiat and the Potential Wastewater Infrastructure improvements are generally located within:

    Township 25 North, Range 21 East, Section 09

B.Environmental Elements

1. Earth

Find help answering earth questions[3]

a. **General description of the site:**

Circle or highlight one: Flat, rolling**, hilly, steep slopes, mountainous,** other:

[3] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-earth

b. **What is the steepest slope on the site (approximate percent slope)?**

Approximately 25 to 65% (per NRCS Soils Map)

c. **What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.**

According to the USDA NRCS Soils Maps for the City of Entiat, general soil types consist of Cashmont Loam, Burch Loam, Beverly Loam, Entiat Loam, Pogue Loam.

d. **Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

Not applicable. Soil stability will be evaluated for each project during design.

e. **Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**

Not applicable. Will be evaluated for each project during design.

f. **Could erosion occur because of clearing, construction, or use? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

g. **About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

Not applicable. Will be evaluated for each project during design.

h. **Proposed measures to reduce or control erosion, or other impacts to the earth, if any.**

Not applicable. Will be evaluated for each project during design.

2. Air

Find help answering air questions[4]

a. **What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.**

Not applicable. Will be evaluated for each project during design.

b. **Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

[4] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-Air

c. **Proposed measures to reduce or control emissions or other impacts to air, if any:**

Not applicable. Will be evaluated for each project during design.

3. Water

Find help answering water questions[5]

a. **Surface:**

Find help answering surface water questions[6]

1. **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

   The Columbia River and Entiat River is in the vicinity of the recommended improvements in the FP-GSP. It is not anticipated that the improvements will occur within surface waters shown on the National Wetlands Index mapping.

2. **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

   Not applicable. Will be evaluated for each project during design.

3. **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

   None

4. **Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.**

   Not applicable to the adoption of the Plan

5. **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

   No.

6. **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

[5] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water

[6] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Surface-water

b. Ground:

Find help answering ground water questions[7]

1. **Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.**

   Not applicable to the adoption of the Plan

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals…; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

   Not applicable to the adoption of the Plan

c. Water Runoff (including stormwater):

1. **Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

   Not applicable. Will be evaluated for each project during design.

2. **Could waste materials enter ground or surface waters? If so, generally describe.**

   Not applicable. Will be evaluated for each project during design.

3. **Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

   Not applicable. Will be evaluated for each project during design.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Not applicable. Will be evaluated for each project during design.

4. Plants

Find help answering plants questions

a. Check the types of vegetation found on the site:

- ☐ **deciduous tree: alder, maple, aspen, other**
- ☐ **evergreen tree: fir, cedar, pine, other**
- ☐ **shrubs**
- ☐ **grass**

[7] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Groundwater

☐ **pasture**

☐ **crop or grain**

☐ **orchards, vineyards, or other permanent crops.**

☐ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**

☐ **water plants: water lily, eelgrass, milfoil, other**

☐ **other types of vegetation**

Not applicable. Will be evaluated for each project during design.

b. **What kind and amount of vegetation will be removed or altered?**

Not applicable. Will be evaluated for each project during design.

c. **List threatened and endangered species known to be on or near the site.**

Not applicable. Will be evaluated for each project during design.

d. **Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any.**

Not applicable. Will be evaluated for each project during design.

e. **List all noxious weeds and invasive species known to be on or near the site.**

Not applicable. Will be evaluated for each project during design.

5. Animals

Find help answering animal questions[8]

a. **List any birds and other animals that have been observed on or near the site or are known to be on or near the site.**

Examples include:

- **Birds: hawk, heron, eagle, songbirds, other:**
- **Mammals: deer, bear, elk, beaver, other:**
- **Fish: bass, salmon, trout, herring, shellfish, other:**

Not applicable. Will be evaluated for each project during design.

b. **List any threatened and endangered species known to be on or near the site.**

Not applicable. Will be evaluated for each project during design.

c. **Is the site part of a migration route? If so, explain.**

Not applicable. Will be evaluated for each project during design.

d. **Proposed measures to preserve or enhance wildlife, if any.**

[8] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-5-Animals

Not applicable. Will be evaluated for each project during design.

e. **List any invasive animal species known to be on or near the site.**

Not applicable. Will be evaluated for each project during design.

6. Energy and natural resources

Find help answering energy and natural resource questions[9]

a. **What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

Not applicable. Will be evaluated for each project during design.

b. **Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.**

Not applicable. Will be evaluated for each project during design.

7. Environmental health

Health Find help with answering environmental health questions[10]

a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.**

1. **Describe any known or possible contamination at the site from present or past uses.**

   Not applicable. Will be evaluated for each project during design.

2. **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

   Not applicable. Will be evaluated for each project during design.

3. **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

   Not applicable. Will be evaluated for each project during design.

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[9] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-6-Energy-natural-resou

[10] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-7-Environmental-health

4. **Describe special emergency services that might be required.**

   Not applicable. Will be evaluated for each project during design.

5. **Proposed measures to reduce or control environmental health hazards, if any.**

   Not applicable. Will be evaluated for each project during design.

b. Noise

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

   Not applicable. Will be evaluated for each project during design.

2. **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?**

   Not applicable. Will be evaluated for each project during design.

3. **Proposed measures to reduce or control noise impacts, if any:**

   Not applicable. Will be evaluated for each project during design.

8. Land and shoreline use

Find help answering land and shoreline use questions[11]

a. **What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

   Not applicable. Will be evaluated for each project during design.

b. **Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses because of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?**

   Not applicable. Will be evaluated for each project during design.

   1. **Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?**

      Not applicable. Will be evaluated for each project during design.

c. **Describe any structures on the site.**

   Not applicable. Will be evaluated for each project during design.

d. **Will any structures be demolished? If so, what?**

   Not applicable. Will be evaluated for each project during design.

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[11] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-8-Land-shoreline-use

e. **What is the current zoning classification of the site?**

Not applicable. Will be evaluated for each project during design.

f. **What is the current comprehensive plan designation of the site?**

Not applicable. Will be evaluated for each project during design.

g. **If applicable, what is the current shoreline master program designation of the site?**

Not applicable. Will be evaluated for each project during design.

h. **Has any part of the site been classified as a critical area by the city or county? If so, specify.**

Not applicable. Will be evaluated for each project during design.

i. **Approximately how many people would reside or work in the completed project?**

Not applicable. Will be evaluated for each project during design.

j. **Approximately how many people would the completed project displace?**

Not applicable. Will be evaluated for each project during design.

k. **Proposed measures to avoid or reduce displacement impacts, if any.**

Not applicable. Will be evaluated for each project during design.

l. **Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.**

Not applicable. Will be evaluated for each project during design.

m. **Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:**

Not applicable. Will be evaluated for each project during design.

9. Housing

Find help answering housing questions[12]

a. **Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

No housing proposed.

b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

No housing expected to be eliminated.

c. **Proposed measures to reduce or control housing impacts, if any:**

Not applicable. Will be evaluated for each project during design.

[12] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-9-Housing

10. Aesthetics

Find help answering aesthetics questions[13]

a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

   Not applicable. Will be evaluated for each project during design.

b. **What views in the immediate vicinity would be altered or obstructed?**

   Not applicable. Will be evaluated for each project during design.

c. **Proposed measures to reduce or control aesthetic impacts, if any:**

   Not applicable. Will be evaluated for each project during design.

11. Light and glare

Find help answering light and glare questions[14]

a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**

   Not applicable. Will be evaluated for each project during design.

b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

   Not applicable. Will be evaluated for each project during design.

c. **What existing off-site sources of light or glare may affect your proposal?**

   Not applicable. Will be evaluated for each project during design.

d. **Proposed measures to reduce or control light and glare impacts, if any:**

   Not applicable. Will be evaluated for each project during design.

12. Recreation

Find help answering recreation questions

a. **What designated and informal recreational opportunities are in the immediate vicinity?**

Not applicable. Will be evaluated for each project during design.

b. **Would the proposed project displace any existing recreational uses? If so, describe.**

Not applicable. Will be evaluated for each project during design.

c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

Not applicable. Will be evaluated for each project during design.

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[13] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-10-Aesthetics

[14] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-11-Light-glare

13. Historic and cultural preservation

Find help answering historic and cultural preservation questions[15]

a. **Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.**

   Not applicable. Will be evaluated for each project during design.

b. **Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

   Not applicable. Will be evaluated for each project during design.

c. **Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.**

   Not applicable. Will be evaluated for each project during design.

d. **Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

   Not applicable. Will be evaluated for each project during design.

14. Transportation

Find help with answering transportation questions[16]

a. **Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

   Not applicable. Will be evaluated for each project during design.

b. **Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

   Not applicable. Will be evaluated for each project during design.

c. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

   Not applicable. Will be evaluated for each project during design.

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[15] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-13-Historic-cultural-p

[16] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-14-Transportation

d. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

e. **How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

Not applicable. Will be evaluated for each project during design.

f. **Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

g. **Proposed measures to reduce or control transportation impacts, if any:**

Not applicable. Will be evaluated for each project during design.

15. Public services

Find help answering public service questions[17]

a. **Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.**

Not applicable. Will be evaluated for each project during design.

b. **Proposed measures to reduce or control direct impacts on public services, if any.**

Not applicable. Will be evaluated for each project during design.

16. Utilities

Find help answering utilities questions[18]

a. **Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:**

Not applicable. Will be evaluated for each project during design.

b. **Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

Not applicable. Will be evaluated for each project during design.

[17] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-15-public-services
[18] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-16-utilities

C.Signature

Find help about who should sign[19]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

X _____

Type name of signee:

Position and agency/organization:

Date submitted:

D.Supplemental sheet for nonproject actions

Find help for the nonproject actions worksheet[20]

Do not use this section for project actions.

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. **How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?**

   The proposal is to adopt the City of Entiat Wastewater Facilities and General Sewer Plan, dated 2025, which provides a plan for continued and improved wastewater management. It is unlikely that adoption of the FP-GSP will increase the production, storage, or release of toxic or hazardous substances or long-term noise production. The FP-GSP evaluates the City of Entiat's wastewater treatment facility and wastewater collection system by: evaluating existing flows and wastewater loadings and providing future flow/load projections, an analysis of existing wastewater systems, evaluating improved alternatives, developing financing options and implementation schedules. These improvements will address wastewater facility capacity and treatment as well as collection system I/I and capacity. If

[19] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-C-Signature

[20] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-d-non-project-actions

the improvement projects suggested in the FP-GSP are implemented, noise and emissions to air would temporarily increase during construction.

- **Proposed measures to avoid or reduce such increases are:**

  A. Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable)

  B. Requiring proposals to comply with applicable environmental review and implementation regulations.

  C. Obtaining permits for wastewater improvement projects in the FP-GSP from agencies with jurisdiction applicable to water quality, air quality, noise, and toxic or hazardous substances.

  D. Requiring control measures during construction of wastewater improvement project in the FP-GSP and requiring contractors to be responsible for implementing appropriate measure during construction in compliance with environmental regulations including those related to air emissions, noise and discharge to water and production, storage, or release of toxic or hazardous substances (i.e. Dept. of Ecology, Dept. of Health, etc.).

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The adoption of the FP-GSP will not affect plants, animals, fish or marine life. The wastewater improvement projects included in the FP-GSP could have an impact on these environmental elements.

- **Proposed measures to protect or conserve plants, animals, fish, or marine life are:**

  A.Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable)

  B.Requiring proposals to comply with applicable environmental review and implementation regulations.

  C.Obtaining permits for wastewater improvement projects in the FP-GSP from agencies with jurisdiction applicable to water quality, air quality, noise, and toxic or hazardous substances.

  D.Requiring control measures during construction of wastewater improvement project in the FP-GSP and requiring contractors to be responsible for implementing appropriate measure during construction in compliance with environmental regulations including those related to air emissions, noise and discharge to water and production, storage, or release of toxic or hazardous substances (i.e. Dept. of Ecology, Dept. of Health, etc.).

3. How would the proposal be likely to deplete energy or natural resources?

The adoption of the FP-GSP will not affect energy or natural resources. The wastewater management projects included in the FP-GSP could have a direct impact on these environmental elements.

- **Proposed measures to protect or conserve energy and natural resources are:**

A. Measures may include public conversation education and use of energy efficient materials when economically and otherwise feasible.

B. Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable).

C. Requiring proposals to comply with applicable environmental review and implementation regulations.

D. Obtaining permits for wastewater improvement projects in the FP-GSP from agencies with jurisdiction applicable to water quality, air quality, noise, and toxic or hazardous substances.

E. Requiring control measures during construction of wastewater improvement project in the FP-GSP and requiring contractors to be responsible for implementing appropriate measure during construction in compliance with environmental regulations including those related to air emissions, noise and discharge to water and production, storage, or release of toxic or hazardous substances (i.e. Dept. of Ecology, Dept. of Health, etc.).

4. **How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection, such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?**

All projects will be evaluated for potential impacts during the review process.

- **Proposed measures to protect such resources or to avoid or reduce impacts are:**

A. Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable).

B. Compliance with City of Entiat critical areas and shoreline management regulations.

C. Requiring proposals to comply with applicable environmental review and implementation regulations.

D. Obtaining permits for wastewater improvement projects in the FP-GSP from agencies with jurisdiction applicable to water quality, air quality, noise, and toxic or hazardous substances.

E. Requiring control measures during construction of wastewater improvement project in the FP-GSP and requiring contractors to be responsible for implementing appropriate measure during construction in compliance with environmental regulations including those related to air emissions, noise and discharge to water

and production, storage, or release of toxic or hazardous substances (i.e. Dept. of Ecology, Dept. of Health, etc.).

5. **How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?**

The adoption of the FP-GSP will not affect land and shoreline use. The wastewater improvement projects included in the FP-GSP could have an impact on these environmental elements.

- **Proposed measures to avoid or reduce shoreline and land use impacts are:**

A. Following plans, priorities, guidelines, and rules in the Comprehensive Plan and Municipal Code.

B. Required project proposals to comply with Comprehensive Plans, Municipal Code, and other applicable review and implementation regulations.

C. Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable).

6. **How would the proposal be likely to increase demands on transportation or public services and utilities?**

The adoption of the FP-GSP will not affect demands on transportation or public services and utilities. The wastewater improvement projects included in the FP-GSP could have an impact on these environmental elements.

- **Proposed measures to reduce or respond to such demand(s) are:**

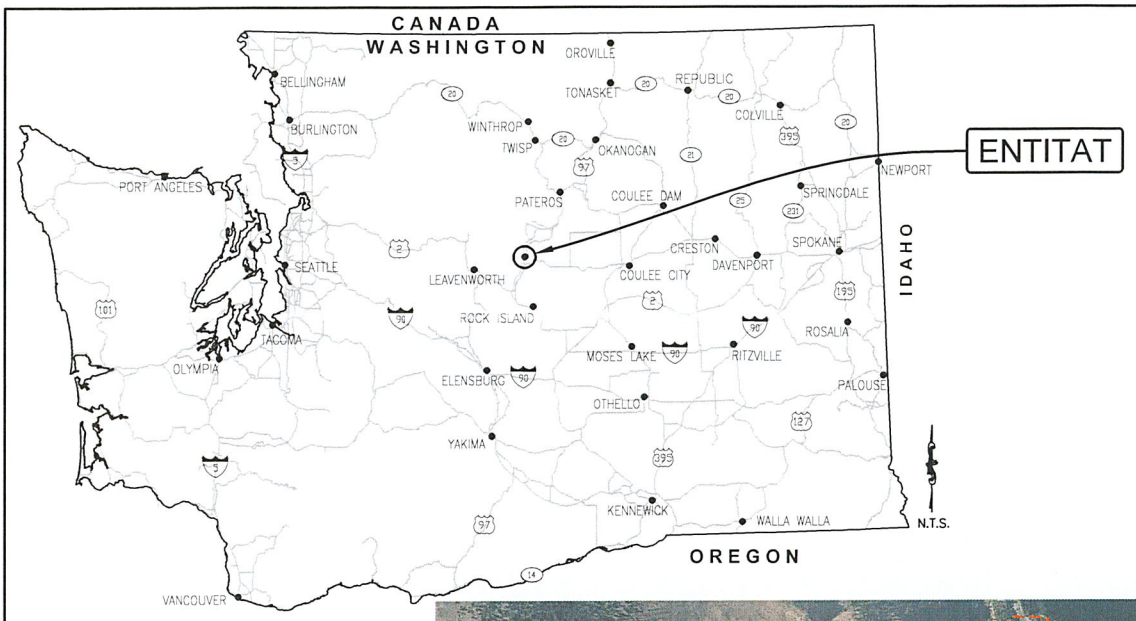
A. Following plans, priorities, guidelines, and rules in the Comprehensive Plan and Municipal Code.

B. Required project proposals to comply with Comprehensive Plans, Municipal Code, and other applicable review and implementation regulations.

C. Compliance with environmental review and implementation requirements applicable to wastewater improvement projects included in the FP-GSP (i.e.,SEPA, NEPA and SERP if applicable).

7. **Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.**

The Washington State Department of Ecology must approve the FP-GSP. In addition, the City will comply with environmental review and implementation requirements applicable to wastewater system improvement projects included in the FP-GSP. Therefore, the proposal to adopt the City of Entiat FP-GSP to provide improved wastewater system management is unlikely to conflict with local, state, or federal laws or requirements for the protection of the environment.





1950106-Fig 2-1_Vicinity Map

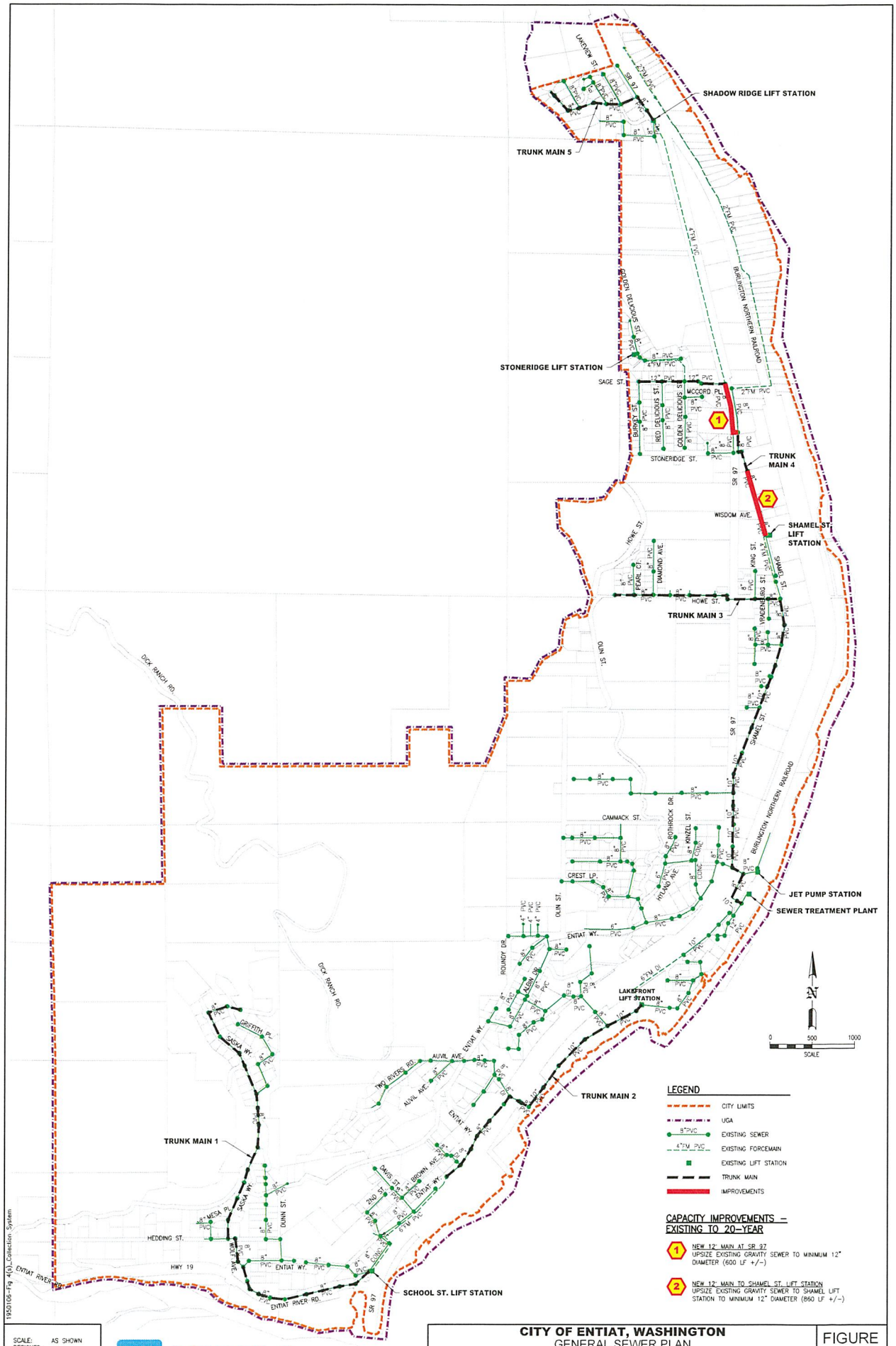
SCALE:	AS SHOWN
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DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-01-06
DATE:	1/24/24

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Engineering & Management

CITY OF ENTIAT, WASHINGTON
GENERAL SEWER PLAN

VICINITY MAP

FIGURE
2-1



1950106-Fig 4(x)_Collection System

SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	195-01-06
DATE:	12/06/24

VARELA
Engineering & Management

CITY OF ENTIAT, WASHINGTON
GENERAL SEWER PLAN

SUMMARY OF CAPACITY IMPROVEMENTS

FIGURE
4-X

THE WENATCHEE WORLD

Invoice

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Bill to
City of Entiat

Invoice number	FF6FC18D-0057
Notice ID	sGDHYfkDq98xDUjNAguT
Publisher	Wenatchee World
Date of issue	Apr 7, 2025
Date due	May 7, 2025
Amount due	**$276.38**

Description	Qty	Unit price	Amount
4/10/2025: Custom notice (Thursday Rate)	1	251.25	251.25

=== Notes ===
Notice Name: State Environmental Policy Act
Order Number: WWO001358

=== How to pay this invoice ===
Column Software PBC accepts online payment via credit or debit card, or ACH bank transfers. Please click here to pay online:
https://www.column.us/invoices/SvhRTrpnD0Z9lAhfPZWg/pay

Please note that, once paid, the merchant name on your billing statements will be Column Software PBC.

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Net Subtotal	$251.25
Tax	0.00
Processing Fee	25.13
Amount due	$276.38

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Notice ID: sGDHYfkDq98xDUjNAguT | **Proof Updated: Apr. 07, 2025 at 08:32am PDT**
Notice Name: State Environmental Policy Act

This is not an invoice. Below is an estimated price, and it is subject to change. You will receive an invoice with the final price upon invoice creation by the publisher.

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(509) 784-1500

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Columns Wide: 2
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4/10/2025: Custom notice (Thursday Rate)	251.25

Subtotal	$251.25
Tax	$0.00
Processing Fee	$25.13
Total	**$276.38**

See Proof on Next Page

State Environmental Policy Act
STATE ENVIRONMENTAL POLICY ACT

Determination of NonSignificance

April 4, 2025
Lead agency: City of Entiat
Agency Contact: Mark Botello, mbotello@entiatwa.us , 509-784-1500

Description of proposal: The proposed project is for the adoption of the City of Entiat's Facilities Plan and General Sewer Plan dated 2025. The Facilities Plan and General Sewer Plan is a non-project action; it is a planning document that identifies the City's treatment and collection system deficiencies and correspond ing improvement alternatives. This Facilities Plan and General Sewer Plan is in compliance with ECY requirements.

Location of proposal: The Facilities Plan and General Sewer Plan recommend several capital improvements to the City's existing wastewater collection system. The City of Entiat and the recommended Facilities Plan and General Sewer Plan improvements are generally located within Township 25 North, Range 21 East, Section 09 .

The City of Entiat has determined that this proposal will not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030. We have reviewed the attached Environmental Checklist and other information on file with the lead agency. T his information is available to the public on request.

This DNS is issued under WAC 197-11-340(2) and the comment period will end on Friday, April 25, 2025

Responsible Official:	Mark Botello
Position/title:	Public Works Director/Community Development Director
Phone:	509-659-1930
Address:	14070 Kinzel St., Entiat, WA 98822

Signature ON/FILE
(electronic signature or name of signor is sufficient)

Date

Pursuant to EMC 14.10.030 Administrative appeals. Appeal of an administrative decision made to the hearing examiner shall be filed with the city within 14 calendar days after the date of the decision of the matter being appealed. If the 14-day period ends on a weekend or on a holiday, the following working day shall be the fourteenth day.
Date: April 10, 2025
######